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Evaluating the Effects of Self-Control Depletion on Task Persistence: A Focus on the Moderating Effects of Performance Monitoring

Hayley Houseman

EVALUATING THE EFFECTS OF SELF-CONTROL DEPLETION ON TASK PERSISTENCE: A FOCUS ON THE MODERATING EFFECTS OF PERFORMANCE MONITORING

by

HAYLEY A. HOUSEMAN

(Under the Direction of Jeffrey Klibert)

ABSTRACT

Self-control is essential in day-to-day life and has important implications for goal attainment, successful living, and psychological well-being. However, self-control is known to fail when resources are depleted physically, cognitively, or emotionally, which can lead to difficulties completing important tasks. Performance monitoring, which makes a standard salient so that people can sustain their performance while attending to their goals, might buffer the loss of self-control on task performance. Overall, the purpose of this study was to experimentally examine the effects of self-control depletion and performance monitoring on task persistence. Eighty undergraduate students were recruited to participate in the study. Participants were randomly assigned first to a self-control depletion condition and then to a performance monitoring condition using an online format. Group differences on task persistence were determined by how long it took participants to quit a series of anagram problems. A 2 (Self-Control Depletion) x 3 (Performance Monitoring) Factorial ANCOVA, with trait conscientiousness scores as a covariate, was analyzed on task persistence scores. Results revealed non-significant main effects for trait conscientiousness, self-control depletion condition, and performance monitoring condition. Similarly, there was a non-significant interaction effect. These results suggest that self-control depletion, performance monitoring, and trait conscientiousness largely do not affect persistence on anagram task scores. However, there were significant methodological and environmental limitations associated with the study that minimized the likelihood of detecting significant findings. The implications of the study are discussed, and future recommendations are offered.

INDEX WORDS: Self-control depletion, Emotion exaggeration, Process model of self-control, Persistence, Anagram task, Conscientiousness, Motivation, Self-control

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HAYLEY A. HOUSEMAN

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HAYLEY A. HOUSEMAN

Major Professor:	Jeffrey Klibert
Committee:	Janie Wilson
	Amy Hackney

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CHAPTER 1

INTRODUCTION

Self-control plays a critical role in daily life, whether one is trying to maintain a diet, accomplish work, or simply watch less television. It gives people the ability to reach goals despite many temptations and barriers. Self-control is the ability to use thoughts, emotions, and behaviors to adaptively override responses that deter people from reaching their long-term goals (Baumeister & Alquist, 2009; Baumeister et al. 2007; Inzlicht et al., 2014).

The ability to maintain self-control has important implications for successful living and psychological well-being. Those with more self-control have better health-related behaviors (Bogg & Roberts, 2004), academic success (Duckworth & Seligman, 2005; Shoda et al., 1990), adjustment, emotion regulation, interpersonal relationships, self-esteem, and psychological health (Tangney et al., 2004). On the other hand, those with reduced self-control often experience more criminal convictions, substance dependence, and obesity (Moffitt et al., 2011). As a specific example, chronic dieters who lost self-control in a laboratory challenge gave in to food temptations more often than those who did not identify themselves as dieters, suggesting that the ongoing challenge of controlling food intake created a deficit in general self-control (Vohs & Heatherton, 2000). The negative impact of reduced self-control applies to many other situations, such as compromising athletic performance (Dorris et al., 2011) and making impulsive purchases as consumers (Baumeister et al., 2008). Thus, reduced self-control leads to problematic behaviors across a wide range of situations.

Purpose of the Current Study

The current study evaluates whether the effects of self-control depletion on task persistence are moderated by performance monitoring. Specifically, I examined if task persistence is affected

by a performance monitoring standard that alters perception of the amount of work left to complete on a task. This study should provide a larger theoretical and empirical context to explain the conditions by which self-control affects task performance. My specific aim was to examine how performance monitoring might induce motivational mechanisms that buffer the loss of self-control. In the current study, I aimed to answer the following questions:

a) Does being instructed to laugh while watching an unfunny comedic video cause a decrease in persistence on a tedious anagram task?
b) Does the presence of a performance monitoring standard (i.e., a task bar) buffer the effects of self-control depletion on anagram task persistence? Further, will those in a slow task bar condition persist longer on an anagram task than those in a normal task bar condition?
c) Is the buffering effect of a performance monitoring standard the greatest for those who have experienced self-control depletion?
d) Does covarying out variability associated with trait conscientiousness clarify the role of self-control depletion on task persistence scores?

Self-Control Depletion

How, exactly, is self-control lost? Research supports that self-control will fail in the presence of temptations, such as in the famous "marshmallow" test (e.g., Mischel, 2014). In this methodology, children who are given the choice of eating one marshmallow immediately versus two marshmallows after a short period of time would often eat the one marshmallow in front of them instead of waiting for two. Eating the single marshmallow immediately is considered a self-control failure since the children were not able to adhere to their more distal goal of eating two marshmallows. The temptation of seeing (and smelling) the single marshmallow attenuated

children's self-control. Therefore, one way to maintain self-control is to avoid temptation when possible.

A more general approach to the concept of lost self-control can be found in research on self-control depletion, a series of laboratory methods that quickly and briefly challenge self-control and then assess any remaining self-control. The regulatory depletion effect occurs when self-control is reduced to the point that people are not able to regulate their behaviors (Muraven et al., 1998). There is substantial evidence to support the existence of the regulatory depletion effect (Baumeister et al.1998; Baumeister et al., 2005; Muraven et al., 1998; Schmeichel et al., 2003; Vohs & Schmeichel, 2003; Webb & Sheeran, 2003), although "ego depletion," a term coined by Baumeister (Baumeister et al., 1998), has come under fire recently as perhaps creating small effects (Hagger et al., 2010; Carter & McCullough, 2013; Carter & McCullough, 2014; Hagger & Chatzisarantis, 2014; Carter et al., 2015; Hagger et al., 2016; Dang, 2018; Inzlicht & Friese, 2019). Be that as it may, laboratory challenges to self-control provide a useful foundation for research on how lost self-control might be regained.

Researchers have commonly used a dual-task paradigm to measure the regulatory depletion effect (e.g., Baumeister et al., 1998). First, participants are randomly assigned to a depletion or a non-depletion condition. Those in the depletion condition receive the depletion manipulation, while those in the non-depletion condition do not. Next, subsequent outcomes are measured using a second task, such as persistence. The idea is that if self-control is lost in the first task, participants will lack the self-control needed to persist on a subsequent task.

Studies using the dual-task paradigm employ various methods. I will focus this overview on *creating* depletion, therefore I am defining the independent variable. To deplete participants, investigators might use a self-control task related to a physical behavior, cognition, or emotion.

For instance, Coco et al. (2020) used an exhausting, physical task to deplete participants by asking them to perform a stringent cycling task with the cycle load incrementally increasing. Depletion was measured using dependent variables such as performance on the Stroop test (Stroop, 1992) and the Trial-Making Test (Tombaugh, 2004). The Stroop test electronically presents color words, such as "yellow" or "green," but the words are written in another color. For example, the word "yellow" might be written in blue letters. Participants must select the color of the words on repeated trials, and the accuracy of their choices are recorded. The Trial Making Test (TMT) requires participants to draw lines between circles with numbers in them in sequential order. A participant draws a line from the circle with a 1 to a circle with a 2. During the second part of the TMT, participants must simultaneously connect letters and numbers in order. The amount of time and number of errors are observed in both parts of the TMT. The researchers found that the extensive physical exercise was correlated with worsened cognitive performance as indicated by more errors on the Stroop task and Trial Making Test. Thus, the physical task was effective in depleting participants.

In the cognitive domain, depletion can occur with challenging mental tasks. As examples, cognitive depletion has been shown to occur during the Stoop task (Stroop, 1992), a thought control task (Muraven et al., 1998), a counter-attitudinal speech (Baumeister et al., 1998, Experiment 2), and a task requiring participants to cross out the letter *e* (Baumeister et al., 1998, Experiment 4). Just as the Stroop task was explained as a dependent variable in the prior paragraph, it can be used to deplete participants in the first stage of a dual-task experiment (as the independent variable). Mental effort is required to react to the color of a word rather than read the word when the two features are incongruent, making this a cognitive task. For example, it takes mental effort to recognize that the word "yellow," written in blue letters, is a blue word.

As a second methodology, Muraven et al.'s (1998) used a thought suppression task that instructed participants not to think about a white bear, which caused participants to give up faster on a subsequent anagram task. This type of task illustrates that trying to suppress a thought is effortful and depletes mental resources. As a third method, performing a counter-attitudinal speech draws on the same self-control resources as other depletion tasks and therefore can be used to deplete mental resources (Baumeister et al., 1998, Experiment 2). As a final classic task to induce cognitive self-control depletion, Baumeister et al. (1998) instructed participants to cross off all of the instances of the letter *e* on a typewritten sheet of paper that met a set of complex rules (e.g., only cross off *e* if it is not adjacent to another vowel or one extra letter away from another vowel). This mentally challenging task was effective in depleting participants. From this brief overview, it should be clear that cognitive challenges can reliably attenuate self-control.

The third type of depletion that can be induced in participants is emotion depletion. Emotion depletion typically occurs when using an emotion-suppression/emotion-exaggeration task (Vohs & Schmeichel, 2003), or an emotion-appraisal task (Gross, 1998). For instance, Vohs and Schmeichel (2003) placed participants into three conditions: the emotional-suppression condition required participants to watch a video, a sad and emotional clip from *Terms of Endearment*, and keep all emotional responses neutral; the control condition required that participants let their feelings flow naturally; the emotion-exaggeration condition required that participants show their feelings as much as possible and to experience their emotions fully. Both the emotion-suppression condition and emotion-exaggeration condition yielded the regulatory depletion effect. Further, the emotion-exaggeration condition resulted in more regulatory depletion than the emotion-suppression condition. Similarly, Dang (2018) provided a meta-

analysis supporting emotional responses to videos as a reliable way to reduce subsequent self-control.

