



**A University of Sussex PhD thesis**

Available online via Sussex Research Online:

<http://sro.sussex.ac.uk/>

This thesis is protected by copyright which belongs to the author.

This thesis cannot be reproduced or quoted extensively from without first obtaining permission in writing from the Author

The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the Author

When referring to this work, full bibliographic details including the author, title, awarding institution and date of the thesis must be given

Please visit Sussex Research Online for more information and further details

**What makes people with high trait self-control successful? The role of  
beliefs about the utility of emotions and emotion regulation in self-  
control success**

**By  
Michelle Tornquist**

**Thesis submitted for the degree of Doctor of Philosophy  
School of Psychology  
University of Sussex  
September 2018**

## **Statement**

This thesis conforms to a ‘paper format’ where Chapters 2 and 3 are presented as multi-study papers for publication. All key studies reported in this thesis were preregistered via the Open Science Framework (OSF) prior to data collection. Thus, for each study, I preregistered a description of the study aims, the sample, all measures and tasks, the procedure, my hypotheses (both confirmatory and exploratory), and in most cases I also preregistered a general analysis plan. The raw data for each study was uploaded after data collection was completed. In each chapter, I clearly distinguish between exploratory and confirmatory analyses. To provide full transparency, if any deviations from my preregistration plans were made, I have reported this in the corresponding chapter. A link to each preregistration is provided in the Methods in each study.

Even though this thesis conforms to a ‘paper format’, in Chapter 1 I provide an overview of the theories, research, measurement techniques, and gaps in the literature that are relevant to the chapters presented within this thesis, followed by a summary of the two chapters. In Chapter 4, which is the final ‘General Discussion’ chapter, I discuss my key findings, implications, study limitations and ideas for future research. All references herein are presented in a combined reference list at the end. Chapter 2 is under review, whereas Chapter 3 is in preparation for submission.

I am the first author of the papers presented in Chapters 2 and 3, followed by my PhD supervisor Eleanor Miles. I was responsible for all aspects of initial study design, data collection, data analysis, and writing a first draft of each paper. Eleanor Miles was responsible for providing feedback throughout the process, including study design and various drafts of the papers, as well as making corrections to the final papers. Details about the publication status of each chapter are presented below.

## Chapter 2:

Tornquist, M., & Miles, E. (manuscript under review). Trait self-control and beliefs about the utility of emotions for initiatory and inhibitory self-control.

## Chapter 3:

Tornquist, M., & Miles, E. (manuscript in preparation). The role of beliefs about the utility of emotions and emotion regulation in self-control performance among people higher and lower in trait self-control.

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature.....

Michelle Tornquist

14<sup>th</sup> September 2018

## **Acknowledgements**

First, I wish to express my gratitude to my supervisor Dr Eleanor Miles. Thank you for your constructive feedback and advice, for allowing me to develop my own ideas while also offering me your unwavering support, and for all the opportunities you have given me throughout the process. You have truly helped me to become a better researcher. I would further like to thank you for your engagement, positivity, and kindness – I have really enjoyed my time as a PhD student and I couldn't ask for a better supervisor. I also wish to express my gratitude to Dr Dan Chiappe. Thank you for encouraging me to pursue a career in academia in the first place, for your endless belief in me, for pushing me to my true potential, and for going out of your way for me countless times. I would also like to thank Dr Pete Harris. Thank you for being so helpful when Eleanor was on leave, for your honest words, and for your thorough feedback throughout the process.

Further, I would like to thank the people who make my life happy in so many ways. To my biggest cheerleaders and rocks – Rose-Marie and Alf. I am so grateful for everything you have done for me and for always believing in me. Without you I would not be where I am today. Tommie, for always being there to save the day, for the inappropriate jokes that somehow make me smile, and for feeding me your delicious food. Macho, for being my best friend and for loving me unconditionally. Benjamin, for creating incredible memories with me and for making me laugh every single day during this journey.

Fanny, for visiting me wherever I have been in the world and for saving me countless times – if you only knew how much you have helped me to get through this. Siri, for lifting me up countless times by reminding me of our unforgettable memories, for your encouraging words, and for choosing me as Ralph's godmother. Beckson, for

bringing me cookies and for (literally) dragging me away from my books. Haddy, for randomly calling when I most needed it. Elin, for the many wine nights and endless giggles. Lisa, for your positive and carefree vibes, and for visiting me despite a giant pregnant belly. Sarah, for the well-needed countryside getaways and for being the best babysitter in this world. I am deeply grateful to have all of you in my life.

**In dedication to**

Rose-Marie and Alf. You are the reason this is possible.

## UNIVERSITY OF SUSSEX

Michelle Tornquist

Thesis submitted for the degree of Doctor of Philosophy

**What makes people with high trait self-control successful? The role of beliefs about the utility of emotions and emotion regulation in self-control success****Summary**

High trait self-control predicts a successful, healthy, and happy life.

Nonetheless, *how* people with high trait self-control succeed at self-control and attain these outcomes remains unclear. To date, a few studies have linked high trait self-control with effective emotion regulation, and others have linked emotion regulation with enhanced self-control. Building on these insights, along with insights from instrumental emotion regulation, which holds that people regulate emotions to attain goals, this programme of research tests whether people higher in trait self-control use their emotions and emotion regulation to succeed at self-control.

Two studies (Study 1:  $N = 253$ ; Study 2:  $N = 306$ ) first examined the relations between trait self-control and beliefs about the utility of emotions in everyday situations that varied in self-control type required. Three studies (Study 1:  $N = 415$ ; Study 2:  $N = 140$ ; Study 3:  $N = 210$ ) then explored the links between trait self-control, beliefs about the utility of emotions, and emotion regulation in performance contexts that varied in self-control demand, and how these factors influenced emotions and self-control performance.

Convincing evidence was found that people higher, relative to lower, in trait self-control considered positive emotions more useful and negative emotions less useful across situations, although these beliefs did not translate into preferences or choice to regulate emotions. Modest evidence was found that people higher in trait self-control experienced more positive and less negative emotion following a regulatory task, and

that more positive and less negative emotion helped people higher in trait self-control to succeed at self-control. Thus, trait self-control predicts beliefs about the utility of emotions, but whether these beliefs translate into behavior depend on context.

This research contributes to our understanding of how emotions and emotion regulation might shape self-control success and has the potential to inform the design of interventions to improve people's self-control and help them to attain positive outcomes.



## Contents

<b>Statement .....</b>	<b>2</b>
<b>Acknowledgements.....</b>	<b>4</b>
<b>Summary .....</b>	<b>6</b>
<b>Contents .....</b>	<b>8</b>
<b>List of Tables .....</b>	<b>10</b>
<b>List of Figures.....</b>	<b>11</b>
<b>Chapter 1: Introduction .....</b>	<b>12</b>
Self-control: an overview.....	13
Emotions: an overview .....	30
Combining emotion and self-control research.....	35
Instrumental Emotion regulation: an overview .....	40
Combining instrumental emotion regulation and self-control research.....	46
Summary and overview of empirical chapters .....	48
<b>Chapter 2: Paper 1 – Trait self-control and beliefs about the utility of emotions for initiatory and inhibitory self-control.....</b>	<b>53</b>
Abstract.....	54
Introduction.....	55
Study 1: Initial Evidence.....	61
Method.....	61
Results and Discussion .....	63
Study 2: Confirmatory Evidence .....	66
Method.....	66
Results and Discussion .....	68
General Discussion.....	72
Footnotes .....	77
<b>Chapter 3: Paper 2 – The role of beliefs about the utility of emotions and emotion regulation in self-control performance among people higher and lower in trait self- control.....</b>	<b>80</b>
Abstract.....	81
Introduction.....	82
Study 1 .....	91
Method.....	92
Results and Discussion .....	97

Study 2 .....	104
Method.....	105
Results and Discussion .....	112
Study 3 .....	122
Method.....	123
Results and Discussion .....	127
General Discussion.....	134
Footnotes .....	152
<b>Chapter 4: General Discussion .....</b>	<b>157</b>
Summary of findings .....	157
Implications of findings .....	165
Limitations and future directions .....	179
Conclusions.....	186
<b>References .....</b>	<b>187</b>
<b>Appendices .....</b>	<b>207</b>
Appendix 1. Self-Control Vignettes, Domains and Self-Control Type.....	207
Appendix 2. Sample Self-Control Behaviors, Domains and Self-Control Type .....	209
Appendix 3. Emotional Events .....	210
Appendix 4. Instructions for Regulatory Writing Task .....	211
Appendix 5. Instructions for Regulatory Writing Task .....	212
Appendix 6. Choices used in Discounting Task .....	213

**List of Tables**

Table 1.1. Overview of the empirical chapters and studies included in this thesis.....	52
Table 2.1. Descriptive statistics for utility ratings of positive and negative emotions for initiatory and inhibitory self-control .....	70
Table 3.1. Percentage of participants choosing immediate versus delayed rewards ....	127

### List of Figures

Figure 1.1. Key variables of the instrumental model of emotion regulation. ....	42
Figure 2.1. Estimated mean expected utility ratings of positive and negative emotions in initiatory and inhibitory self-control situations for participants higher (+1 <i>SD</i> ) and lower (-1 <i>SD</i> ) in trait self-control.....	71
Figure 3.1. Mean expected utility ratings of positive and negative emotions for tasks that are high and low in self-control demand.....	98
Figure 3.2. Mean regulatory preference ratings of positive and negative emotions for tasks that are high and low in self-control demand.....	102
Figure 3.3. Flowchart demonstrating measures and tasks administered at various stages during the experiment. ....	111
Figure 3.4. Regulatory choice (posiitive recall, negative recall) in the high and low self- control demand conditions .....	113
Figure 3.5. Mean experiences of positive and negative emotions after recalling positive, negative, and neutral personal events .....	128
Figure 3.6. Estimated mean self-control performance for participants higher (+1 <i>SD</i> ) and lower (-1 <i>SD</i> ) in trait self-control in the positive, negative, and neutral regulatory conditions.....	131

## Chapter 1: Introduction

You absolutely love delicious food but you also really want to get in shape? You have a hangover and you promise yourself that you will never drink this much again, yet at the next party you end up drinking too much anyway? You want to quit smoking, you know how bad this habit is for your health, and yet you cannot get yourself to stop smoking? These questions lie at the heart of self-control, which refers to the ability to “override impulses to act as well as the ability to make oneself initiate or persist in boring, difficult, or disliked activity” (Carver, 2010, p.766).

Self-control research has a long history in psychology, with one classic example of this early work being Walter Mischel and colleagues research on children’s ability to delay gratification (Mischel & Ebbesen, 1970; Mischel, Zeiss, & Ebbesen, 1972), and has been studied in many subdisciplines of psychology and other social sciences (Kross & Guevarra, 2015). To date, there is little doubt that the ability to self-control is associated with a wide range of positive outcomes, such as good physical and mental health, harmonious interpersonal relationships, and improved work and academic performance (Crescioni et al., 2011; Finkel & Campbell, 2001; Tangney, Baumeister, & Boone, 2004), whereas the inability to self-control is associated with numerous negative outcomes such as overeating, addictive and criminal behaviors, and financial and health problems (Moffitt et al., 2011; Vohs & Heatherton, 2000). In light of this, advancing our understanding of *how* people succeed at self-control has invaluable implications, given that this knowledge may have the potential to improve self-control in people and help them to achieve positive life outcomes.