Note that in the dual-task paradigm, one self-control task (physical, cognitive, or emotional) can be used to reduce self-control, and a second self-control task is used to assess the loss. So far, I have focused on the first task, providing examples of physical, cognitive, and emotional independent variables. I should note that the self-control task used as the dependent variable can also fall into the physical, cognitive, or emotional realm.

As an example of a physical self-control dependent variable, Bray et al. (2011) assessed hand-grip performance after depleting participants relative to a control condition which was not depleted. They measured hand-grip using the MVC muscle-endurance performance task pre- and post-cognitive depletion, which involved performing the Stroop task, versus no cognitive depletion. They found that the depletion group showed more deterioration of physical resources than the non-depletion group based on the duration of squeezing a hand-grip.

A researcher might also measure self-control depletion using a cognitive task, such as attempting to solve a difficult puzzle. For example, Baumeister et al. (1998, Experiment 1) depleted some participants by instructing them to eat radishes instead of chocolate chip cookies nearby. A second group of participants were asked to eat the chocolate chip cookies, and a third group of participants did not participate in this task. Next, all participants attempted to trace over a geometric figure without picking up their pencil; they were unaware that the geometric puzzles were unsolvable. The outcome of the study was the amount of time participants spent solving the puzzles. Those in the radish condition did not persist as long on the task as those in the cookie or the control condition, indicating a loss of self-control measured by a cognitively challenging dependent variable.

Vohs and Heatherton (2000, Study 2) also used an impossible task to assess loss of self-control. They first depleted participants by having them watch a video with either overflowing M&M candies nearby, which constituted the high temptation group, or across the room, which constituted the low temptation group. Following the video, participants were asked to complete a geometric task by locating sixteen target figures, which was unknowingly impossible to do. Those in the high temptation group did not persist on the task as long as those in the low temptation group, indicating the usefulness of a cognitive self-control measure.

Baumeister et al. (1998, Experiment 3) depleted participants by asking them to watch *Terms of Endearment* or watch a funny Robin Williams video while at the same time suppressing or not showing their emotions. Those in the no regulation condition were told to let their emotions flow. The participants were then tasked to complete 13 anagrams by rearranging letters to form words in a period of 6 minutes. Those in the suppress emotion condition performed worse, or solved fewer anagrams, than those in the no regulation condition. Similarly, during a writing task, Muraven et al. (1998, Study 2) separated participants into three categories: the thought expression group, who were told to think about a white bear, the suppress thoughts condition, who were told not to think of a white bear, and a no thought control condition, who were not given instructions about a white bear. Participants subsequently performed an anagram task, which they did not know to be unsolvable. Those in the thought suppression group did not persist as long on the anagram task as those in the no thought control or thought expression group, indicating that the thought suppression task was depleting.

As a final type of dependent variable, emotional self-control has been used to assess depletion. Grillon et al. (2015) tested the effect of self-control depletion on emotional responding to see if those in the control condition were more able to regulate their negative emotions than

the depletion condition. They induced self-control depletion by asking participants to copy a written passage omitting the letters *a*, *e*, and *i*, and they measured participants' startle response when shown emotionally negative images (e.g., dangerous or dead animals, guns, or bloody scenes). As expected, those in the depletion condition had more startle responses to the negative images, indicating that those in the depletion condition could not regulate their emotions as well as those in the non-depletion condition. This study illustrates that self-control depletion can affect our emotion regulation; therefore, depletion can be measured using emotion regulation tasks.

It can be seen that the dual-task paradigm requires a self-control task as an independent variable and as a dependent variable. In general, three domains capture physical, cognitive, and emotional self-control, with any combination within a given study. Although it might be expected that the first task depletes self-control as measured by the second task, the literature provides different potential explanations.

Models of Self-Control

The wealth of research using the dual paradigm approach has led to two primary and competing theories: the strength model and the process model. The *strength model* posits that self-control is like a muscle, with a finite amount of strength available at any given time (Baumeister et al., 1998; Muraven & Baumeister, 2000). In other words, self-control is like a glass of water. At first, the glass is full, but drinking from it reduces the amount of water in the glass. This may be why people feel fatigued after using self-control (Baumeister et al., 1998). The strength model is elegantly simple; however, it does not take into account motivational influences.

Conversely, the *process model* explains that motivations and perceptions influence self-control. This model theorizes that as people become depleted, they shift from goal seeking intentions and behavior to gratification seeking intentions and behavior (Inzlicht & Schmeichel, 2012). In other words, motivations change when self-control is exercised. Evidence suggests that self-regulation is indeed influenced by motivational factors (Chiew and Braver, 2011). Chiew and Braver (2011) explain that monetary incentives improve performance. They argue that money motivates people to perform better, which requires the use of more self-regulatory processes. Zhu et al. (2017) also found evidence to support the process model. Participants who were in a depletion-motivation condition performed better than participants who were in a depletion-control condition due to the presence of an incentive (i.e., an extrinsic motivator). Because self-regulation is influenced by motivational factors, increasing motivation to perform a task appeared to buffer the effects of self-control depletion.

As a second approach to adjusting motivation, researchers can heighten participants' awareness of their performance. In fact, performance monitoring has been shown to buffer the effects of self-control depletion (Voce & Moston, 2016; Wan & Sternthal, 2008). Performance monitoring makes a standard salient so that people can sustain their performance while attending to their goals. In other words, people consider, "How long would most people persist on this task?" or "Am I performing at the level of most people?"

One way to activate a focus on self-performance is to make the self salient while participants are performing a task (Scheier & Carver, 1983). Scheier and Carver (1983) asked participants to draw a geometric figure from memory, with one group working in front of a mirror. They found that participants working in front of a mirror more frequently pressed a button to see the slide again compared with the control condition. In other words, the mirror

enhanced focus on the self, such that participants sought out more feedback on their performance, allowing them to often compare their own performance to a standard. Similarly, social comparisons (Baumeister et al., 2005, Experiment 6) can remind people to keep up the pace with their peers on a task, such as when students observe how many math questions their peers have completed so that they know how fast to complete their own math problems. Finally, using a clock (Wan & Sternthal, 2008) or a task bar (Voce & Moston, 2016) are effective ways to make a standard salient, increase goal motivation, and improve task performance.

Let us explore the idea of a salient performance standard. What makes the feedback of a clock, for example, adjust motivation? First, monitoring occurs when people track their behavior and evaluate their performance. Second, a perceived standard must exist, even if that standard is just in the mind of the actor. Third, monitoring must entail evaluating personal performance in relation to a standard (Carver, 2004; Carver & Scheier, 1998). Because people are more likely to disregard their task goal while they are depleted (Duncan, 1990), performance monitoring may help depleted people attend to their task goal. A renewed focus on a standard of performance – similar to a good work ethic – may increase motivation and persistence on a task.

The performance monitoring study by Wan and Sternthal (2008) may shed light on the mechanisms that make performance monitoring effective. After depleting participants, the researchers made a clock salient as participants completed a puzzle task. Participants with an inaccurate, fast clock did not persist as long on the puzzle task as participants with an accurate clock. The authors provide a post-hoc explanation that those with the fast clock condition believed they had already spent their "fair share" of time on a task, as indicated by the accelerated time on the clock. This explanation follows the norms-of-reciprocity notion, which holds that a participant will fulfill their obligation to the researcher. Once the participant believes

that they have spent more time on a task (i.e., fast clock condition), they may perceive that they have fulfilled their obligations to the researcher. As a result, the participants in the fast clock condition quit sooner than those presented with an accurate clock. If the *strength model* were correct, those with a fast clock should have had the same amount of self-control resources as those with an accurate clock. After all, participants in the three conditions should have retained the same amount of self-control after completing the same depleting task. Differences in persistence can only be explained by changes in motivation, as supported by the *process model*.

The *process model* proposes that motivation to work will shift toward motivation to quit and seek more pleasurable activities. If so, participant motivation to complete a task might dwindle if the participant believes that they have already completed enough work. A performance monitoring cue, such as the time on a clock, might indicate that participants are almost finished with a task. If participants believe they have already spent a reasonable amount of time, they may quit the task. Thus, participant motivation to complete a task adjusts according to how many resources they expect to use during the task.

If Wan and Sternthal (2008) are correct in assuming that motivation waned for those observing a fast clock, the same explanation should apply to a slow clock. Participants who perceive that they have not persisted for a reasonable length of time based on an internal standard (e.g., comparing how many anagrams a participant believes they finished to how much time on a clock remains) should continue the task longer than those with an accurate clock. In fact, any indication of performance, including a clock or a task bar, should yield the same results. Further, the outcome should be more pronounced for those who have been depleted because they are less likely to attend to internal cues and more likely to base their performance on the task bar. Conversely, previous literature suggests that those in a slow task bar condition may not persist as

long as those in a no task bar or a normal task bar condition due to the perception that their task goal is psychologically more distant. For instance, the goal gradient hypothesis states that people tend to be more motivated to complete a goal when they perceive the psychological distance to the goal as being closer; on the other hand, when they perceive the psychological distance to the goal as being farther, they are less motivated to complete the goal (i.e., the goal gradient hypothesis) (Hull, 1932; Brown, 1948). Additionally, people in a depletion condition may view a persistence task as more difficult to complete in general, so they may perceive the goal as more distant (Cole et al., 2014). This distance may motivate people to quit a task sooner rather than later. Therefore, it is possible that persistence on a task with the presence of a slow task bar may either increase of decrease motivation to persist on a task. Either outcome would provide further support for the process model of motivation. However, if the strength model is correct, depleted participants should persist for the same amount of time across task bar conditions.

Personality and Self-Control

Although I recognize that differential feedback may adjust performance, I cannot ignore the potential role of individual differences, such as a participant's personal work ethic. Trait conscientiousness is one of the main five domains of the Big-Five Inventory (BFI-2) and is important in determining personality (Soto & John, 2017). Conscientiousness is characterized by proactive aspects, such as the need for achievement and commitment to work, and by inhibitive aspects, such as high morality and cautiousness (DeYoung et al., 2007). Conscientiousness has been subdivided into areas of preciseness, practicality, promptness, exactness, fastidiousness (Hofstee & De Raad, 1992), reliability, meticulousness, carefulness, accuracy, low superficiality (Perugini & Gallucci, 1997), order, decisiveness-consistency, industriousness (Saucier & Ostendorf, 1999), impulse control, responsibleness, work (Peabody & De Raad, 2002),

organization, neatness, systematicity, efficiency, conventionality (Roberts et al., 2004), competence, dutifulness, self-discipline, deliberation, rule-consciousness, perfectionism, socialization, good impressions, well-being (Roberts et al. 2005), tidiness, task planning, perfectionism, efficiency, and perseverance (MacCann et al., 2009). The most recent Big Five personality assessment, the BFI-2, divides conscientiousness into three main sub-groups: organization, productiveness, and responsibility (Soto & John, 2017). Because conscientiousness includes the facets above, it is reasonable to assume such individual differences will play a role in performance on the anagram task. Participants with more trait conscientiousness may persist longer on the task regardless of experimental conditions.

Hypotheses

The current study used performance monitoring as a potential buffer against the regulatory-depletion effect. I used a traditional dual-task paradigm to create and measure self-control depletion. First, I used an emotion-exaggeration task to deplete participants. One group exaggerated their emotions while watching a video that is not funny, and a second group simply watched the video. After participants watched the video, they completed a solvable anagram task under one of three conditions: the first group did not see a task bar, a second group saw an accurate, normal task bar, and a third group saw an inaccurate, slow task bar. The solvable anagram task followed similar methodologies found in existing literature (e.g., Baumeister et al., 1998; Voce & Moston, 2016). For those who are depleted, I expected that performance monitoring would be an effective buffer against self-control depletion when the task bar is accurate. Because trait conscientiousness may have affected the relationship between the variables in my study, I included conscientiousness as a covariate to remove any variability due to trait conscientiousness. My hypotheses are as follow (See Figure 1):

(1) I hypothesize that participants who must laugh at an unfunny video will not persist on an anagram task as long as participants who simply watch the video. This will signify a main effect of depletion condition.

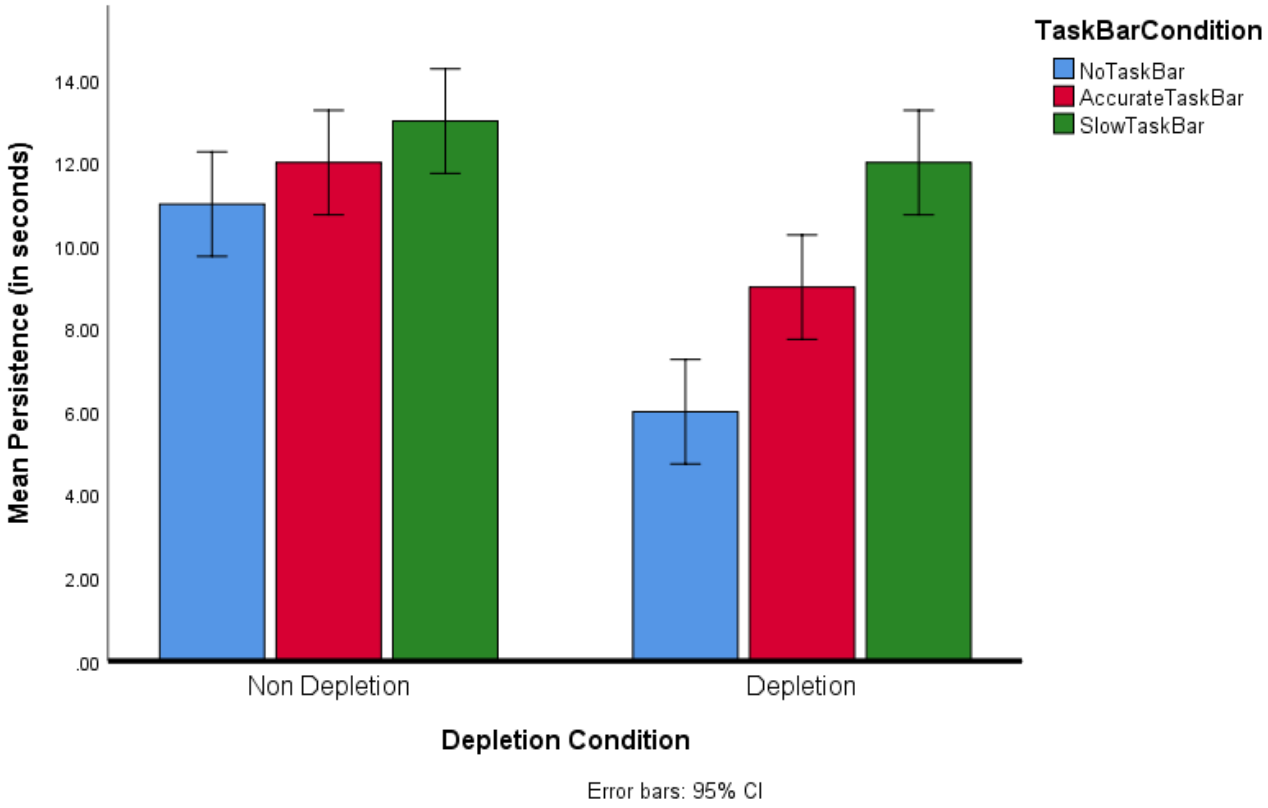
(2) I hypothesize that participants who see a normal task bar during a tedious anagram task will have more self-control to persist than the group that does not see a task bar. Further, I hypothesize that participants in a slow task bar condition will persist longer than those in a normal task bar condition because they will not perceive that they have accomplished enough work as compared with an internal standard of what constitutes a reasonable amount of work. This result will signify a main effect of task bar feedback.

(3) I hypothesize an interaction between self-control groups and task bar groups in accounting for variation in tasks persistence scores.

(4) I hypothesize that covarying out variability associated with trait conscientiousness will clarify the role of self-control depletion on the amount of time spent on the anagram activity. Specifically, I am looking to determine if there will be a significant main effect for variation of trait conscientiousness on task persistence.

FIGURE 1

Hypothesized Persistence on the Anagram Task



CHAPTER 2

METHODOLOGY

Participants

I originally planned to recruit 111 undergraduate students enrolled at Georgia Southern University to participate in this study for class credit, per sample size calculations provided by G*Power (Faul et al., 2009). When performing the above calculations, I relied on plans to use an ANCOVA to examine two main effects and a potential interaction effect, where the effect size type was Cohen's *f*. I anticipated a small effect size of 0.3, an alpha level of 0.05, a power level of 0.80, a numerator for degrees of freedom of 2, 6 groups, and 1 covariate. However, due to difficulties associated with the pandemic and recruiting individuals to participate in an online experimental procedure, I was unable to recruit as many participants as initially desired.

Eighty undergraduate students enrolled at Georgia Southern University were recruited to participate in this study for class credit. Before data collection started, approval from Georgia Southern University's Institutional Review Board (IRB) was obtained. Students signed up for the study on the university's SONA systems portal. Three students were removed from the final sample for failing to follow instructions regarding how to complete the anagram task. Overall, 77 participants were retained in the final sample. The sample consisted of 52 women (67.5%), 23 men (29.9%), and 2 people who identified as non-binary (2.6%). The average age of the participants was 20.03 years (SD = 2.7), with an age range of 18 to 33 years. Participants indicated their academic year; one participant identified as a dual-enrolled, high school student (1.3%), 49 participants identified as first-year students (63.6%), 14 participants identified as second-year students (18.2 %), 5 participants identified as third-year students (6.5%), 5 participants identified as fourth-year students (6.5%), and 3 participants identified as being

beyond their fourth year in their program (3.9%). In terms of ethnicity, 30 participants identified as White (39%), 26 participants identified as Black (33.8%), 7 participants identified as Latino/Latina/LatinX (9.1%), 6 participants identified as multiethnic (7.8%), 5 participants identified as Asian American (6.5 %), 2 participants identified as Other (2.6%), and 1 participant identified as Native American (1.3%).

Materials and Measures

Self-Control Depletion Video. A video clip was used as a platform to implement the self-control depletion activity. Specifically, I used a YouTube video titled *"Nadia Kamil Shoes Cringe Woman Stand-Up"* that lasted four minutes and twenty-eight seconds (QUORN SLIP ONS, 2018). The clip can be viewed at https://www.youtube.com/watch?v=Yh0yAwSynZY. The video depicts a female stand-up comedian doing stand-up in front of a live audience. The comedian appears to be eccentric and awkward, and her delivery is disorganized. Her jokes get a moderate number of laughs from the audience. Overall, the purpose behind choosing the video was the quality of the jokes. In general, due to the low level of audience feedback (i.e., laughter), I suspected the performance was not as funny as other comedic videos. It was important to select a video where participants would have to force laughter as part of the self-control depletion task.

As manipulation check measures, I assessed participant perceptions of the video with items such as, "*The comedian in the video is funny*." Participants responded to this item using the following options: *"Strongly Agree," "Agree," "Neutral/No Opinion," "Disagree,"* or *"Strongly Disagree."* I also asked participants to rate their familiarity with the video clip using one question, *"Have you seen this video before?"* Participants were asked to respond *"Yes,"* or *"No."*

Mood Measure. I used a modified item from the Brief Mood Introspection Scale (BMIS) to assess mood (Mayer & Gaschke, 1988). In my study, I asked participants to indicate their overall mood using a sliding bar. Participants indicated their overall mood from the least pleasant, with the lowest value at 0, to most pleasant, with the highest value at 10 (Appendix A). Participants were asked to complete the mood measure three times during the course of the experiment. I assessed mood to see if the persistence measure can be explained merely by mood differences rather than self-control depletion between groups.

Anagram Tasks. The solvable anagram task was administered through Qualtrics. All anagrams were six letters long (see Appendix B). Each participant was asked to unscramble the words and type them into a text box. Before beginning the task, participants were provided an example: *"If given 'z i y d z,' you would type the response 'dizzy' into the text box."* Participants were asked to complete as many anagrams as possible. I placed 100 (no task bar, normal task bar) or 200 (slow task bar) anagrams on Qualtrics dependent upon group assignment. Each anagram is located on its own page. Participants were instructed to click the right arrow to move on to the next anagram. On every anagram page, participants were given the option to quit the study (see Appendix C). Participants quit the study by selecting *"Quit Task"* from a drop-down menu.