This thesis aimed to contribute to our understanding of this issue. Specifically, drawing together research on emotions that has suggested that emotions can be used as tools to achieve self-control success (DeSteno, 2018), and research on instrumental

emotion regulation that has shown that people can regulate emotions to attain goals (Tamir, 2009a), along with research on self-control that has shown that people who are good at self-control regulate their emotions more effectively in laboratory settings and more often in real-life, as compared to people who are less good at self-control (Hennecke, Czikmanti, & Brandstätter, 2018; Hofmann et al., 2014; Paschke et al., 2016), this thesis aims to understand whether people with good self-control use emotion regulation as a strategy to succeed at self-control.

The present chapter introduces the reader to the theories, research, measurement techniques, and gaps in the literature that form the basis to this thesis, which consists of two multi-study empirical papers that test key predictions made by the instrumental theory of emotion regulation to enhance our understanding of whether people with good self-control use emotion regulation as a strategy to succeed at self-control. Following this initial orientation to the relevant research, the specific aims and predictions of each empirical paper are summarized.

### **Self-control: an overview**

Today, the terms *self-control*, *self-regulation*, *willpower*, and *self-discipline* are often used interchangeably to refer to the same process. Herein, the term *self-control* is used, which, as stated above, refers to the ability to “override impulses to act as well as the ability to make oneself initiate or persist in boring, difficult, or disliked activity” (Carver, 2010, p.766). In other words, self-control is what stops us from eating our favorite chocolate to maintain a healthy weight, what makes us keep running on the treadmill even though it might be unpleasant, what helps us refrain from saying something hurtful when we are angry to maintain good relationships, and what makes us do our homework instead of playing computer games to earn a good grade. Even though many definitions of self-control have been proposed in the literature, this particular definition was chosen because it implies that self-control involves both

preventing and enacting behaviors, which is a key aspect of the current framework as we shall see in a later section.

Self-control is thought to be closely related to other constructs such as impulsivity and Big Five conscientiousness (Frieze & Hofmann, 2009; Tangney et al., 2004), although these constructs are not entirely the same. That is, while impulsivity implies a lack of control over impulses, self-control is the ability to control impulses (Frieze & Hofmann, 2009). Likewise, while conscientiousness can operate with or without impulses, self-control only operates in situations where there is a conflict between impulses and long-term goals (de Boer, van Hooft, & Bakker, 2011). Moreover, even though “lumping” self-control with related constructs such as conscientiousness has been successful in predicting various life outcomes, “splitting” self-control from these related constructs has been particularly successful in predicting certain outcomes such as achievement (Duckworth & Seligman, 2017). Thus, self-control is typically studied as a separate construct.

Moreover, self-control can be conceptualized as either state or trait self-control (Baumeister & Alquist, 2009; de Ridder, Lensvelt-Mulders, Finkenauer, & Baumeister, 2012; Tangney et al., 2004). State self-control is the *current* behavior that varies across time and situations and may depend on factors such as previous self-control efforts (Muraven & Baumeister, 2000), a shift in motivation (Inzlicht, Schmeichel, & Macrae, 2014), environmental factors (Papies, 2016), and many others. Indeed, several lines of research has investigated the factors that disrupt state self-control to understand why people sometimes fail at self-control. One well-known model that attempts to explain this is the strength model of self-control (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Broadly, this model holds that self-control is a limited resource and that exerting self-control reduces this resource and temporarily impairs subsequent self-control (also

referred to as ‘ego depletion’). Thus, in this view, people fail at self-control because their self-control resources are depleted due to previous self-control efforts, and they are therefore unable to exert further self-control (though it is highly debated whether ego depletion exists: see Carter et al., 2015).

An alternative view suggests that people fail at self-control due to shifts in motivation, attention, and emotion (Inzlicht, Schmeichel, & Macrae, 2014). Broadly, this view suggests that, after people pursue ‘have-to’ goals that require self-control exertion, they become more motivated to pursue enjoyable ‘want-to’ goals rather than pursuing more ‘have-to’ goals, and thus shift their attention and emotions toward ‘want-to’ goals and away from ‘have-to’ goals. Hence, in this view, people fail at self-control because they want to do something enjoyable rather than controlling themselves further, not because they are unable to exert further self-control as indicated by the ego depletion model. However, while these models (and others) provide insights into why people fail at self-control, much less is known about how people succeed at self-control.

One fruitful approach to enhance our understanding of this issue might be to study people high in trait self-control. As opposed to state self-control, trait self-control is the dispositional ability to self-control across time and situations, which tend to emerge early in life (Mischel, 2014). It is typically high trait self-control, rather than high state self-control, that has been linked with numerous positive life outcomes (de Ridder et al., 2012; Tangney et al., 2004). For example, longitudinal research has showed that higher levels of trait self-control at a young age predict numerous positive outcomes later in life including financial stability, reductions in crime, and physical health (Moffitt et al., 2011), which is assumed to be due to their stable ability to self-control. Put differently, some people are inherently better than others at overriding impulses and to persist in disliked activity across time and situations, and these



differences in trait self-control are subsequently associated with success in various life domains.

Nonetheless, only a few studies (e.g., Frieze & Hofmann, 2009; Schmeichel & Zell, 2007) have actually tested whether the link between trait self-control and positive life outcomes stems from the ability to override impulses and to persist in disliked activity; that is, whether greater trait self-control predicts increased performance on behavioral measures of self-control. One exception is research conducted by Schmeichel and Zell (2007), who found that people higher in trait self-control were better at inhibiting the impulse to blink and to pull their hand out of iced water, as compared to people lower in trait self-control, providing initial evidence that greater trait self-control is indeed associated with enhanced performance on behavioral measures of self-control.

Nevertheless, little is known about the specific strategies that people higher in trait self-control might use to succeed in situations that require them to use self-control and thus to achieve various goals and positive outcomes. That is, while some have suggested that people with high trait self-control succeed at achieving their goals because they actively avoid tempting situations (Ent, Baumeister, & Tice, 2010), experience fewer conflicting temptations overall (Hofmann, Baumeister, Förster, & Vohs, 2012), and establish adaptive habits (Adriaanse, Kroese, Gillebaart, & de Ridder, 2014; Galla & Duckworth, 2015), this research does not enable us to draw conclusions about how they succeed when they are *actually* faced with a situation that requires them to use self-control. Thus, whether people with high trait self-control use any particular strategies to succeed at self-control is largely an open question. This thesis aims to close this gap by examining the mechanisms by which trait self-control might lead to self-control success.

**Measurement techniques in self-control research.** This thesis aims to measure trait self-control, performance on behavioral measures of self-control, and to manipulate expected self-control demand, both in the lab and in real-life. Thus, below I first present common measures of trait self-control, followed by a description of common behavioral dependent measures of self-control performance used in the laboratory and in real-life. I then discuss the strengths and weaknesses of these methods, followed by a description of the measures included in the studies presented in this thesis.

*Measuring dispositional self-control.* Although behavioral tasks such as delay of gratification tasks and the Go/No-Go task can be used to measure dispositional self-control (Eigsti et al., 2006; see also Duckworth & Kern, 2011, for an overview), the most common method to measure dispositional self-control is through questionnaires, completed by the participant or an informant such as a family member (Duckworth & Kern, 2011). These questionnaires typically tap various behaviors that require self-control such as the ability to override short-term temptations in favor of long-term goals, to sustain and direct attention, and to work effectively towards long-term goals.

De Ridder et al. (2012) suggested that the three most common questionnaires that have been used to measure trait self-control are the 36-item (e.g., “I lose my temper too easily”) Self-Control Scale and its brief version (Tangney et al., 2004), the 30-item (e.g., “I do things without thinking”) Barratt Impulsiveness Scale (Patton, Stanford, & Barratt, 1995), and the 24-item (e.g., “I often act on the spur of the moment without stopping to think”) Low-Self- Control Scale (Grasmick, Tittle, Bursik, & Arneklev, 1993). These questionnaires have showed significant small to medium relationships with actual behaviors, although the Self-Control Scale has showed the strongest relationships with behaviors and has been used more frequently than the two other scales to study a broader range of behaviors (De Ridder et al., 2012).

Even though using these questionnaires to measure dispositional self-control can be beneficial because they can be easily administered and because they are thought to be relatively valid measures of dispositional self-control, one obvious drawback with these questionnaires is that they may be biased by social desirability or demand characteristics. For example, being “good at self-control” is generally considered a desirable characteristic and people may therefore overreport on their dispositional ability to self-control.

*Measuring self-control outcomes in laboratory settings.* Furthermore, a wide range of behavioral tasks have been used as dependent measures of self-control in laboratory settings. These include, but are not limited to, completing the Stroop task or a Stop-signal task, attempting to solve unsolvable anagrams, performing a pain tolerance task, crossing out letters, squeezing a handgrip, solving complex math problems, delay gratification tasks, and food and snack consumption tasks (Duckworth & Kern, 2011; Hagger, Wood, & Chatzisarantis, 2010).

For example, the handgrip task is one common dependent measure of self-control, particularly in research on ego depletion (see Hagger et al., 2010, for details). In this task, participants compress a handgrip with their dominant hand for as long as possible with a piece of paper held between the handles. The experimenter starts timing the participant once he or she holds the paper firmly between the handles and stops it when the paper slips, with more time spent squeezing the handgrip indicating better self-control (Muraven et al., 1998). Another common task used to measure self-control is a snack consumption task (Hagger et al., 2010). In this task, participants are, for example, left alone in the lab to work on an unrelated task with a bowl of snacks (e.g., chocolate) placed in front of them, which they are typically invited to consume.

Unbeknownst to the participants, the researchers then count how much snacks they consumed, with less consumption indicating better self-control (e.g., Tong et al., 2015).

However, given that these behavioral tasks are very different from one another, it is debatable whether they measure the same construct. Indeed, Duckworth and Kern (2011) suggested that, even though these tasks have in common that they involve voluntary control in the service of greater goals, the diversity in these tasks reflect the many ways that self-control has been operationalized in the literature. Duckworth and Kern (2011) therefore examined the convergent validity of various self-control measures. They found that delay gratification tasks (e.g., snack or monetary delay tasks) were positively associated with other delay tasks ( $r = .21$ ), as well as self-reported ( $r = .15$ ) and informant-reported ( $r = .21$ ) self-control questionnaires. This data suggests that delay tasks are relatively valid measures of self-control, though they may not measure the exact same construct given the small correlations. The researchers further found that, compared to delay gratification tasks, executive function tasks (e.g., Stroop task, Stop-signal task) had lower correlations with other executive function tasks ( $r = .15$ ) and with self-reported ( $r = .10$ ) and informant-reported ( $r = .14$ ) self-control questionnaires. Broadly, these findings suggest that some lab-tasks (e.g., delay tasks) may be better measures of self-control than others (e.g., executive function tasks).

From an applied viewpoint, it is also debatable whether these laboratory self-control tasks actually require any self-control or whether they require self-control to the same extent as performing real-life self-control behaviors. For example, it is debatable whether squeezing a handgrip measures self-control *per se*, and whether performing this task requires self-control to the same extent as resisting dessert when dining out with friends, and whether people who perform well on the former necessarily succeed at the latter. Consistent with these speculations, Shenhav (2017) argued that there are

differences between how self-control choices (i.e., choosing between short-term and long-term gains) are made in the lab vs. in real-life, and that these differences make the lab situation lower in self-control demand. Specifically, he argued that choosing to eat a snack in the lab only affects a single calorie intake and is therefore relatively unharmed to a person's long-term health goals, suggesting that choosing between eating or resisting the snack in this situation may require little self-control. Presenting participants with a snack task can therefore lead researchers to conclude that their participants lacked self-control (if they generally ate the snack) or that their participants were very self-controlled (if they generally resisted the snack) without actually requiring them to use self-control. Similarly, Barber and colleagues (2012) suggested that persistence, which is commonly used as an index of self-control, may indicate an inability to disengage from tasks when necessary and thus a sign of poor (rather than good) self-control. Together, this research raises the question whether certain lab-tasks, in fact, require self-control and whether they require self-control to the same extent as real-life self-control behaviors.

Yet, laboratory task measures of self-control *do* yield interesting information about self-control, and there are many benefits associated with these task measures. For instance, performance on these tasks are more objectively measured than self-reported performance questionnaires, which can, as mentioned above, be vulnerable to social desirability (Duckworth & Kern, 2011). Furthermore, these laboratory task measures are also generally more convenient (e.g., simpler, faster) and typically cost less money than measuring self-control in naturally occurring environments and may therefore be suitable for researchers who have limited time and a limited research budget. Moreover, from a more general point of view, laboratory tasks such as these also allow researchers to control the environment in ways that would be impossible in naturally occurring

environments, ultimately allowing them to isolate the effects of interest and to test their predictions more precisely (Falk & Heckman, 2009).

***Measuring self-control outcomes in real-life.*** Researchers have also used real-life behavioral outcomes as dependent measures of self-control, assessed through the experience sampling method (or similar approaches), self-reports, or other methods. These behavioral outcomes include behaviors such as dental care, smoking cessation, persistence in boring activities, unhealthy eating, physical exercise, alcohol and caffeine consumption, and study habits. It is generally assumed that these behaviors require self-control and that a person who is able to resist undesirable behaviors (e.g., drinking alcohol) and who is able to engage in desirable behaviors (e.g., exercising) has good self-control. For example, Muraven (2010) argued that smoking cessation requires self-control and therefore used a measure of abstinence from smoking as dependent measure of self-control (assessed through daily telephone calls and biochemically methods), and Oaten and Cheng (2006) used various measures such as junk food intake, smoking, caffeine and alcohol consumption, and healthy eating habits as dependent measures of self-control (assessed through self-reports at different points in time).

Using real-life behaviors to measure self-control is beneficial given that this technique provides considerable ecological validity and reduced recall bias, particularly when the data is collected “in the moment” (see Scollon, Kim-Prieto, & Diener, 2003), allowing researchers to get access to aspects of people’s lives that would be difficult to assess in the laboratory. Nonetheless, even though it might seem obvious that behaviors such as studying and resisting delicious food require some degree of self-control, few studies have, to my knowledge, tested whether these behaviors, in fact, require self-control. However, some important insights into this comes from Hofmann, Vohs, and Baumeister (2012) who demonstrated in an ESM study that people reported using self-

control when they experienced short-term desires for sleep, sex, leisure, spending, and eating, suggesting that resisting these real-life behaviors require self-control.

Hennecke et al. (2018) similarly asked participants in an ambulatory assessment study to rate the extent to which various activities that involve a self-regulatory challenge (e.g., working, attending lectures, studying) were unpleasant, physically and mentally effortful, emotionally challenging, and boring. They found that the greatest physical effort and boredom was experienced during housework, the greatest unpleasantness was reported for other activities such as standing in line, and the greatest mental effort was reported when studying. Although they did not measure self-control demand specifically, these findings might suggest that these real-life behaviors require self-control.

In sum, dispositional self-control is often measured through questionnaires such as the Self-Control Scale. Even though this measure is thought to be an easily administered and valid measure of self-control, it may also be subject to biases such as social desirability. Moreover, many different behavioral lab-tasks have been used as dependent measures of self-control, with some tasks (e.g., delay tasks) being better measures of self-control than others (e.g., executive function tasks). These tasks are thought to objectively measure self-control performance, although there is an ongoing debate about whether these tasks, in fact, require self-control. Lastly, real-life behavioral outcomes have also been used as dependent measures of self-control (e.g., smoking cessation). These behavioral measures can provide ecological validity, although they can be relatively difficult to administer and only a few studies have tested whether these behaviors, in fact, require self-control.

**The current framework: self-control measurement techniques.** Bearing in mind the strengths and weaknesses of the measurement techniques discussed above, this

section describes the particular measurements that are used in this thesis to measure trait self-control, performance on behavioral measures of self-control, and to manipulate expected self-control demand, both in the lab and in real-life.

***Measuring dispositional self-control.*** To measure trait self-control, a self-reported questionnaire measure is employed. This method is preferred in this thesis over other methods that have been used to measure dispositional self-control (e.g., delay gratification task measures) because self-reported questionnaire measures of self-control have yielded stronger evidence of convergent validity than task measures of self-control (Duckworth & Kern, 2011).

Specifically, the 13-item Brief Self-Control Scale is used to measure trait self-control, which is a shorter version of the Self-Control Scale described above. The Brief Self-Control Scale is highly correlated with the full scale ( $r = .93$ ), and is employed to measure trait self-control in this thesis because it has shown good reliability and validity, has been used in different populations and with various behavioral outcomes, and because it has been used more frequently in research studies than the full version (de Ridder et al., 2012; Tangney et al., 2004). The short version is particularly appealing in this thesis given that participants are asked to perform many other tasks in the studies presented herein, ultimately reducing their workload.

Participants who complete this questionnaire rate their agreement with statements that tap self-control behaviors (e.g., “I am good at resisting temptation”) on a 5-point scale where 1 = *not at all like me* and 5 = *very much like me*. All items are then used to calculate a mean trait self-control score (9 items are reverse scored), with higher scores indicating higher levels of trait self-control and thus greater dispositional ability to self-control.



*Measuring self-control outcomes in laboratory settings.* The work presented within this thesis also seeks to manipulate expected self-control demand and to measure performance on behavioral measures of self-control. To this end, three common self-control tasks are used. First, because retyping text while breaking the habit of using certain keys requires self-control (Muraven, Shmueli, & Burkley, 2006), a retyping task is used to manipulate expected self-control demand (Study 1; Chapter 3). Second, because attempting to solve unsolvable anagrams is thought to require self-control (Muraven et al., 1998), an unsolvable anagram task is employed to measure self-control performance (Study 2; Chapter 3). Third, following prior research (Li, 2008; Tuk, Trampe, & Warlop, 2011), a delay discounting task is also used to measure self-control performance, in which participants choose between small-immediate and large-delayed rewards, knowing that they may receive one of their choices in the form of a payment (Study 3; Chapter 3).

However, the retyping and anagram tasks are not only included in this thesis because they are commonly used in the self-control literature, but also because they may require more self-control than other common laboratory self-control tasks. That is, with the caveats in mind that certain laboratory self-control tasks may require little or no self-control (Shenhav, 2017), in this thesis I also present findings from a supplemental study that was conducted to take precaution against the possibility of including tasks that do not require self-control and thus to ensure that the self-control tasks included herein are relatively high in self-control demand.

Specifically, Chapter 3 briefly describes a supplemental study ( $N = 26$ ) that was conducted to identify laboratory tasks that are high and low in self-control demand to be included in this thesis (Study 1 and 2; Chapter 3). In this supplemental study, undergraduates were presented with four potentially high self-control tasks that have

been used as dependent measures of self-control performance in the self-control literature, as well as four potentially low self-control tasks, and rated these tasks for their self-control demand. Among the potentially high self-control tasks, the retyping task and the anagram task received the highest self-control demand scores. Among the potentially low self-control tasks, another (easy) retyping task and a music task received the lowest self-control demand scores. Thus, these tasks are employed in this thesis to manipulate expected self-control demand or to measure self-control performance.

In addition, the delay discounting task (Study 3; Chapter 3) is preferred over other task measures of self-control because it involves making real choices that are somewhat similar to how self-control choices are made in real-life (i.e., resisting short-term desires in favor of long-term more beneficial choices). It is also preferred over other tasks because delay discounting tasks are more strongly associated with self-report and informant-report self-control questionnaires than other task measures of self-control (e.g., executive function tasks such as the Stroop task: Duckworth & Kern, 2011), suggesting that it is a relatively valid measure of self-control. Thus, because the validity of this task measure has been tested and confirmed in prior work, it was not included in the supplemental study described above.

*Measuring self-control outcomes in real-life.* I also aim to test my hypotheses in real-life self-control situations. That is, even though I do not use real-life self-control behaviors as dependent measures of self-control in this thesis, I use these types of behaviors to simulate real-life scenarios that require people to perform self-control behaviors, and I ask participants to imagine themselves in these scenarios before responding to various questionnaires. Based on insights from self-control research that has suggested that imagined scenarios generally produce responses that are similar to peoples' real-life reactions (e.g., McIntyre, Barlow, & Hayward, 2015), I argue that

using imagined self-control behaviors is a good starting point for testing my hypotheses in the context of everyday self-control.

However, given that only a few studies have tested whether real-life self-control behaviors, in fact, require self-control, in this thesis I also present findings from three supplemental studies (in addition to the one described above) to ensure that the real-life self-control behaviors included herein are high in self-control demand. To achieve this, I first conducted a study that asked undergraduates ( $N = 60$ ) to write about two personal events that required them to use a lot of self-control. This resulted in 120 potentially high self-control scenarios. I then conducted a second supplemental study that asked Mturk workers ( $N = 49$ ) to imagine themselves in these scenarios and rate them for their self-control demand. This allowed me to select five scenarios that received high self-control demand scores to be included in this thesis (Study 1; Chapter 2). Next, I conducted a third supplemental study aimed at identifying real-life behaviors that were high in self-control demand and that varied in initiatory and inhibitory self-control (a distinction that is introduced in the next section). In this supplemental study, Mturk workers ( $N = 384$ ) rated 111 self-control behaviors that potentially varied in initiation and inhibition for their self-control demand. Among these behaviors, I selected 18 behaviors that received high self-control demand scores and that could be classified as requiring initiation or inhibition (as determined by two trained coders) to be included in this thesis (Study 2; Chapter 2).