As another validity check, I assessed perceptions of participants' abilities on the anagram task with two items: *"How many anagrams do you think you solved?"* and *"How many anagrams do you think you got right?"* Additionally, I assessed perceptions of effort, motivation, and competence in completing the anagram task with three items: *"I put effort into the anagram task," "I was motivated to work on the anagram task,"* and *"I am generally good at completing*

(unscrambling) anagrams." Participants rated their agreement on the statements by indicating *"Strongly Agree," "Agree," "Neutral/No Opinion," "Disagree,"* or *"Strongly Disagree."*

Conscientiousness Measure. I assessed trait conscientiousness using the twelve conscientiousness items from the updated Big Five Inventory – 2 (BFI-2) scale (Soto & John, 2017). The conscientiousness items measure a participant's tendency to be organized, productive, and responsible. These are the core features of conscientiousness, all of which relay information about the motivation and goal setting orientation of individuals (Soto & John, 2017). A sample item is, *"I am someone who tends to be disorganized."* Participants rated their agreement on a 5-point scale, with item responses ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Total scores ranged from 12 to 60, with higher scores reflecting greater conscientious traits. In terms of psychometric properties, this conscientiousness measure demonstrates very good test-retest reliability and excellent internal consistency (α = .86 -.88) (Soto & John, 2017). In this study, the conscientiousness measures demonstrated solid internal consistency (α = .79).

Demographic Information. I collected demographic information, including gender, age, year in school, and ethnicity from all participants. Participants had the ability to skip the demographic items, but it was suggested that they complete all items. In addition, I collected information on participants' testing environment since participants were tested from their chosen location (Appendix D).

Task Persistence Measure. I evaluated and measured for persistence on the anagram task as a dependent variable. I measured the amount of time participants spent on the before they chose to quit the anagram task. The Qualtrics software recorded time spent on the anagram task in units of seconds.

Experimental Conditions

Self-Control Depletion Conditions. Participants were randomly placed into one of two different self-control depletion groups. All participants were asked to watch the comedic video. Individuals in the depleted self-control group were given a set of specialized instructions:

> *"Please watch the YouTube video all the way through. Laugh at all of the jokes in the video. Laugh at every punchline. Laugh as hard as you can, even if the jokes are not funny. Laugh harder than you normally would. Pay close attention to each joke that is said. Click play to get started."*

The purpose of these instructions was to ensure that every participant in the depletion condition had similar expectations for how often and intensely they should laugh while watching the video. While participants watched the video, I recorded the number of times they laughed and tallied the number on a note sheet. I marked that participants laughed if they made an audible laughing sound, took a breath and started laughing again, or made an upward, exhaling movement or sound consistent with the expression of laughter. For example, some participants had small laughs, while others laughed loudly without stopping very long for breath between laughs. Some participants did not laugh after instruction, and some participants stopped laughing in the middle of the video. If participants did not laugh within the first minute of the video, or if they stopped laughing, I asked them to pause the video, and I instructed them to laugh again. For some participants, it was necessary to instruct them to laugh once more.

Individuals in the no depletion task were asked to simply watch the video. They were provided the following instructions:

> *"Please watch the YouTube video all the way through. Pay close attention to each joke that is said. Click play to get started."*

Laughter was recorded for the no depletion group in the same fashion that laughter was recorded for the depletion group to ensure participants followed instructions.

Performance Monitoring Conditions. In the current study, participants were randomly assigned into a no task bar, normal task bar, and slow task bar condition. The no task bar condition represented the performance monitoring control group, the normal task bar condition represented the basic performance monitoring condition, and the slow task bar condition represented a special performance monitoring condition that has not yet been examined to my knowledge.

Those in the normal task bar condition and the slow task bar condition could easily see a task bar on the bottom of the screen that ranged from 0% to 100% completion, but the exact percent of completion was not displayed during the task. The words "Survey Completion" were located above the bar. For each anagram that was solved, the completion of the task increased, as indicated by the task bar. Those in the no task bar condition saw no bar. In the no task bar condition and the normal task bar condition, there were 100 anagrams, each 6 letters, that participants could solve (Appendix B). In the slow task bar condition, there were 200 anagrams, each 6 letters, that participants could solve. The slow task bar condition showed half the amount of completion that the no task bar condition and the normal task bar condition showed. Therefore, it appeared that participants in the slow task bar condition had more anagrams to finish.

Procedure

Participants signed up via the SONA System, where a link for the meeting and instructions for completing the study were offered. Data collection procedures took place over Zoom meetings. Each meeting was scheduled to last one hour. The study administrator tested

participants virtually from one of the psychology department's laboratories. Two to three reminders were sent to each participant repeating these instructions and reminding participants of their scheduled meeting time. Once meetings were scheduled, each participant was given an electronic Zoom meeting invitation.

In SONA, participants were instructed to pick an environment with limited distractions (i.e., be in a room alone, be in a space where they are comfortable to laugh out loud, and remove distractions such as cell phones and smart watches), to use a laptop or desktop (since the study was not compatible with other devices), and to log onto Zoom 10 minutes ahead of their scheduled time. At the beginning of the Zoom meeting, participants were greeted, asked to turn on their audio and video feeds, asked to share their screen, and sent their survey link. Participants opened the survey on their computer and followed instructions from the study administrator. The study administrator ensured that the participant was using the correct device (i.e., a laptop or desktop computer). Additionally, those with a Mac computer were instructed to turn off their auto-correct function, and those with a Personal Computer (PC) were asked to turn off their spell-check function. The auto-correct and spell-check functions make it easier for participants to correctly solve the anagrams in the anagram task, which may make it easier for participants to persist longer on the anagram task. Thus, these functions were removed to ensure validity on the anagram task.

Participants were then given an informed consent form, which all participants downloaded on to their computers. Participants read through the document and asked questions as needed. During the informed consent process, participants were notified of the nature of the study, specifically the time-commitment, risks, and benefits to participating. Once participants consented, they entered their participant identification number in a text box and were asked to

remove distractions (i.e., phones, smart watches, and being in a room alone). Next the study administrator explained:

> *"I will now be turning off my video. Please keep your video and audio on for this part of the study. The survey will ask you to wait for the administrator at times, and I will chime in and speak to you. Otherwise, you can click through. Click the right arrow to get started."*

After the study administrator turned off her video, participants completed the first mood measure. Next, all participants were instructed to watch a "cringy" stand-up comedian in a YouTube video titled *"Nadia Kamil Shoes Cringe Woman Stand-Up*." Using Qualtrics, participants were randomly assigned a unique set of instructions in watching the video. Specifically, those in the self-control depletion group were asked to exaggerate their emotional reaction to the video, defined by laughing often and audibly during the video, whereas those in the control (no depletion) group were asked to simply watch the video. After watching the video, all participants were assessed for mood a second time. At this point, the administrator asked participants to stop sharing their screen to avoid observer bias during the next tasks. Specifically, they were instructed as follows:

> *"Please stop sharing your screen on Zoom at this time. Turn off your video but leave your audio on. When you click next, you will see instructions for the anagram task. Please click next and read the entire page of instructions out loud."*

Again, participants were randomly assigned to another set of groups based on the presence of a task bar. Participants were randomly assigned to a no task bar, normal task bar, or slow task bar as they solved different anagram tasks. Regardless of task bar condition, participants were asked to unscramble anagrams and quit when they would like. Participants

could quit the task at any time by selecting a drop-down menu and clicking "Quit Task." Participants were given the opportunity to complete 100 or 200 anagrams depending on their randomly assigned task bar condition. Those in the no task bar condition and those in the normal task bar condition had the opportunity to solve 100 anagrams, while those in the slow task bar condition had the opportunity to solve 200 anagrams. The slow task bar condition was overloaded with anagrams to increase the perception that there was a large number of anagrams to complete at all times. Each participant was given a maximum of 30 minutes to complete the anagram task. The instructions for the anagram task were worded based on previous literature (Baumeister, 1998; Voce & Moston, 2016). The instructions delivered to participants can be found in Appendix C.

After participants completed the anagram task, they were asked to complete the final mood measure. Participants were also asked to rate their perceptions of different features of the study (i.e., the video and anagram task) as well as to complete survey questions regarding trait conscientiousness, demographic information, testing environment, and perceptions regarding the purpose of the study. Lastly, participants were thanked for their time and provided contact information for the university's counseling services in case they experienced any kind of distress. Participants were formally debriefed using a structured form (See Appendix E). In total, it took participants approximately between 20 and 60 minutes depending upon how fast they decided to quit the anagram task.

Planned Analysis

Preliminary Analyses. I ran a number of analyses to ensure elements of my study were validated. First, I ran frequency statistics on participant perceptions of humor to determine how funny participants perceived the comedic video. It was expected that participants would not think

the video was funny. Second, I ran a 2 (Self-Control Depletion Group) x 3 (Task Bar Condition) x 3 (Time) Mixed Factorial ANOVA to determine variation on mood. Specifically, I evaluated 3 main effects, 3 two-way interaction effects, and 1 three-way interaction effect. Significant interaction effects would be probed further to determine the unique nature of the interaction. The purpose behind running this analysis was to determine if engaging in the study's procedures affected participants' mood. There is some evidence (Baumeister & Alquist, 2009), though mixed, that the depletion task and the anagram task can affect mood. However, it is unknown how strong and stable this effect is. Finally, I ran a simple ANOVA to determine if self-control depletion groups varied by frequency of laughter as a manipulation check. The purpose of this analysis was to determine if participants had significant differences in their number of laughs. It was expected that those in the no depletion group would laugh significantly fewer times than the self-control depletion group.

Primary Analysis. I ran a 2 Self-Control Depletion (no depletion, depletion) x 3 Performance Monitoring (no task bar, normal task bar, or slow task bar) Factorial ANCOVA, with trait conscientiousness scores as a covariate, to determine within and between group differences on task persistence. Any significant interaction effects would have been probed using field-approved post-hoc analyses.