In sum, based on prior work that has questioned whether laboratory task measures of self-control require self-control (Shenhav, 2017) and given that few studies have tested whether real-life behaviors that are often used to measure self-control, in fact, require self-control, this procedure allows me to account for these potential drawbacks and thus to ensure that the tasks and behaviors included herein are high in

self-control demand. Moreover, given that prior work has challenged whether lab-based self-control translate into real-life self-control (e.g., Miles et al., 2016), this procedure also allows me to assess the generalizability of my findings by testing my hypotheses in both laboratory and real-life self-control situations.

**Distinguishing between initiatory and inhibitory self-control.** Thus far, I have introduced the concept of self-control and I have described common measurement techniques used in the self-control literature, and the ones included in this thesis. However, I have not yet considered that there might be different forms of self-control. Hence, in this section I introduce the idea that self-control may operate both as an inhibitory and an initiatory mechanism, and that it might be important to distinguish between these forms of self-control in order to capture the full spectrum of the self-control construct.

Most self-control researchers agree that good self-control leads to positive outcomes by inhibiting undesired behaviors (Tangney et al., 2004). This is evident in current definitions of self-control which often emphasize that self-control is an inhibitory mechanism. For example, Milyavskaya and Inzlicht (2017) defined self-control as the ability to “restrain one’s impulses in the service of greater goals and priorities” (p.1), and Tangney and colleagues (2004) defined self-control as the capacity to “override or change one’s inner responses, as well as to interrupt undesired behavioral tendencies (such as impulses) and refrain from acting on them” (p. 274).

This emphasis on self-control as an inhibitory mechanism is also apparent in the various measures that have been used to measure trait self-control and behavioral self-control outcomes in the lab and in real-life. Specifically, it appears that the majority of these laboratory tasks and real-life behaviors tap inhibition (e.g., Stroop task, Stop-signal task, delay gratification tasks, resist tempting food, abstinence from smoking and

alcohol). This trend is similarly reflected in questionnaire measures of trait self-control. For example, most of the items in the Self-Control Scale and its short version (Tangney et al., 2004) emphasize a person's dispositional ability to inhibit impulses (e.g., "I am good at resisting temptation" and "I have a hard time breaking bad habits"; see de Ridder et al., 2011, for details). This suggests that self-control is typically conceptualized as an inhibitory process.

Nonetheless, more recently, researchers have argued that self-control is not only an inhibitory mechanism. For example, Fujita (2011) suggested that there is more to self-control than just the inhibition of impulses and he therefore defines self-control more broadly as the "general process by which people advance abstract, distal over concrete, proximal motives in judgment, decisions, and behavior" (p. 362). Likewise, de Ridder and colleagues (2011) advised that, because self-control can also lead to positive outcomes by promoting desired behaviors, an initiatory component of self-control should be included in current definitions of self-control.

In light of this, a few researchers have suggested that some laboratory tasks and real-life behaviors that have been used to measure self-control tap initiation. For example, Imhoff and colleagues (2014) argued that performance on an anagram task requires initiation and may therefore serve as a dependent measure of initiatory self-control. Furthermore, behavioral outcomes such as exercising, studying, and healthy eating have been used as dependent measures of initiatory self-control, given that these behaviors may be unpleasant to perform in the short-term but have long-term desirable outcomes (Davisson, 2013; de Boer et al., 2011; de Ridder et al., 2011).

A few researchers have similarly argued that current questionnaire measures of trait self-control include a few items (e.g., "I am able to work effectively toward long-term goals") that tap initiation (Davisson, 2013; De Ridder et al., 2011). As such, De

Ridder et al. (2011) examined a two factor structure of the Brief Trait Self-Control Scale and found evidence for two factors: one for trait inhibitory self-control and one for trait initiatory self-control, with people scoring high on the former being better at inhibiting self-control behaviors (e.g., resist smoking) than others, and people scoring high on the latter being better at initiating self-control behaviors (e.g., studying) than others. They further found that trait inhibition and trait initiation were related but yet somewhat distinct constructs ( $r = .68$ ).

These things considered, a distinction between inhibitory and initiatory self-control has recently been proposed in the self-control literature (Davisson, 2013; de Ridder et al., 2011; de Boer et al., 2011; Haynes, Kemps, & Moffitt, 2016), both as traits and as behavioral outcomes. Inhibitory self-control is thought to primarily function to inhibit attractive but undesired behaviors (e.g., eating a cake) and initiatory self-control is thought to primarily function to promote unattractive but desired ones (e.g., going to the gym), although it is important to also point out that this distinction is not always clear-cut and that these self-control types may depend on each other such that a person may need to first inhibit a behavior (e.g., stop playing video games) in order to initiate another (e.g., go for a run; see also Davisson, 2013). However, even though these studies have contributed to our understanding of how self-control operates by emphasizing that self-control is both an inhibitory and initiatory mechanism, studies that distinguish between these self-control types are relatively scarce, and the specific strategies that people might use to succeed at initiating or inhibiting self-control behaviors is largely an open question. Thus, the work presented within this thesis provides an initial exploration of these questions.

Hence, as mentioned previously, in this thesis self-control is defined as the ability to “override impulses to act as well as the ability to make oneself initiate or

persist in boring, difficult, or disliked activity” (Carver, 2010, p.766), given that this definition includes both inhibition and initiation components. Furthermore, even though I do not distinguish between initiatory and inhibitory self-control on the trait level (given the well-established validity of the Brief Trait Self-Control Scale used herein), I distinguish between behavioral outcomes that require initiatory vs. inhibitory self-control in order to understand how people might succeed in these situations.

### **Emotions: an overview**

Emotions can be defined as “experiential, physiological, and behavioral responses to personally meaningful stimuli” (Mauss & Robinson, 2009, p. 209), and can be classified according to various perspectives. For example, dimensional perspectives organize emotions according to their *valence*, contrasting positive emotions with negative emotions (e.g., happy vs. sad), or according to their *arousal*, contrasting high arousal emotions with low arousal emotions (e.g., surprised vs. quiet), whereas discrete perspectives typically contrast distinct emotions with other distinct emotions (e.g., anger vs. sadness; Mauss & Robinson, 2009). Furthermore, although *emotions* and *moods* are often used interchangeably, some researchers distinguish between these terms, with emotions being more intense, briefer and caused by specific events relative to moods (Beedie, Terry, & Lane, 2005). Researchers sometimes also distinguish between *self-conscious* and *basic* emotions (e.g., guilt vs. fear), with the former requiring more self-reflection and self-evaluation than the latter (Tangney, 2003). This thesis primarily focuses on the broad distinction between positive and negative emotional states, for reasons that will be explained in a later section.

**Measurement techniques in emotion research.** To test the overarching aims of this thesis, I needed to both induce and measure experiences of emotional states. Hence, in this section I first describe various techniques, along with their strengths and weaknesses, that are commonly used to induce and measure emotional experiences in

research studies. I then provide a description of the measurement techniques used within this thesis.

***Emotion inductions.*** To assess how emotions influence various outcomes in experimental settings, researchers typically induce emotions in participants. Common examples of emotion inductions include film/pictures elicitations, priming, imagination, autobiographical recall, Velten elicitations, music elicitations, and reading text (Gerrards-Hesse & Spies, 1994; Lench, Flores, & Bench, 2011; Westermann et al., 1996). Moreover, the procedure for these different emotion induction tasks are relatively similar, such that participants are typically instructed to engage with the emotional stimuli for an allotted time (e.g., watching a film intended to increase anger for 5 minutes), and the emotions participants experience after engaging with the stimuli are typically compared to the emotions they experienced before engaging with the stimuli to test whether the emotion induction successfully induced emotions.

Although the vast majority of these emotion inductions have proven to be effective in eliciting the emotions of interest to the researchers (Gerrards-Hesse & Spies, 1994; Lench et al., 2011; Westermann et al., 1996), these tasks are associated with various advantages and disadvantages. For example, in music inductions, which are generally effective in inducing emotions (particularly positive vs. negative emotions), participants listen to an assigned music clip for an allotted time. The advantages of this task are that the music clips are standardized across participants (i.e., participants in the same condition listen to the same music) and that researchers can choose from existing music clips that have been developed to effectively induce emotional states in research studies. Some disadvantages are that it may be difficult to ensure that participants effectively engage with the music (they may, for example, wear the earphones without listening) and that most music clips that researchers can choose



from tend to be classical music which may not be representative of people's choice of music in real-life (particularly among students: Lench et al., 2011).

***Measuring emotional experiences.*** Emotional experiences in response to an emotion induction (or emotional experiences in general) can be measured in many ways and it has been suggested that there is no “gold standard” measure of emotions. Measurement techniques of emotional experiences include autonomic nervous system measures (e.g., sweat glands and blood circulatory system responses), self-report measures of emotional experiences, behavioral measures (e.g., facial behaviors judged by observers), and others (Mauss & Robinson, 2009).

One of the most common measures of positive and negative emotions in response to an emotion induction is self-reported questionnaires. This measure is thought to be a relatively valid measure of *current* emotional experiences, though one possible drawback with this measure is that some people are unwilling to report on their emotional states, particularly when these emotional states are negative in valence (Mauss & Robinson, 2009). One of the most widely used scales to measure emotions is the Positive and Negative Affect Schedule, which has yielded good psychometric properties (PANAS; Watson, Clark, & Tellegen, 1988). Nonetheless, this measure is actually thought to measure positive and negative activation (i.e., high arousal) given that the emotion terms in this scale refers to activated positive and negative emotions (e.g., alert, attentive; Watson, Wiese, Vaidya, & Tellegen, 1999), rather than common positive and negative emotion terms (e.g., joyful, angry), that are not always positive or negative in valence, respectively (e.g., a person can feel alert and attentive in a threatening situation; Harmon-Jones, Bastian, & Harmon-Jones, 2016).

Another common technique aimed at measuring emotions is autonomic nervous system measures, in which researchers typically measure bodily responses such as skin

conductance level, heart rate, or blood pressure (Mauss & Robinson, 2009). These measurement techniques are beneficial because they indirectly measure emotions even when participants are unwilling to report on their emotional states (Lobbestael, Arntz, & Wiers, 2008). In contrast, possible disadvantages of these measurement techniques are that researchers who use them cannot be sure whether the bodily responses they observe reflect emotional responses *per se* or whether they reflect other bodily responses that the autonomic nervous system regulates (e.g., digestion, effort: Mauss & Robinson, 2009).

In sum, there are many different techniques that can be used to induce and measure emotions, and each of these techniques are associated with various advantages and disadvantages. Given that most emotion inductions and emotion measurements are effective in inducing and measuring emotions, the best way to choose methods might therefore be for practical reasons. For example, it might be practical to use inductions such as autobiographical recall in online studies, given that this induction offers insights into how well participants engage with the emotional stimuli (as observed in the writings). In contrast, it might be suitable to use music inductions in lab-studies because the experimenter has control over starting and stopping the music and can thus ensure that the participants are listening to the music. Furthermore, because people may be unwilling to report on their negative emotions, it may be practical to use an indirect measure when the key interest is to measure negative emotions (e.g., neuroimaging methods), whereas it might be practical to use self-reports or behavioral measures when the main focus is to measure positive emotions. Of course, methods that involve neuroimaging or bodily responses are expensive and may therefore not be an option, in which self-reported questionnaires might be best.