CHAPTER 3

RESULTS

Preliminary Analyses

Frequency Data. The data were examined in order to determine the distribution of scores for participant ratings of how funny they thought the video was. It was expected that participants would not find the video funny, which is consistent with the results of the analysis (M = 1.961, SE = .124). To evaluate whether these effects violated the normal distribution, I evaluated the skewness of the data. Results revealed skewness to be .885 with a standard error of .274. In addition, I also evaluated kurtosis of the distribution of scores. Results revealed a value of -.299 with a standard error of .541. The distribution is illustrated in a histogram (See Figure 2). Overall, the results from the Kolmogorov-Smirnov analysis indicates the data were non-normally distributed, $D(77) = .265$, $p < .001$, in a manner consistent with a negatively skewed pattern. This means that there more participants had minimal laughter or no laughter in response to the "cringy" comedic video. This is consistent with expectation since the participants in the no depletion condition were not instructed to laugh at the video, and the video was expected not to be funny.

Additionally, the frequency that participants were asked to quit the anagram task after 30 minutes was examined to inform whether there may have been a ceiling effect for task persistence. I found that the frequency that participants solved anagrams for 30 minutes was as follows: no depletion and no task bar, 3 participants, no depletion and a normal task bar, 1 participant, no depletion and a slow task bar, 3 participants, depletion and no task bar, 1 participant, depletion and a normal task bar, 4 participants, and depletion and a slow task bar, 2 participants. There were 14 total participants who solved anagrams for 30 minutes.

Mood Fluctuations. To evaluate whether differences were reported in mood ratings across the different phases of the study, I ran a 2 Self-Control Depletion (No Depletion, Depletion) x 3 Performance Monitoring (No Bar, Normal Bar, Slow Bar) x 3 Time (Time 1, Time 2, Time 3) Mixed Factorial ANOVA. In terms of main effects, results revealed a significant effect for time, $F(2, 140) = 20.647$, $p < .001$, $\eta_p^2 = .225$. Alternatively, results revealed non-significant main effects for depletion condition, $F(1, 71) = .165$, $p = .686$, $\eta_p^2 = .002$, and performance monitoring condition, $F(2, 71) = .539$, $p = .586$, $\eta_p^2 = .015$. In terms of interaction effects, results revealed non-significant two-way interaction for time*depletion, $F(2, 140) = .277$, $p = .754$, $\eta_p^2 = .004$, time*performance monitoring, $F(4, 140) = .189$, $p = .942$, $\eta_p^2 = .005$, and depletion*performance monitoring, $F(2, 71) = .359$, $p = .699$, $\eta_p^2 = .01$, on mood scores. Finally, results showed a non-significant three-way interaction for time*depletion*performance monitoring, $F(4, 140) = .384$, $p = .817$, $\eta_p^2 = .011$, on mood scores.

A graphical depiction of the main and interaction effects is offered in Figure 3. Pairwise comparisons indicate that participants reported higher mood scores at Time 1 ($M = 7.117$, $SD = 2.045$) compared to mood scores at Time 2 ($M = 6.623$, $SD = 2.357$), $p = .007$, and Time 3 ($M = 5.961$, $SD = 2.093$), $p < .001$. In addition, ratings of mood at Time 2 were higher compared to ratings of mood at Time 3, $p < .001$. These findings suggest that participants' mood scores changed over time. Regardless of assigned depletion condition or performance monitoring condition, mood for all participants significantly decreased across Time.

Manipulation Check. I ran a simple ANOVA to determine if there was a difference in the frequency of laughs between the no self-control depletion group and the self-control depletion group. It was expected that those in the depletion group would laugh significantly more times than the no depletion group. The analysis confirmed this expectation, as the number of laughs in

the depletion group (M = 20.326, SD = 13.319) was significantly higher than the number of laughs in the no depletion group (M = .677, SD = 1.512), F (1,75) = 73.045, $p < .001$, $\eta_p^2 = .493$. This is consistent with the nature of the self-control depletion task and suggests participants followed instructions.

Primary Analysis

A 2 Self-Control Depletion (no depletion, depletion) x 3 Performance Monitoring (no task bar, normal task bar, or slow task bar) Factorial ANCOVA, with trait conscientiousness scores as a covariate, was analyzed to determine within and between group differences on task persistence. Means and standard deviations can be seen in Table 1. Conscientiousness had a non-significant main effect on task persistence, $F(1, 70) = .002$, $p = .969$, $\eta_p^2 < .001$. There was also a non-significant main effect for self-control depletion condition, $F(1, 70) = 2.374$, $p = .128$, $\eta_p^2 = .033$; there were no differences in task persistence between the no depletion group (M = 974.107, SD = 648.721) and the depletion group (M = 761.730, SD = 617.636). Results revealed a non-significant main effect for performance monitoring condition, $F(2, 70) = .332$, $p = .718$, $\eta_p^2 = .009$; there were no differences in task persistence among the no task bar group (M = 797.401, SD = 620.142), the normal task bar group (M = 879.466, SD = 685.120), and the slow task bar group (M = 896.889, SD = 629.399). Finally, results indicated a non-significant interaction between depletion condition and performance monitoring condition, $F(2, 70) = 1.194$, $p = .309$, $\eta_p^2 = .033$. A bar graph depicting the non-significant interaction effects of self-control depletion and task bar conditions on persistence is offered in Figure 4.

Because of the non-significant effect of the covariate, trait conscientiousness, I decided to evaluate the relationship between the covariate and the dependent variable, task persistence, more directly. Specifically, I ran a bivariate correlation to obtain a better understanding of this

relationship. Results revealed a non-significant relationship between these two variables, r = .013, p = .913, suggesting that individuals who reported higher trait conscientiousness scores did not have higher task persistence scores compared to individuals who reported lower trait conscientiousness scores.

Because of this null relationship, I decided to re-evaluate the primary model without the covariate. Specifically, I analyzed a 2 Self-Control Depletion (no depletion, depletion) x 3 Performance Monitoring (no task bar, normal task bar, or slow task bar) Factorial ANOVA. There was a non-significant main effect for self-control depletion condition, $F(1, 71) = 2.411$, p = .125, η_p^2 = .033; there were no differences in task persistence between the no depletion group (M = 974.107, SD = 648.721) and the depletion group (M = 761.730, SD = 617.636). Results revealed a non-significant main effect for performance monitoring condition, $F(2, 71) = .339$, p = .713, η_p^2 = .009; there were no differences in task persistence among the no task bar group (M = 797.401, SD = 620.142), the normal task bar group (M = 879.466, SD = 685.120), and the slow task bar group (M = 896.889, SD = 629.399). Finally, results indicated a non-significant interaction between depletion condition and performance monitoring condition, $F(2, 71) = 1.227$, p = .299, η_p^2 = .033.

TABLE 1

Means and Standard Deviation Scores for Self-Control Depletion and Performance Monitoring Conditions on Task Persistence

	Non-Depletion Group (n = 34)			Depletion Group (n = 43)		
Measures	No Bar (n = 13)	Normal Bar (n = 10)	Slow Bar (n = 11)	No Bar (n = 15)	Normal Bar (n = 13)	Slow Bar (n = 15)
Task Persistence						
M	760.146	1041.352	1165.839	829.688	754.938	699.659
SD	679.909	609.917	628.303	585.697	736.824	571.762

FIGURE 2

Frequency of Laughs During “Cringy” Comedic Video

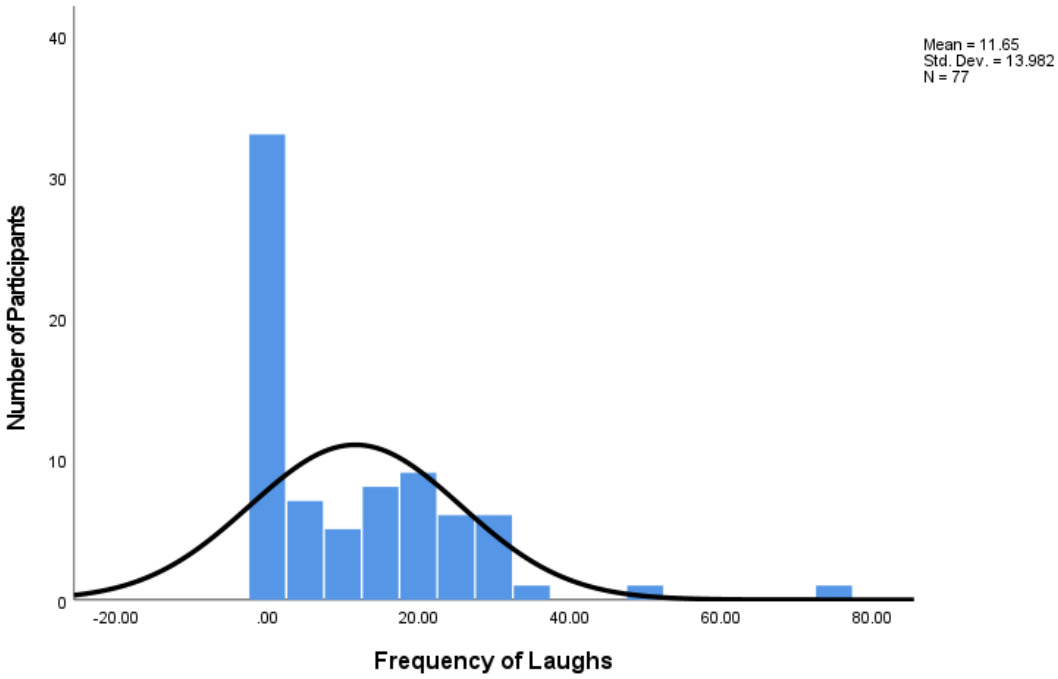


FIGURE 3

The Interaction Effects of Self-Control Depletion, Task Bar Condition, and Time on Mood

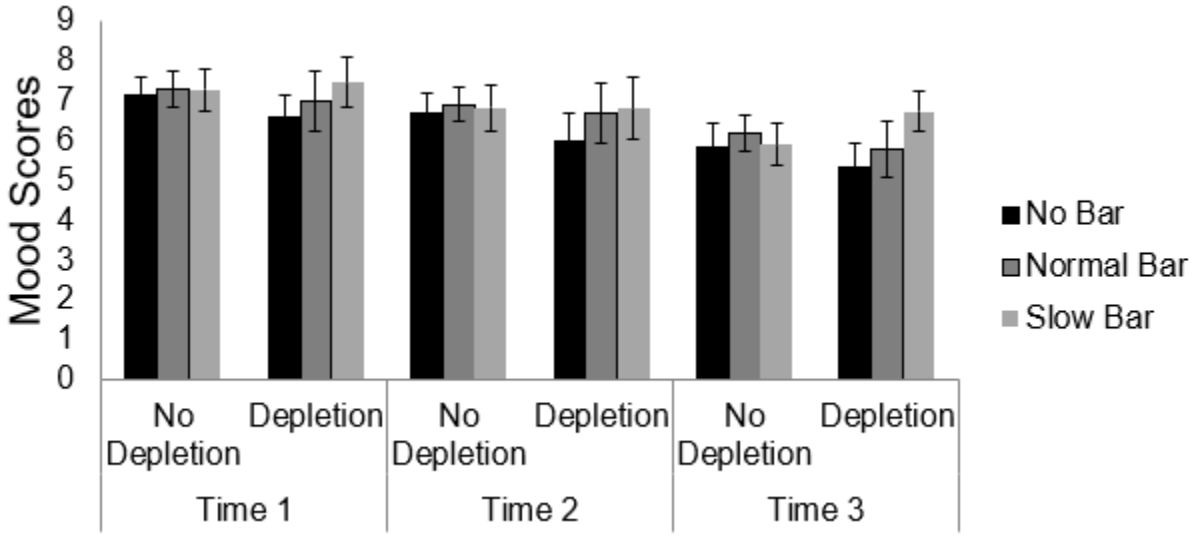
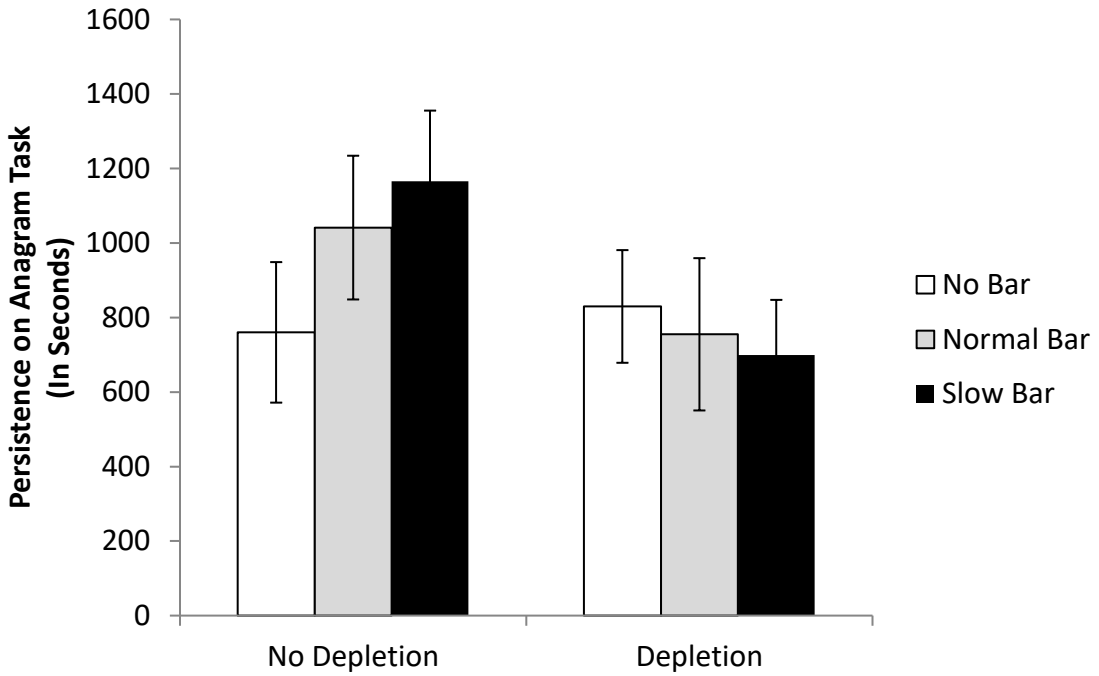


FIGURE 4

The Interaction Effects of Self-Control Depletion and Task Bar Condition on Persistence



CHAPTER 4

DISCUSSION

Review of Purpose

The purpose of this study was to examine the potential for performance monitoring to buffer against the loss of self-control on task persistence scores. Given this primary goal, I worked to complete the following: (1) determine whether there were self-control depletion group differences on persistence scores associated with an anagram task; (2) determine whether there were performance monitoring group differences on persistence scores associated with an anagram task; (3) determine whether an interaction effect between self-control group and task bar group exists, such that the impact of the task bar should be most pronounced for those in the depletion group; and (4) determine if covarying out variability associated with trait conscientiousness would clarify the role of self-control depletion on the amount of time spent on the anagram task.

Self-Control Depletion Task

I ran a simple ANOVA as a manipulation check to determine if coded laughs were greater for depletion versus non-depleted control participants. Results revealed that the frequency of laughs in the depletion group was significantly greater than in the non-depletion group. This suggests that the depletion task was organized consistent with expectation; group differences in the frequency of laughs is consistent with the nature of the self-control depletion task and indicates participants followed instructions. However, this finding alone does not suggest the current depletion task was effective in minimizing self-control resources. Because I did not employ baseline and post measures of self-control depletion in the current study, future research is needed to clarify whether this approach is effective and/or more/less effective than other

depletion approaches. For instance, experimental research might evaluate whether this emotion exaggeration task decreases different indices of self-control (e.g., accuracy on cognitive tasks, self-reports of emotional dysregulation, skewed decision-making abilities) by evaluating change between baseline and post measures and compare whether the size of change in self-control metrics is similar or greater to other more-empirically validated methods of self-control depletion.

Effects on Mood

I ran a 2 Self-Control Depletion (No Depletion, Depletion) x 3 Performance Monitoring (No Bar, Normal Bar, Slow Bar) x 3 Time (Time 1, Time 2, Time 3) Mixed Factorial ANOVA to evaluate whether differences were reported in mood ratings across the different phases of the study. In the literature, there is some evidence that the depletion task and the anagram task would affect mood (e.g., Baumeister & Alquist, 2009). Interestingly, I found a main effect for time, but results revealed non-significant main effects for self-control depletion condition and performance monitoring condition. Similarly, all four interaction effects were non-significant. These findings suggest that participants, regardless of group assignment, reported decrements in mood across the study.

In the current study, the lowest rating of mood was reported at Time 3 by all participants, which suggests that as the study continued, all individuals experienced a dip in mood. It is interesting that differences in mood were not revealed between individuals who were assigned to the self-control depletion group versus the no depletion group. Previous research suggests it is possible for self-control depletion to negatively affect mood (Baumeister & Alquist, 2009). This was not the case in my study. Instead, my findings are more consistent with other literature suggesting that self-control depletion has minimal effects on mood (e.g., Baumeister et al.,

1998). One potential reason for the lack of differences may be the construction of the non-depletion activity control group. Specifically, just watching the "cringy" comedian video may have been somewhat depleting on its own. It is possible that some individuals in the control condition may have experienced a sense of boredom or even embarrassment for the comedian. Research suggests that experiences with boredom and embarrassment may tax individuals' resources in a way that minimizes mood (e.g., Osgood, 2015). If this is the case, control participants may have been unintentionally depleted, which calls into question the validity of the construction, organization, and implementation of the self-control depletion task. Considering these findings, it is important for future researchers to evaluate whether online self-control tasks actually deplete participants' cognitive and emotional resources. Sometimes constructing a control group with similar stimuli as the intervention group can negate the intended effects. Therefore, it is recommended that researchers re-evaluate the effects of my self-control depletion conditions using multiple control groups, a true-control group, where participants are given no stimuli, and a control group, where participants watch a less emotionally impactful video. This will be important in determining whether watching a less emotional video can unintentionally deplete an individuals' resources and determine whether true differences between groups are detected on self-control outcomes.

Trait Conscientiousness and Task Persistence

I ran a 2 Self-Control Depletion (no depletion, depletion) x 3 Performance Monitoring (no task bar, normal task bar, or slow task bar) Factorial ANCOVA, with trait conscientiousness scores as a covariate, to evaluate within and between group differences on task persistence. I failed to find a significant main effect for conscientiousness on task persistence. This finding suggests that individuals with low and high consciousness traits reported comparable task

persistence scores. This finding is inconsistent with existing literature, which states that task persistence and trait-conscientiousness are highly related (e.g., Schmidt et al., 2020). Therefore, it is odd that the main effect for trait conscientiousness was non-significant in my model. There are a few reasons why I may not have been unable to detect significant differences. First, it is possible that the 30-minute time limit for completing anagrams may have created a ceiling effect, since 30 minutes may not be enough time to draw out differences in trait conscientiousness. This, in turn, may have reduced opportunities to differentiate low versus high scores of conscientiousness on my task persistence measure. In the future, researchers should lengthen the amount of time given to complete anagrams to allow for differences between low and high conscientious traits to impact task persistence more completely.

Second, the connection between trait conscientiousness and task persistence may have been minimized because of how conscientiousness was measured in the study. Specifically, measuring conscientiousness via the BFI-2 may have been a poor choice given the goals of the study. Importantly, the BFI-2 conscientiousness scale may not adequately account for the motivational and effort-based aspects of conscientiousness within its item pool. For instance, there are no conscientiousness items on the BFI-2 that directly measure motivation or tolerance to complete boring tasks. Measuring the motivational component of trait conscientiousness directly may be necessary in drawing out meaningful differences on task persistence. In the future, researchers might select a self-report that measures more trait motivation features of conscientiousness. One such measure is the Achievement Motivation Inventory (Schuler et al., 2004), which examines motivation and conscientiousness as it relates self-control.