**The current framework: Emotion measurement techniques.** Considering the advantages and disadvantages of the measurement techniques reviewed above, in this

section I describe the particular measures that will enable me to induce states of positive and negative emotions in participants and to measure their subsequent emotional experiences in the studies presented within this thesis.

***Emotion inductions.*** In this thesis, autobiographical recall is used as the emotion induction. This emotion induction is preferred over other emotion inductions because it is a common and effective way to induce emotions (Lench et al., 2011), because this procedure has been used to induce emotions in numerous studies that are similar in scope to the studies presented herein (as described in the next section), and because this particular emotion induction may be more suitable for online studies than other emotion inductions. That is, in emotion inductions that involve watching a video or listening to music it may be difficult to know if participants effectively engage with the emotional stimuli (i.e., if they are actually watching the video or listening to the music), whereas autobiographical recall offers some insights into participants' engagement with the task as indicated by their written responses and time spent writing. I therefore argue that this particular emotion induction is suitable for the program of research presented in this thesis.

***Measuring emotional experiences.*** The studies within this thesis employs self-report measures of emotional experiences to assess changes in emotions after vs. before the autobiographical recall, which is a relatively valid measure of current emotions as discussed above (Mauss & Robinson, 2009). In particular, the modified Differential Emotions Scale (mDES; Fredrickson et al., 2003) is used to measure positive and negative emotions, mainly because this scale includes a wider set of common emotion terms, particularly positive emotions, than other scales like the PANAS. I argue that it is particularly important to use a scale that encompass *common* emotion terms in the studies within this thesis given that participants are asked about their beliefs and

preferences for various emotions and it is therefore crucial that they can relate to the emotions they are asked about.

The mDES is also preferred over other scales because it allows for analyzing both discrete emotions (e.g., amusement, anger) and aggregated subscales of positive and negative emotions and has proven to yield high reliability and validity (Fredrickson, 2013; Galanakis et al., 2016). That is, even though the main focus in this thesis is to compare aggregated subscales of positive vs. negative emotions, I initially also wanted the option to explore distinct emotions. This particular scale allows me to do that. The mDES asks participants to rate how strongly they experience 10 positive and 10 negative emotions (though a trio of emotion adjectives is used to capture each emotion) on a 5-point Likert scale (1 = *not at all*, 5 = *extremely*), although a 7-point Likert scale is typically employed in this thesis given that 7-point scales are often more desirable than 5-point scales, particularly when people are able to differentiate between feeling slightly, moderately, and extremely (Krosnick & Presser, 2010).

### **Combining emotion and self-control research**

Researchers have been interested in examining how emotions influence many aspects of the human condition including cognition, physiology, and behavior. The work presented in this thesis generally concentrates on how emotions influence *behavior*. According to prior research, emotions can lead to a strong desire to act in certain ways, and researchers often link certain emotions to specific action tendencies (Frijda, 1986; Lazarus, 1991). For example, negative emotions such as anger leads to the urge to approach and attack whereas fear leads to withdrawal and escape, and positive emotions such as interest leads to the urge to explore and learn new skills whereas joy leads to the desire to play and socialize (Fredrickson, 2001). Thus, these lines of research suggest that emotions function both to initiate and inhibit various behaviors (see also Zhu & Thagard, 2002).

Given that emotions function to engender behavior, researchers have similarly been interested in examining how emotions influence self-control, and it is generally assumed that positive emotions facilitate self-control behaviors relative to negative emotions (see Aspinwall, 1998, for a review), both when these emotions are induced in the laboratory (Garg, Wansink, & Inman, 2007; Raghunathan & Trope, 2002; Winterich & Haws, 2011), and when they are naturally experienced in real-life (Niermann et al., 2016; Vinci et al., 2017). The beneficial effects of positive emotions on self-control have also been observed on a wide range of self-control behaviors (e.g., food and caffeine consumption, exercising, smoking), providing robust evidence that positive emotions are more adaptive for self-control than negative emotions (though this effect may vary by context: Aspinwall, 1998). Research has similarly shown that positive emotions can counteract ego depletion. Indeed, Tice and colleagues (2007) found that depleted participants (i.e., those who performed an initial self-control task) who experienced positive emotions due to an induction performed as good on subsequent self-control tasks as non-depleted participants and better than those who experienced negative or neutral emotions.

In addition, even though most of these studies have focused on investigating how current emotional states, and particularly how changing these emotional states, influence self-control behaviors, a few studies have also investigated how *anticipated* emotions (i.e., the emotions a person expects to feel in the future) influence self-control behaviors (Patrick et al., 2009; Winterich & Haws, 2011). For example, research has demonstrated that participants instructed to think about how much pride they would feel as a result of *not* eating a cheesecake ate significantly less cake than controls and participants instructed to think about how much shame they would feel as a result of eating the cake (Patrick et al., 2009). These findings suggest that thinking about the

future positive emotions that you may experience if you succeed at inhibiting your impulses help you to resist these impulses and to achieve self-control success. However, even though it seems important to consider the role of anticipated emotions in self-control success, studies investigating this link are currently scarce. Thus, in this thesis I focus on whether current states of positive and negative emotions, and particularly whether changing these emotional states through emotion regulation (described in a later section), can facilitate self-control. It is, however, also important to point out that the distinction between anticipated and current emotions may not always be clear-cut as a person may, for example, think about how happy they will feel in the future if they succeed at self-control, also making them feel happy now.

Furthermore, specific positive or negative emotions may be particularly helpful or harmful for self-control. For example, Patrick et al. (2009) found that participants who experienced pride consumed less cake and had fewer tempting thoughts than controls and participants who experienced shame, and Winterich and Haws (2011) found that participants who experienced hope consumed less unhealthy food than participants who experienced happiness, suggesting that pride and hope might be particularly helpful for self-control (see also DeSteno, 2018; Katzir, Eyal, Meiran, & Kessler, 2010; Williams & DeSteno 2008, for effects of pride on self-control). Similarly, all negative emotions may not be equally harmful to self-control; for example, Zemack-Rugar, Bettman, and Fitzsimons (2007) found that participants primed with guilt spent less money on an indulgent choice than participants primed with sadness, indicating that guilt may have some positive influences on self-control.

Even though these findings suggest that some emotions such as pride and hope might facilitate self-control more than other positive emotions, and that guilt facilitate self-control relative to other negative emotions under certain circumstances, there are no

studies, to my knowledge, that have found that positive emotions are significantly *less* beneficial to self-control than negative emotions, suggesting that positive emotions generally improve self-control relative to negative emotions. Thus, as mentioned previously, this thesis first and foremost aims to contrast the effect of states of positive emotions with states of negative emotions on self-control, though I also test how certain distinct emotions that have been experimentally linked to self-control in prior studies (e.g., pride, hope) influence self-control.

**Mechanisms underlying the effects of positive emotions on self-control.** Why would positive emotions enhance self-control relative to negative emotions? One possible explanation for this comes from the broaden-and-build theory (Fredrickson 2001). This theory holds that positive, compared to negative, emotions broaden people's repertoires of attention, thoughts, and actions, and, in doing so, help them to build new resources (e.g., physical, intellectual, social), that help them to overcome challenges. Applying this to the context of self-control, a person who experiences positive emotions and who is faced with a self-control dilemma such as choosing between buying chocolate vs. sticking to their diet and thus resist the chocolate, might consider a variety of strategies that might help them to meet this challenge (i.e., the "broaden" aspect of the theory) and then use these strategies (i.e., the "build" aspect of the theory) to overcome this challenge. For example, they might decide to avoid the candy aisle in the shop or distract themselves by calling a friend, ultimately helping them to resist buying chocolate and thus to succeed at self-control.

Delving further into why positive emotions enhance self-control, the mood-maintenance theory suggests that people who experience positive emotions are motivated to protect these emotions and therefore refrain from actions that may reduce them (Andrade, 2005; Clark & Isen, 1982). That is, a person who experiences positive

emotions and who is choosing between buying chocolate vs. sticking to their diet and thus resisting buying chocolate may want to maintain these positive emotions and therefore decide not to buy the chocolate because, even though eating the chocolate might make them feel good in the present moment, it may also make them experience negative emotions (e.g., regret, guilt) as a result of failing to stick to their diet. Thus, to protect their positive emotional state, they may choose not to buy the chocolate, indicating self-control success. In contrast, if this person experienced negative emotions, they may be motivated to engage in behaviors that will make them feel good as fast as possible and thus choose to eat the chocolate, indicating self-control failure.

Other theories that also favor the idea that positive emotions benefit self-control but that are less central to this thesis are the dynamic model of affect (DMA; Zautra et al., 2001), which holds that positive emotions are a resource that aid in managing stressful situations, and others have similarly argued that episodes of positive emotions add up to a storage of positive emotions that serve as a buffer in stressful times (Hobfoll, 1989), suggesting that people who experience positive emotions are particularly resistant to stressful situations. Thus, assuming that self-control situations might be stressful, it is possible that positive emotions serve as a buffer in these situations and thus help people to choose the virtuous choice, indicating self-control success.

Thus, given the consistent evidence that positive emotions improve self-control relative to negative emotions and that this can be explained by a number of psychological mechanisms, it seems plausible that people should be able to “make use of” these emotions to succeed at self-control, either by strategically making themselves experience these emotions in self-control situations, and/or by incidentally experiencing these emotions in self-control situations. Some tentative evidence that people may be



able to harness these emotions to succeed at self-control comes from research showing that people higher in trait self-control, who tend to succeed at self-control and achieve their goals, tend to experience high levels of positive emotions and low levels of negative emotions in their daily lives, as compared to people lower in trait self-control (Hofmann et al., 2014). These data might suggest that, consistent with research showing that positive emotions facilitate self-control whereas negative emotions have the opposite effect, these emotional experiences might help people higher in trait self-control to achieve self-control success, although it is unclear whether people with high trait self-control make themselves experience these emotions to achieve self-control success, or whether they experience these emotions spontaneously, which might then facilitate their self-control success.

Hence, this thesis proposes to investigate whether people higher, relative to lower, in trait self-control make themselves experience higher levels of positive emotions and lower levels of positive emotions in self-control situations, and whether higher levels of positive emotions and lower levels of negative emotions help people higher, relative to lower, in trait self-control to achieve self-control success.