Self-Control Depletion and Task Persistence

I failed to find a significant main effect for self-control depletion, which suggests that there are no differences in task persistence scores between those in the depletion group and the

non- depletion group. This finding is inconsistent with existing literature, which maintains that there is a difference in self-control outcomes when people undergo self-control depletion (e.g., Baumeister et al., 1998). Although the self-control depletion task was effective in producing a greater frequency of laughs, this non-significant main effect for self-control depletion on task persistence is problematic. There are a few possible explanations for what might have occurred to bring about this failure in significance. First, there may not have been enough statistical power to detect small or moderate effects. It is quite possible that the effect size of self-control depletion on task persistence is somewhat smaller (e.g., Dang, 2018). This means that a more powerful study is needed to draw out meaningful differences between self-control depletion groups. In the future, researchers should double the sample size of my study to ensure they are able to detect small and moderate self-control depletion effects.

Second, it is unknown if the implementation of an online depletion task is effective in producing differences in self-control outcomes. It is possible that all participants were depleted due to the online nature of the task, which would account for the detected non-significant effect on task persistence scores. When administering the study online, there was a long process of getting each participant set up for the study, since each participant started with different computer settings and testing environments. Setup required that participants read through multiple reminder emails, follow detailed instructions, choose or even create a testing environment with limited distractions, have a basic understanding of Zoom, change their auto-correct or spell-check settings, and open up the survey on their device. In a number of instances, the research administrator even needed to walk participants through certain technical components that seemed confusing to participants. By the time the study began, some participants may have already been depleted due to the strain of setting up the study.

Because of these technological difficulties and lack of experimental control commonly associated with online tasks, it is unclear whether self-control depletion can be adequately manipulated over the internet. Attempts were made to develop and implement the self-control depletion task in a similar manner to a face-to-face method. However, internet designs may be inherently depleting and therefore make it near impossible to effectively manipulate differences through the construction of different groups. To adequately manipulate self-control depletion over the internet, researchers need to minimize the impact of the set-up procedures on the participants. For instance, it might be beneficial for researchers to train participants on setting up an online experiment before actually asking them to participate in the experiment. Specifically, researchers may need to teach participants how to share their screen and turn off autocorrect and spell-check features. Overall, more research is needed to effectively instruct research administrators on the best methods of minimizing testing fatigue on participants.

*Performance Monitoring and Task Persistenc*e

Similarly, I failed to find a significant main effect for performance monitoring on persistence; there were no significant differences in task persistence among the no task bar, the normal task bar, or the slow task bar condition. Again, this finding is inconsistent with the literature, which indicates that performance monitoring should improve persistence on a task by creating a salient standard of comparison (Wan & Sternthal, 2008; Voce & Moston, 2016). In fact, previous literature strongly suggests that there should be differences between all three groups: performance monitoring condition (i.e., normal task bar), no performance monitoring condition (i.e., no task bar), and perception of task completion (i.e., slow task bar). There are some explanations as to why the perception that participants had more work to do in the slow task bar condition did not increase persistence. First, power was an issue in this study and may

have decreased the likelihood of detecting a small or moderate performance monitoring effects. Second, the presence of a clock on participant computers may have affected persistence on the anagram task. Consistent with the literature, the presence of a clock may have modified participants' subjective experience of time (Vohs & Schmeichel, 2003). This was something that could not easily be addressed in the formation of an online experimental design. However, in future studies, it is important to determine if the presence of an external clock negates the effects of different performance monitoring groups on task persistence scores. One way to evaluate this effect is to create a unique condition where researchers manipulate the presence of an external clock and evaluate differences among groups on task persistence outcomes.

The results also revealed a non-significant interaction between self-control depletion and performance monitoring condition. Initially, this may seem like performance monitoring does not buffer the effects of self-control depletion on task persistence. However, there was a unique trend in the data (Figure 4) worth noting. In the non-depletion group, persistence scores appeared to vary in the expected direction; whereby higher scores were reported among those placed in the normal and slow bar groups. Higher persistence scores by the normal bar group versus the no bar group is consistent with the process model of self-control (Inzlicht et al., 2012), which argues that the presence of a task bar increased motivation and therefore self-control resources. In addition, the highest reported persistence scores were reported by individuals who were placed in the slow bar condition. This trend is consistent with previous literature, in that altering participants' perception of their completion of their "fair share" of a task changed persistence (Wan & Sternthal, 2008).

Conversely, a different pattern was revealed for individuals who were placed in the self-control depletion group. Specifically, individuals who were placed in the normal bar and slow

bar groups reported lower persistence scores compared to individuals in the no bar group. This trend is consistent with the goal gradient hypothesis (Hull, 1932; Brown, 1948), which states that people tend to be more motivated to persist when they believe they are close to completing a goal. This may explain why individuals in the slow bar group reported the lowest task persistence scores; they believed they were further away from completing the prescribed goal. Overall, these patterns are interesting and present a unique intersectional trend worth exploring.

Despite the characterization of these trends, results did not furnish a significant interaction effect. This, again, reinforces the need to re-evaluate the study's questions using a highly powered experimental design. It is quite possible that there is a true interaction effect, but due to low sample size, I was not able to detect such an effect.

In the future, researchers should further investigate the differences between depleted groups and non-depleted groups in the context of a salient performance standard. Self-reports of perceived effort, motivation, difficulty, and having completed one's "fair share" of the work may help explore the potentially motivating nature of performance standards in non-depleted groups and the potentially demotivating nature of performance standards in depleted groups. Additionally, the perception of psychological distance to the goal should be assessed so that researchers can compare distance scores to self-control outcomes (e.g., persistence on a task).

Finally, while my findings do not provide evidence for the buffering role of performance monitoring on the causal relationship between self-control depilation and task performance, my findings should not dissuade other researchers from identifying buffering effects through other mechanisms. For instance, positive affect induced by watching a funny video buffers the effects of depletion on subsequent abilities in a dumbbell task (Zhu et al., 2017). This finding highlights the potential for positive affect to moderate the effects of self-control depletion on task

persistence. To study the effects of positive affect on self-control outcomes, I would design a new study that uses the current study's methodological framework. In the first experiment, I would evaluate whether my emotion exaggeration task is effective in depleting participants' self-control resources. If results suggest my self-control depletion task is effective, I would design and implement a second experimental study. In the second experiment, I would randomly assign participants into self-control depletion groups (depletion vs. no depletion) and then randomly assign participants into one of three affect groups (positive affect group, negative affect group, control group). I would evaluate differences on persistence using a similar anagram task.

Limitations

There are numerous limitations worth noting. Some limitations were associated with environmental stressors outside of my control. Other limitations included technical aspects associated with the nature of the sample, choice of instruments, and statistical power.

COVID-19 Pandemic. The impact of the COVID-19 Pandemic may have directly impacted my ability to construct this study as originally intended. First, the pandemic restricted my ability to recruit a full complement of participants. I was only able to recruit 80 participants out of the 111 planned participants. Recruitment difficulties likely result in a lack of power to detect moderate and small effects. Second, there was a strong likelihood that potential participants were reluctant to sign up for my study. Potential participants might have been more attracted to participating in self-survey studies compared to an experimental study that was re-engineered to fit the restrictions of online evaluation. When reading the abstracts for different studies in SONA, participants may have been reluctant to sign up for a study that involved interaction with a research administrator over Zoom during a very specific window of time, when they could have signed up for a survey-based study that could be taken at any time from

any location. If this is the case, this suggests that participants who signed up for my study may have been inherently different from the larger population of people I was recruiting from. For instance, a significant number of participants scheduled sessions toward the end of the semester, which suggests these individuals may vary in levels of consciousness and neuroticism compared to other students who participated in research studies earlier in the semester.

Third, this study was originally planned as an in-person laboratory study but was moved to Zoom because of health concerns for participants. The reconstruction of the methodology to fit an online platform was extensive and complicated. For instance, I needed to develop more extensive instructions to help individuals use Zoom and other online resources before beginning the experiment. Participants had to take additional steps to get started, such as finding a suitable testing environment, removing distractions, using the correct device (i.e., a laptop or desktop), finding and using audio and video equipment, learning to share their screen, turning off auto-correct and spell-check features, and opening the survey on their device. Considering the energy needed in preparing to participate in the study, it is highly probable that some participants were already depleted, which would have negatively affected my ability to detect significant differences on task performance outcomes. Fourth, there is a strong likelihood that all students experienced more strain and threats to mental health because of the pandemic. It is possible that students were naturally depleted as they adjusted to the difficulties associated with the pandemic. Again, such difficulties may have negatively affected my ability to detect significant differences.

Fifth, I needed to drop data from three participants because participants failed to follow instructions regarding the use of autocorrect and spell-check. These features allow participants to solve the anagrams faster, which impacts the validity of the anagram task. By removing participants, my sample sized was reduced, which likely affected the power of my statistics to

detect significant findings. Sixth, participants were subject to more distractibility in general since they likely completed the study in a more chaotic environment (e.g., home or office space) when compared to a laboratory. It is unknown if and to what degree location and environment affected participant motivation, effort, and concentration, but it is likely that some participants were distracted away from the study because of their chosen environment. Finally, some features of participants' computer screen may have affected participants' ability to complete different elements of the study. For instance, participants could see the time on their computers, which serves as an additional performance monitoring standard that may have negatively affected the validity of the performance monitoring conditions. If some participants checked the time during the anagram task, they may not have behaved in the same way as would be expected without the presence of the clock. For example, the depletion task may not have influenced the perception of time and when participants quit the task in the same way they would have without the presence of a clock.

Methodological Limitations. In terms of generalizability, the results of this study apply to young adults, college students, and mostly women. Future research should evaluate whether these findings hold up in evaluation of other non-college, older adult, and diverse gender populations. Additionally, I collected self-report data from participants, which can be problematic. Self-report data is known to be subject to demand characteristics and social desirability biases, which may negatively influence my ability to detect accurate findings.