### **Instrumental Emotion regulation: an overview**

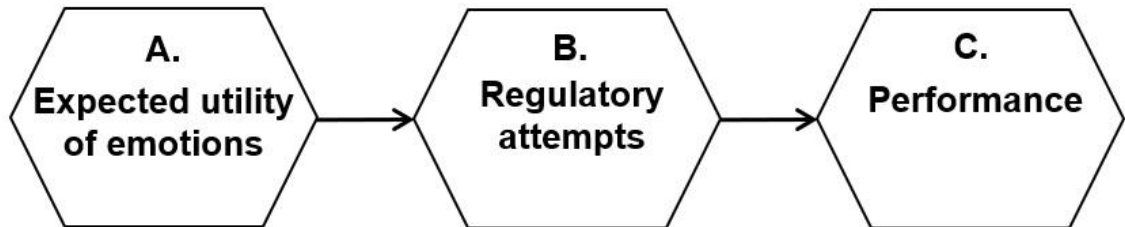
One way to change or “make use of” these emotions might be through emotion regulation. Emotion regulation refers to the process by which individuals alter which emotions they have, when they have them, and how they experience and express them (Gross 1998, 2015). While most emotion regulation efforts aim to decrease negative emotions and to increase positive ones (English, Lee, John & Gross, 2017; Gross, Richards, & John, 2006; Larsen, 2000), the theory of instrumental emotion regulation holds that emotion regulation efforts aim to strategically change current emotional states in ways that facilitate performance and goal pursuit, independent of the valence of these emotions (Tamir, 2009a). Specifically, this view holds that people regulate emotions to

increase the emotions they believe will enhance their performance. For example, people who believe that experiencing positive emotions will help them to get off the couch and go to the gym might engage in regulatory attempts to increase their positive emotions in this situation, perhaps by watching a comedy or looking at photos that evoke positive memories.

Even though most research on instrumental emotion regulation has focused on emotion utility beliefs, this view further holds that, when faced with a challenging situation, people regulate emotions to increase the emotions that they typically experience as part of their personality. For example, people who tend to experience negative emotions and who await a difficult exam might engage in regulatory attempts to increase their negative emotions, perhaps by thinking about a negative experience or listening to sad music. Researchers that have tested this theory have repeatedly found evidence that the emotions people believe to be useful, along with the emotions they typically experience, predict their regulatory attempts to increase these emotions in a particular performance context, and that these regulatory attempts lead to increased experiences of these emotions that then *are* useful to their performance in this context (Tamir, 2005; Tamir, 2009b; Tamir & Ford, 2012; Tamir et al., 2015).

Furthermore, the instrumental theory of emotion regulation is consistent with early expectancy-value theories of self-regulation (e.g., Atkinson, 1957; Feather, 1982; see also Tamir & Ford, 2012; Tamir et al., 2015, for more details about these theories), which generally holds that people are motivated to behave in ways they expect will be useful to their goal pursuit. For example, people may be motivated to train consistently for a triathlon if they expect that this training will be useful to their performance on the race day, suggesting that people perform behaviors depending on the expected utility of these behaviors, and that these behaviors may facilitate their goal pursuit. Thus, as

described above, the instrumental theory of emotion regulation similarly suggests that people regulate emotions depending on the expected utility of these emotions, and that emotion regulation can lead to improvements in performance and facilitate goal pursuit (see Figure 1.1, for an overview of this theory).



*Figure 1.1.* Key variables of the instrumental model of emotion regulation. A = beliefs about expected utility of emotions; B = regulatory attempts; C = performance. This model holds that the more people believe that an emotion will be useful to them in a particular performance context, the more likely they are to engage in regulatory attempts to increase that emotion in this context, and that these regulatory attempts lead to improvements in performance in this context.

In this thesis, I take an instrumental approach to emotion regulation to understand whether the expected utility of emotions in the context of self-control may lead to attempts to regulate emotions in this context, and whether emotion regulation may lead to improvements in self-control performance specifically, and whether these effects are moderated by trait self-control.

#### **Measurement techniques in instrumental emotion regulation research.**

Following the instrumental theory of emotion regulation, this thesis aims to test which emotions people consider useful and attempt to regulate in the context of self-control, and whether this is moderated by trait self-control. To achieve this, I adopt various measurement techniques from research on instrumental emotion regulation. As such, in

this section I first describe common measurement techniques used in this research area, and I then describe the measures used in the studies presented within this thesis.

***Measuring beliefs about the expected utility of emotions.*** Researchers who take an instrumental approach to emotion regulation often assess the extent to which participants believe that various emotions will be useful to them in different performance contexts, given that these ratings predict participants' subsequent attempts to regulate these emotions, and because the emotions participants consider useful in a particular situation actually are useful to them in this situation. Put differently, because beliefs about the utility of emotions predict actual emotion regulation and subsequent performance, researchers often measure beliefs about the utility of emotions as an index of emotion regulation. For example, Tamir and Ford (2012) measured 'expected usefulness of emotions' by asking participants to rate how successful they expected to be in a negotiation task when experiencing different emotions (e.g., angry, happy), and Netzer and colleagues (2015) measured 'perceived utility of emotions' by asking participants to rate the extent to which they expected various emotional experiences (e.g., fearful, cheerful) to improve the game performance of another person. Thus, even though researchers use different terms to refer to this measure, they are essentially referring to the same construct. In this thesis, I refer to this construct as 'beliefs about the utility of emotions'.

***Measuring regulatory attempts.*** However, even though researchers often measure beliefs about the utility of emotions as an index of emotion regulation, this measure does not allow researchers to measure how people *actually* regulate emotions. Therefore, research into instrumental emotion regulation also tend to measure regulatory attempts in performance contexts. Specifically, prior research into instrumental emotion regulation has typically asked participants to either *rate* the degree

to which they prefer to engage in activities intended to increase various emotions, or to *pick* activities intended to increase these emotions. Examples include asking participants to rate the extent to which they prefer to listen to music, recall a personal event, watch film clips, and read articles, that vary by emotion. More examples include asking participants to pick a personal event to recall or to pick music clips to listen to, that also vary by emotion (Tamir, 2005; Tamir, 2009b; Tamir & Ford, 2012; Tamir et al., 2015; Tamir, Mitchell, Gross, 2008).

One key feature here is that participants are told beforehand that they will engage in their preferred or chosen emotion-eliciting activity right before completing a task, making their preferences and choice an indicator of their attempts to regulate their emotions in this situation, given that these activities *do* induce emotions in participants. Another key feature is that participants are typically instructed to engage in their preferred or chosen emotion-eliciting activity (although they are sometimes randomly assigned to engage in an emotion-eliciting activity), which then leads to increases in the preferred or chosen emotion. To illustrate, a person who picks to listen to happy-inducing music in a certain situation is thought to have made this choice in an attempt to increase their happiness and, if they then get to listen to their chosen happy-inducing music, this leads to increases in happiness. Crucially, this measure therefore serves as an indicator of participant's attempts to regulate emotions *and* as an emotion induction.

To summarize, researchers who take an instrumental approach to emotion regulation often measure people's beliefs about the utility of emotions in performance contexts, which may serve as an index of emotion regulation. However, because this measure does not measure actual emotion regulation, researchers also measure regulatory attempts in performance contexts, as measured by people's preferences or choice to engage in emotion-eliciting activities that vary by emotion (e.g., happy vs.

angry music clips). In studies where participants engage with the emotion-eliciting activities, this measure serves both as an index of regulatory attempts *and* as an emotion induction.

**The current framework: instrumental emotion regulation measurement techniques.** This thesis measures both beliefs about the utility of emotions and regulatory attempts in the laboratory and everyday self-control situations described previously. To measure beliefs about the utility of emotions, participants in this thesis are asked to rate the extent to which they believe that different emotions (emotion terms adapted from the mDES discussed above) can help them to succeed in laboratory and everyday self-control situations, using a scale ranging from 1 (*not at all*) to 7 (*extremely*).

Furthermore, to measure regulatory attempts (and to induce emotions), participants in this thesis are asked to rate the extent to which they prefer to recall various personal events on a scale of 1 (*not at all*) to 7 (*extremely*), and/or to pick one event to recall, that vary in emotion (emotion terms are typically adapted from the mDES). As mentioned previously, autobiographical recall was chosen because this task is one of the most widely used measure of regulatory attempts in research on instrumental emotion regulation, because it is a common and effective way to induce emotions (Lench et al., 2011), and because it is suitable for online studies given that it allows researchers to ensure that the participants engage with the task. Thus, participants in this thesis who, for example, choose to recall a past personal event that made them feel angry is thought to have made this choice in an attempt to increase their anger and that, if they then get to write about their chosen event, this should lead to increases in anger.

### **Combining instrumental emotion regulation and self-control research**

As yet, no research into instrumental emotion regulation has tested predictions made by the instrumental theory of emotion regulation in the context of self-control, and no prior studies on instrumental emotion regulation have measured trait self-control. Building on evidence showing that people can regulate emotions to enhance their performance and to attain goals (Tamir, 2009a), it seems plausible that people should also be able to regulate emotions to enhance their *self-control performance*, and that people with high trait self-control might be especially likely to do so given their enhanced ability to effectively regulate emotions and their tendency to succeed at self-control. In particular, if positive emotions are adaptive and negative emotions are maladaptive for self-control, and if people can harness these emotions to achieve self-control success as discussed above, it seems reasonable to argue that one way to harness these emotions might be by regulating these emotions instrumentally to achieve self-control success. That is, people should be able to regulate emotions to increase their positive and to decrease their negative emotions to achieve self-control success, and people higher in trait self-control should be especially likely to do this.

This is, however, not to say that emotion regulation and self-control are two entirely distinct processes. Indeed, emotion regulation and self-control are sometimes thought to conceptually overlap, and emotion regulation is sometimes considered one form of self-control (e.g., Paschke et al., 2016). This claim is also evident in certain definitions of self-control that include an emotion component. For example, Kross and Guevarra (2015) defined self-control as “the capacity to alter one’s thoughts, feelings, and behaviors to align them with one’s goals” (p.1). This definition firstly suggests that being able to change one’s emotions is an important aspect of being able to self-control, and, secondly, that being able to change one’s emotions can facilitate goal pursuit. Thus, based on these insights along with the plethora of research showing that people

can regulate emotions to attain goals (Tamir, 2009a) and that emotion regulation can facilitate self-control outcomes as we shall see next (Juergensen & Demaree, 2015), emotion regulation seems to be a form of self-control *and* a tool that can be used to facilitate self-control outcomes. In this thesis, I focus on the aspect of the self-control definition that suggests that being able to change one's emotions can facilitate goal pursuit and I take an instrumental approach to emotion regulation by conceptualizing emotion regulation as a tool that can be used to improve self-control outcomes.

Consistent with this, a few studies have indeed linked emotion regulation with enhanced self-control. For example, one study found that instructing participants to use emotion regulation to downregulate their negative emotional states in the lab helped them to resist unhealthy snacks (Juergensen & Demaree, 2015), and another study showed that people who regulated their emotions when faced with daily aversive situations were more likely to succeed in these situations than those who did not regulate their emotions in these situations (Hennecke et al., 2018). These findings suggest that people can use emotion regulation to change their current emotional states in order to achieve self-control success, both in experimental settings and in real-life. More evidence that links emotion regulation with enhanced self-control comes from studies linking high trait self-control with effective emotion regulation, showing that people higher, relative to lower, in trait self-control regulate their emotions more effectively in the lab (Paschke et al., 2016) and that they are more likely to use emotion regulation strategies when facing aversive activities in real-life (though emotion regulation does not mediate the link between trait self-control and self-reported success in such activities: Hennecke et al., 2018). Nonetheless, important to the aims of this thesis, these data do not reveal whether people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control



performance *per se*, and whether this regulation and subsequent emotions leads to improvements in self-control performance. The overarching aim of this thesis is therefore to investigate exactly that.

### **Summary and overview of empirical chapters**

To date, there has been relatively little research into how people higher in trait self-control succeed at self-control and achieve various goals and positive outcomes. This is an important area of research given its potential to inform the design of interventions to improve self-control in people who often fail at self-control and thus help them to achieve more favorable outcomes. For example, if upregulating positive emotions help people with high trait self-control to achieve self-control success, developing interventions aimed at teaching people regulatory skills that would increase these emotions might help them to also achieve self-control success. The overarching aim of this thesis is therefore to contribute to our understanding of the strategies that people higher in trait self-control might use to succeed at self-control. Specifically, this work bridges research into self-control, emotions, and instrumental emotion regulation to examine whether people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control, and whether this regulation and subsequent emotions leads to improvements in self-control.

To test these central hypotheses, I designed a systematic programme of research consisting of five preregistered key studies, along with four supplemental studies, that are organized into two multi-study empirical papers. Each of these studies draw on insights and various methods from research on instrumental emotion regulation to provide converging evidence for these central hypotheses. That is, throughout this work, I test key predictions made by the theory of instrumental emotion regulation by means of self-reports, behavioral measures, and experimental methods. I also test these hypotheses in different types of self-control situations and in one performance situation

that does not require self-control. I argue that this approach will allow me to test the robustness and generalizability of my findings. An overview of the empirical papers included in this thesis are provided below (see also Figure 1.2).

Building on the substantial evidence that people's beliefs about the utility of emotions predict their regulatory attempts to increase these emotions (Ford & Gross, 2018), the primary aim of Chapter 2 was to examine which emotions that people higher in trait self-control consider useful in everyday situations that vary by the type of self-control they require, and thus to provide a starting point for understanding how people higher in trait self-control might regulate their emotions in these situations, as compared to people lower in trait self-control. Specifically, Chapter 2 reports findings from two preregistered key studies (Study 1:  $N = 253$ ; Study 2:  $N = 306$ ), along with three supplemental studies ( $N = 60$ ;  $N = 49$ ;  $N = 384$ , respectively), that examine the emotions that people higher, relative to lower, in trait self-control consider useful in everyday situations that require them to use initiatory and inhibitory self-control, with the first study consisting of both exploratory and confirmatory analyses, and the second consisting of confirmatory analyses aimed at replicating the findings of the first study. The focus of Chapter 2 is therefore on beliefs about the utility of emotions in two types of everyday self-control situations that have rarely been studied in the self-control literature: those that require initiatory and inhibitory self-control.

Nonetheless, even though Chapter 2 provides important insights into how people higher, relative to lower, in trait self-control might regulate their emotions in everyday situations by assessing their beliefs about the utility of emotions in these situations, this data does not allow me to draw any conclusions about how they *actually* regulate emotions in self-control situations, and whether this leads to improvements in self-control. The empirical paper in Chapter 3 accounts for this by examining the emotions

that people higher in trait self-control consider useful *and* prefer to regulate in the context of self-control, and whether these beliefs and preferences translate into improvements in self-control. Assessing emotion regulation and self-control performance is crucial to fully test my overall hypotheses that people higher, relative to lower, in trait self-control regulate their emotions differently in the context of self-control, and that this regulation and subsequent emotions then facilitate their self-control performance.

Importantly, the ‘context’ in Chapter 3 pertains to laboratory self-control situations rather than everyday self-control situations. I argue that it is critical to test my hypotheses both in everyday and laboratory self-control situations, given the notion that everyday self-control might operate differently from laboratory self-control both in terms of how people make self-control decisions in these situations and in terms of the extent to which these situations require self-control (Shenhav, 2017). Additionally, the ‘context’ in Chapter 3 varies by self-control demand (i.e., whether the situations are high or low in self-control demand) rather than the type of self-control they require (i.e., whether the situations require initiatory or inhibitory self-control), allowing me to assess whether my findings are specific to self-control situations or whether they generalize to another performance situation that does not require self-control.

Thus, Chapter 3 reports findings from three preregistered studies, along with one supplemental study ( $N = 26$ ), that each uses a different method from research on instrumental emotion regulation to examine whether people higher, relative to lower, in trait self-control regulate their emotions differently in laboratory performance contexts that are high and low in self-control demand, and whether this regulation and subsequent emotions lead to improvements in self-control performance. Broadly, Study 1 ( $N = 415$ ) first employs self-reported questionnaires to examine whether trait self-

control predicts beliefs about the utility of emotions in performance contexts that are high and low in self-control demand, and whether these beliefs translate into preferences to regulate these emotions. Study 2 ( $N = 140$ ) then employs behavioral measures to examine whether these beliefs and regulatory preferences translate into actual regulatory choice and self-control performance by examining whether trait self-control predicts choice to regulate emotions in these contexts, and whether their choice and subsequent emotions lead to improvements in self-control performance. Finally, to test whether the findings of Study 2 replicate in a carefully controlled environment and when using a different self-control task, Study 3 ( $N = 210$ ) utilizes experimental methods to investigate whether trait self-control predicts self-control performance when participants are randomly assigned to a condition where they receive instructions to either upregulate positive or negative emotions, and this time also including a neutral control condition.

In sum, this programme of research tests whether people higher in trait self-control regulate their emotions differently from people lower in trait self-control in the context of self-control, and whether this regulation and subsequent emotions help them to succeed at self-control. To achieve this, I use a rigorous methodology including self-reports, behavioral measures, and experimental methods, and I also test my hypotheses in three different types of self-control contexts (i.e., in real-life contexts that require initiatory self-control, in real-life contexts that require inhibitory self-control, and in a laboratory context that is high in self-control demand) and in one performance context that requires little self-control. I also test my hypotheses using different types of tasks to measure self-performance, in laboratory environments that vary from moderately to carefully controlled, and using two different populations (undergraduate students and

MTurk workers). Overall, this research approach allows me to achieve rigor and to test the robustness and generalizability of my findings.

Table 1.1. *Overview of the empirical chapters and studies included in this thesis*

Chapter	Key aims
Chapter 2: Study 1 and 2	Investigate the emotions that people higher, relative to lower, in TSC consider useful in everyday situations that vary by self-control type (initiation, inhibition).
Chapter 3:	Examine the emotions that people higher, relative to lower, in TSC consider useful and prefer to regulate in laboratory performance contexts that vary by self-control demand (high, low), and whether these beliefs and preferences translate into enhanced self-control.
Study 1	Assess the emotions that people higher, relative to lower, in TSC consider useful in these situations, and whether these beliefs translate into regulatory preferences.
Study 2	Test how people higher, relative to lower, in TSC choose to regulate emotions in these situations, and whether their choice and subsequent emotions lead to improvements in self-control performance.
Study 3	Investigate whether TSC predicts self-control performance when participants are randomly assigned to either a positive, negative, or neutral emotion regulation condition.

*Note.* In addition to the listed key variables, trait self-control was included as a key variable in all studies. TSC = trait self-control.

Finally, in Chapter 4 I present an overview of the key findings from the present thesis, I discuss the theoretical and practical implications of these findings, I address potential limitations and discuss interesting ideas for future research.

**Chapter 2: Paper 1 – Trait self-control and beliefs about the utility of emotions for initiatory and inhibitory self-control**

Reference:

Tornquist, M., & Miles, E. (manuscript under review). Trait self-control and beliefs about the utility of emotions for initiatory and inhibitory self-control.

**Abstract**

People with good self-control enjoy positive life outcomes. Nonetheless, *how* they achieve these outcomes remains unclear. We propose that people regulate their emotions to increase the emotions they consider useful for self-control, and that this might depend on the self-control type required and trait self-control. Two preregistered studies examined people's beliefs about the utility of emotions in initiatory or inhibitory everyday self-control situations, and whether these beliefs varied by trait self-control. Results showed that participants considered positive emotions more useful for self-control than negative emotions, but that this effect was moderated by situational and individual factors. Specifically, participants considered positive emotions more useful for initiatory than inhibitory self-control, whereas the opposite was found for negative emotions. Also, participants with high trait self-control considered negative emotions less useful and positive emotions more useful for both self-control types. This research might suggest that people can regulate emotions to achieve everyday self-control success.

*Keywords:* self-control, trait self-control, emotion, emotion regulation, initiatory self-control, inhibitory self-control

## Introduction

Self-control refers to the capacity to “override impulses to act as well as the ability to make oneself initiate or persist in boring, difficult, or disliked activity” (Carver, 2010, p.766). Many studies have shown that the ability to exert self-control leads to a happy, healthy, and successful life (de Ridder, Lensvelt-Mulders, Finkenauer, & Baumeister, 2012). Nonetheless, *how* people with good self-control achieve these positive outcomes remains unclear. Drawing together research demonstrating that emotions can facilitate self-control (DeSteno, 2018), that people with good self-control are able to regulate emotions more effectively (Paschke et al., 2016), and that people regulate emotions to experience the emotions they consider useful (Tamir, 2009a), we propose that adaptive regulation of emotions may be one strategy people with good self-control use to achieve their goals.

Moreover, we propose that the most adaptive way to regulate emotions might differ depending on the type of self-control required. While successful self-control is often equated with the ability to *inhibit* undesired behaviors (Tangney, Baumeister, & Boone, 2004), recent theorizing suggests that successful self-control also involves the ability to *initiate* desired behaviors (de Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011). In two preregistered studies, we explore these hypotheses by examining the emotions people consider useful for inhibitory and initiatory self-control, and how these beliefs differ as a function of trait self-control.

## Emotions and self-control

Research has generally demonstrated that positive emotions facilitate self-control relative to negative emotions. For example, Winterich and Haws (2011) found that participants who read a positive story reported lower preferences for unhealthy snacks than those who read a negative story. Similarly, Garg, Wansink, and Inman (2007) found that participants consumed more popcorn while watching sad movies than



while watching happy movies. Studies which have measured, rather than manipulated, positive and negative affect have observed similar effects. For example, Wertheim and Schwarz (1983) found that people higher in depression had a greater tendency to choose immediate rewards over delayed rewards, and Niermann and colleagues (2016) found that higher positive affect predicted more time spent exercising that day, whereas the reverse was true for negative affect. Some research has found specific positive or negative emotions to be particularly helpful or harmful for self-control. For example, pride and hope have been found to be particularly beneficial for self-control (Patrick et al. 2009; Winterich and Haws (2011), and guilt may have some positive effects on self-control (Hofmann & Fisher, 2012; Zemack-Rugar, Bettman, & Fitzsimons, 2007; see also Onwezen, Bartels, & Antonides, 2014), suggesting that not all negative emotions are equally harmful.

These studies demonstrate that our emotions can influence our self-control success, and generally support the hypothesis that positive emotions boost self-control relative to negative emotions, in both experimental settings and real-life (although the effects of positive affect also depend on context: Aspinwall, 1998; Wenzel, Conner, & Kubiak, 2013). Thus, increasing positive and decreasing negative emotions might improve self-control performance.