In terms of construct validity, it might be important to diversify how the dependent variable was measured. In the current study, persistence was measured by the amount of time participants spent on an anagram task. Although behavioral markers of task completion are an adequate measure of persistence, it is not the only measure of persistence. For instance,

persistence can be measured by using a hand-grip task (Bray et al., 2011) or by measuring startle response to negative images (Grillon et al., 2015). It is possible that given all the unique elements of this study, measuring the amount of time participants spend on an anagram task may not be the most efficient means of evaluating persistence. Future studies should consider including multiple measures of persistence in the development of similar experimental designs. Lastly, there may have been some issues in communicating instructions to participants. In pilot testing, participants took an excessive amount of time to quit the anagram task. Thus, for the current study, I altered the anagram task instructions to emphasize quitting the task. Qualitatively, some participants expressed confusion with these new altered instructions; they thought they were supposed to quit the task as soon as they could not complete an anagram. Clearly, this confusion may have influenced participants' decision to quit the task earlier than they may have without provocation. Future research should clarify anagram instructions so that participants both know that they are allowed to quit the task and that they can quit the task when they want to quit.

General Conclusions

This study examined whether performance monitoring could buffer against the loss of self-control on task persistence scores. The self-control depletion did not impact persistence scores. Similarly, results revealed that performance monitoring (i.e., the presence of a task bar) did not influence persistence scores. However, the results illustrated an interesting trend between depletion condition and performance monitoring condition. While non-significant, noted trends suggest multiple self-control and performance monitoring theories may be instrumental in explaining task persistence. Future studies need to re-examine the questions posed in my study with more statistical power, specifically a higher sample size.

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APPENDIX A

MOOD ITEM

Instructions: From 0 being the least pleasant mood to 10 being the most pleasant mood, my overall mood right now is:

(If your overall mood is 0, please slide the bar and then indicate 0)

My overall mood:

Least Pleasant Most Pleasant

0 1 2 3 4 5 6 7 8 9 10

APPENDIX B

LIST OF ALL ANAGRAMS

Crying	i y r c n g	Active	e a i c t v
Donkey	k o n d e y	Afraid	d f a i r a
Effect	f c f t e e	Bottle	t o e l t b
Cookie	c e i k o o	Bright	b i t r h g
Turkey	e k r t u y	Camera	r e a m a c
Hidden	e i d h n d	Choose	e c o o h s
Growth	g h o r t w	Cheese	e e h s c e
Flower	e w f r o l	Safety	y f a e s t
Orange	a e g n o r	Effort	e f t f r o
Pencil	l e i n c p	Finger	f n r i e g
Yellow	e l y l w o	Minute	i e m n t u
Sneaky	y n s e k a	Mirror	r r o m r i
Submit	i m s t b u	Senior	e i r s o n
Target	g e a r t t	Secret	c t e e s r
Tattoo	o t t t o a	Survey	e y u e s r
Hotdog	d g o o t h	Winner	n i n r w e
Garden	a d e g n r	Useful	l u e f s u
Jacket	t e c a k j	People	e e o p p l
Puddle	d p d e l u	Office	e i f c o f
Purple	u p l p e r	Nature	e u n t r a
Accept	p e c a t c	Mother	r m e o h t

Future	e t f u u r	Method	o e m d h t
Height	t g i h e h	Prison	o i p s n r
Health	l e t a h h	Phrase	h s p r s a
Fabric	c b i a r f	Record	d r r o c e
Escape	e a p c s e	Random	n a m o d r
Famous	a u o m f s	Screen	n e s r c e
Enough	n h u e g o	Stable	b e s t a l
Dollar	l d r a o l	Threat	e t t a r h
Danger	g r a d n e	Vision	n i i s v o
Column	m l o c u m	Writer	t i w e r r
Beauty	a y t b u e	System	y m s s e t
Career	e a e r r c	Window	d n w o w i
Bridge	i e r g b d	Valley	y v l e a l
Animal	l i n m a a	Silver	s r v l e i
Common	m n m o c o	Social	l s a i o c
Couple	p c e o u l	Pocket	e t c p o k
Button	t n b o t u	Policy	c o l p y i
Client	i t c n l e	Prince	e p c r n i
Ground	d u o g n r	Normal	m l r n a o
Income	m i c e n o	Listen	n i s l t e
Narrow	r a r w n o	Junior	o u j r i n
Lawyer	e a y r l w	Friend	n d e i r f
Medium	e m m i d u	Flight	g l t f i h

Gender	n e e r g d	School	l h c o s o
Expert	t r e p e x	Breath	h b a r t e
Doctor	c r o o t d	Moment	n t o e m n
Castle	s e a t c l	Person	n r e o s p
Chance	a e h n c c	Energy	r n y e e g
Coffee	o e f o c f	Sister	r e s t s i
Bottom	m t b o t o	Spring	i p g s n r
Stripe	e i r s t p	Change	e a n c g h
Parent	n r e t a p	Turtle	l t t e r u
Simple	m i l p e s	Winter	t e w r n i
Talent	e a l n t t	Bucket	k u b t e c
Switch	h i w c t s	Strong	n r t g o s
--100 anagrams (used in all conditions)--		Forest	e t o f s r
Family	m a y f i l	Joyful	u y o l f j
Donate	e a o t d n	Memory	y m m r e o
Banana	a a a b n n	Season	a n o s e s
Monday	o y m n a d	Better	t e e r t b
Father	h r a e f t	Friday	a y d i r f
Poetry	y t r p e o	Wonder	n o r d e w
August	u u a t s g	Number	e n r u b m
Potato	o o a t t p	Answer	w r a s e n
Sunday	d n y s a u	Tomato	o o a m t t
Circle	e c c l r i	Dragon	g o d a n r

Lonely	e l l n y o	Double	l o d b u e
Beaver	v r a e b e	Volume	m o l e u v
Market	e t a m k r	Ticket	e k i t t c
Pepper	r e e p p p	Square	e u s r q a
Summer	r m e s m u	Inside	e n d i s i
Branch	c r n h b a	Living	i i l g n v
Action	i c n o a t	Cuddle	e d c d l u
Choice	h e c o c i	Rhythm	m h r t y h
Muffin	f n u n m i	Noodle	l n o d e o
Insect	c s t e i n	Trophy	o h t r y p
Artist	i a t t s r	Planet	a t p e l n
Bakery	r k e a y b	Carrot	o r t r a c
Island	d a l i n s	Forget	r e o t g f
Stress	r e t s s s	Author	u r h a o t
Police	i o e p c l	Wizard	r i w d a z
Before	r e e f b o	Palace	e a c p l a
Budget	t u b e d g	Tennis	n e s i t n
Guitar	i r t u a g	Nobody	y o o n d b
Shadow	h o s w a d	Attack	c a a k t t
Option	p n o o i t	Butter	e b t r u t
Object	e c b t o j	Kitten	t i n k t e
Corner	n c r e r o	Smooth	o h m t o s
Liquid	q i i d u l	Closer	s r c e o l

County	n o y t c u	Arrive	a v r e i r
Muscle	c m l u e s	Trivia	a i i r v t
Caring	n r g a i c	Spider	e p r i d s
Ballet	e b l t l a	Crayon	y c a n r o
Relief	e r f i e l	Return	t n e r r u
Player	a l p r y e	Absent	b n a e t s
Marble	l r m e b a	Locker	l k r o e c
Karate	t a e a k r	Tickle	e c l i k t
Advice	i a v e d c	Ladder	e a r d d l
Reward	w d e r r a	Finish	i f n h i s
Sunset	u t n e s s	--200 anagrams (used in slow condition)--	

APPENDIX C

INSTRUCTIONS FOR THE ANAGRAM TASK

Anagram Task

Read the full page out loud starting here: "An anagram is a set of rearranged letters for a word. For example, 'z i y d z' is an anagram for the word 'dizzy.' Today, you will be unscrambling anagrams.

1) Select "Task" and say, "Starting now."

[Image of “Starting now” screen]

2) Unscramble anagrams.

You will unscramble each set of letters and enter the original word into the text box. For example, if you were given "z i y d z," you would type the word "dizzy" into the text box. Note that it is fine to use all lowercase letters. You will click the right arrow to complete the next anagram.

[Image of “Unscramble anagrams” screen]

3) Quit the task.

Please quit the task when you would like to. Quitting will not negatively affect the study. To quit, select the drop-down button in the top left corner and click "Quit Task."

[Image of “Quit Task” screen]

IMPORTANT

As you answer the anagrams, you will have the option to 1) Keep working on the anagram, 2) Quit the task, or 3) Skip the anagram. SKIP ONLY AS A LAST RESORT. It is preferred that you keep working on the anagram or quit the task.

Please reread these instructions until you are confident that you understand the task. You will not be communicating with the study administrator during the task. If you have any questions, ask the study administrator at this time. Please say, "I am ready to start," and wait for the study administrator.

APPENDIX D

TESTING ENVIRONMENT ITEMS

What is your general location (i.e., your office or your bedroom)?

[Participants fill in the answer blank.]

Were you alone for the whole duration of the study?

[Participants select “Yes” or “No.”]

How often did you check the time during the study?

[Participants select from “Often,” “Sometimes,” “Not very often,” or “I did not check the time.”]

Did you have access to a clock during the study?

[Participants select “Yes” or “No.”]

What were distractors in your environment?

[Participants fill in the answer blank.]

APPENDIX E

DEBRIEFING EMAIL TO PARTICIPANTS

Subject: “Debriefing: Emotional Responding Study”

Good afternoon,

Thank you for your participation in the “Emotional Responding” psychological study at Georgia Southern University. By participating in the study, you have gained first-hand experience in an empirical study, and you have benefitted society by allowing researchers to learn about responses to a video and subsequent written tasks.

As part of our ethical guidelines provided from the Institutional Review Board (IRB), we are required to inform participants of any passive deception used in the “Emotional Responding” study. During this study, participants were shown a video and then asked to complete an anagram task. Unknown to the participant, there were three different task bar conditions for the anagram task: a condition without a task bar, a condition with a normal task bar, and a condition with a slow task bar. The task bar showed the amount of completion during the anagram task. This constitutes passive deception because the task bar condition was unknown to the participant.

Once again, we greatly appreciate your participation in psychological research at Georgia Southern University. If you have any further questions, you may contact the primary researcher (myself) at hh09366@georgiasouthern.edu.

Hayley Houseman