### **Emotion regulation and self-control**

Emotion regulation is often considered one form of self-control (Muraven, Tice, & Baumeister, 1998; Paschke et al., 2016), which specifically refers to the attempts to alter which emotions we have, when we have them, and how we experience and express them (Gross, 1998, 2015). While people often attempt to maximize positive and minimize negative emotions (e.g., Larsen, 2000), people also regulate emotions to help them attain goals (Tamir, 2009a). Specifically, people prefer to experience emotions that are useful or trait-consistent during goal pursuit. For example, Tamir and Ford

(2012) found that participants instructed to confront (vs. collaborate) in a negotiation task rated anger as more useful, were more likely to choose pre-negotiation activities that would increase their anger, and that, consistent with their beliefs, anger improved their negotiation performance. Similarly, Tamir (2005) found that highly neurotic people, for whom negative emotions are trait-consistent, preferred to feel worried in demanding situations, and that worry subsequently enhanced their performance. These findings suggest that people's emotional goals are determined by the emotions they consider useful; that they regulate emotions accordingly; and that these emotions have actual beneficial effects on their performance.

Therefore, emotion regulation is both a type of self-control and a strategy which could be used to improve other types of self-control. Consistent with the idea that emotion regulation facilitate self-control, people higher in trait self-control are better able to regulate their emotions in response to negative stimuli (Paschke et al., 2016), demonstrate greater inhibition of daily affective expressions (Zabelina, Robinson, & Anicha, 2007), and have greater emotional stability (Tangney et al., 2004). While these data are correlational, experimental research has shown that emotion regulation can be used to enhance self-control. For example, Juergensen and Demaree (2015) found that participants who were instructed to regulate emotions when viewing tempting images were more likely to resist unhealthy snacks than those who simply viewed the images. Together, these findings suggest that regulating emotions might help people to succeed at self-control.

### **Emotions and initiatory and inhibitory self-control**

The most adaptive way to regulate emotions, however, might depend upon the demands of the situation. While most self-control research assumes that self-control involves inhibition of attractive but undesired behaviors (e.g., snacking), self-control

also comprises initiation of unattractive but desired behaviors (e.g., exercising).

Therefore, conceptual distinctions between initiatory and inhibitory self-control have been proposed (Davisson, 2013; de Ridder et al., 2011; de Boer, van Hooft, & Bakker, 2011; Haynes, Kemps, & Moffitt, 2016). Similarly, it has been argued that emotions function to both initiate and inhibit behaviors (Zhu & Thagard, 2002). Emotions might therefore influence initiatory and inhibitory self-control in different ways.

The body of research demonstrating that positive emotions benefit self-control relative to negative emotions includes both initiatory and inhibitory behaviors (Garg et al., 2007; Niermann et al., 2016), and we are not aware of any research examining how the effect of emotions is moderated by the type of self-control required. There is, however, indirect evidence to suggest that positive emotions may be particularly beneficial for initiating behaviors, while negative emotions might be more useful for inhibiting behaviors. For example, evidence generally suggests that positive and negative affect are related to approach and avoidance behaviors, respectively (Carver & Scheier, 1998), although specific positive and negative emotions may sometimes be related to avoidance and approach behaviors, respectively (Carver & Scheier, 2011). Similarly, studies have found positive links between positive affect and the Behavioral Activation System (BAS), and between negative affect and the Behavioral Inhibition System (BIS; Carver & White, 1994; Elliot & Thrash, 2002), which are conceptually similar to initiatory and inhibitory self-control, respectively (de Ridder et al., 2011). Cross-sectional data also suggests that increased positive affect is related to greater initiatory self-control, although increased negative affect does not seem to predict greater inhibitory self-control (in fact, the opposite may be true; De Boer et al., 2011).

Other research has further demonstrated that positive emotions enhance performance when paired with action concepts (e.g., go, doing), whereas negative

emotions enhance performance when paired with inaction concepts (e.g., stop, pause; Albarracin & Hart, 2011), again providing evidence to link positive emotions with initiation and negative emotions with inhibition. Additional theoretical support comes from Fredrickson's (2001) broaden-and-build theory, which proposes that positive emotions spark the urge to initiate new activities. Consistent with this, Cunningham (1998) found that experiencing positive emotions after a mood induction predicts intentions to engage in social, physical, and leisure activities.

Thus, there is strong theoretical and empirical evidence to suggest that positive emotions might be particularly beneficial for initiatory self-control (e.g., going to the gym), with more mixed evidence in support of a beneficial effect of negative emotions for inhibitory self-control (e.g., avoiding late-night snacking). Taken together, these different lines of research underline the conceptual distinction between initiatory and inhibitory self-control and suggest that positive and negative emotions may influence initiatory and inhibitory self-control in different ways.

### **Present Studies**

Drawing together these strands of research, we suggest that instrumental emotion regulation can help people to succeed at self-control, and that people with good self-control (i.e., people high in trait self-control; Tangney et al., 2004) may be especially likely to use this strategy, given their superior ability to adaptively regulate emotions (Paschke et al., 2016). We conducted two studies to provide supporting evidence for our hypothesis that people higher in trait self-control use emotion regulation as a tool to succeed in self-control situations. Drawing on research showing that people regulate the emotions they consider useful for the task at hand (Tamir, 2009a), we examine the emotions people consider useful for self-control and how these vary according to individual differences in trait self-control. Given that people's beliefs

about the utility of emotions predict their regulatory behaviors during goal pursuit (Tamir, 2009a), the emotions people higher in trait self-control consider useful in self-control situations should be a starting point for understanding the role of emotion regulation in successful self-control.

We also explore whether the emotions people consider useful in self-control situations vary depending on whether the situation requires initiatory vs. inhibitory self-control, and how this is moderated by trait self-control. Given evidence that people higher in trait self-control are better at both initiating and inhibiting behaviors (e.g., exercising: Wills, Isasi, Mendoza, & Ainette, 2007; binge eating: Tangney et al., 2004), the emotions they consider useful for initiatory and inhibitory self-control may give us insight both into which emotions facilitate self-control, and under what circumstances they do so.

We examined these hypotheses in two preregistered studies which progress from exploratory to confirmatory evidence. In Study 1, our preregistered prediction was that people higher in trait self-control would consider positive emotions more useful for their self-control success, in particular pride and hope, and that they would consider negative emotions less useful for their self-control success, as compared to people with lower levels of trait self-control. In other words, we predicted that they would better recognize the beneficial effects of positive emotions and harmful effects of negative emotions on self-control.

In Study 1 we did not make any preregistered predictions about how these effects would vary as a function of inhibitory or initiatory self-control. Our exploratory analyses of the emotions people considered useful for inhibitory and initiatory self-control situations, and how these beliefs varied by trait self-control, led us to make preregistered predictions about these effects in Study 2. Study 1 therefore includes both

exploratory and confirmatory analyses, whereas Study 2 includes only confirmatory analyses, aimed at replicating the findings of Study 1. We used this approach to improve the quality, reproducibility, and reliability of our findings (Open Science Collaboration, 2015).

## **Study 1: Initial Evidence**

### **Method**

A study overview, materials, and data can be found via the Open Science Framework ([https://osf.io/zvtsa/?view\\_only=61b80a8f1dc548df90001e8e074beefe](https://osf.io/zvtsa/?view_only=61b80a8f1dc548df90001e8e074beefe)).<sup>1</sup>

### **Participants**

Participants ( $N = 253$ ) were recruited through Amazon Mechanical Turk (MTurk) and received \$0.75 cents ( $M_{\text{age}} = 41.53$  years,  $SD_{\text{age}} = 12.81$ ; 155 females; 79% White, 10% Asian/Asian American/Asian European, 8% Black/African American/African European, 1% Hispanic/Latino, and 2% Other). Adults living in the USA participated; all participants reported being fluent in English. This study was approved by the local Ethics Committee.

The required sample size for testing our key effects (design: emotion x self-control type + trait self-control as a covariate) was  $N = 128$  (assuming power = .80, alpha = .05, effect size  $f = .25$ ). We set a target sample size of 250 based on the amount of money we were able to spend on this study. Our final sample exceeded our target sample because 3 additional people voluntarily completed our study via MTurk.

### **Materials**

Scores on the following scales were averaged to form one composite score for each scale/subscale, with higher scores indicating higher levels of that construct.

**Trait Self-Control.** Trait self-control was measured using the Brief Self-Control Scale (Tangney et al., 2004). Participants rated 13 items (e.g., “I say inappropriate

things”) on a scale of 1 (*not at all like me*) to 5 (*very much like me*). The scale was reliable (9 reversed scored; Cronbach’s  $\alpha = .88$ ).

**Self-control vignettes.** Participants read five vignettes that described self-control situations that varied in self-control type,<sup>2</sup> with three describing inhibitory self-control (e.g., resisting sweets) and two describing initiatory self-control (e.g., start exercising; see Appendix 1).<sup>3</sup>

**Expected Emotion Utility.** Following Tamir (2005), we assessed how useful participants thought different emotions would be to their self-control success in each of the situations described. Emotions were chosen from the Modified Differential Emotions Scale (Fredrickson, Tugade, Waugh, & Larkin, 2003). Participants indicated how much they thought four positive (Cronbach’s  $\alpha = .91$ ; hope, joy, pride, and serenity) and four negative (Cronbach’s  $\alpha = .87$ ; sadness, guilt, anxiety, and anger) emotions could help them to succeed. Each emotion was defined by three adjectives (e.g., joy: joyful, glad, or happy) to ensure the same understanding of these constructs among the participants. For example, they rated the statement “To what extent do you think feeling hopeful, optimistic, or encouraged would help you succeed in the situation described?” on a scale of 1 (*not at all*) to 7 (*extremely*).<sup>4</sup>

## Procedure

Participants answered questions about demographics (age, gender, ethnicity) and completed the Brief Self-Control Scale. They were then presented with the 5 self-control vignettes, one at a time, and asked to imagine themselves in each situation and provide their expected emotion utility ratings before moving on to the next vignette. Expected emotion utility items and vignettes were presented in a random order. The study was completed through Qualtrics.

## Results and Discussion

### Data Analysis strategy

To assess both our preregistered and exploratory hypotheses, we conducted a 2 (emotion: positive, negative) x 2 (self-control type: initiation, inhibition) within-subjects ANOVA; following Tamir (2005, 2009b), emotion and self-control type were within-subjects factors, trait self-control (centered) a covariate, and utility ratings the dependent variable, allowing us to examine interactions between our within-subjects variables and trait self-control without dichotomizing trait self-control. To examine our preregistered hypotheses concerning whether trait self-control predicted utility ratings for pride and hope specifically, we conducted individual simple regressions.

### Preregistered hypothesis tests

**Do people with higher trait self-control consider positive emotions to be more useful in self-control situations, and negative emotions to be less useful?** The key test of this hypothesis was the interaction between emotion and trait self-control. The analysis first revealed a significant main effect of emotion,  $F(1, 251) = 507.70, p < .001, \eta_p^2 = .67$ , indicating that participants generally considered positive emotions ( $M = 4.54, SE = .07$ ) as more useful for self-control than negative emotions ( $M = 2.30, SE = .06$ ), and a non-significant main effect of trait self-control,  $F(1, 251) = 0.93, p = .34, \eta_p^2 = .004$ , indicating that people with higher trait self-control did not believe that emotions were generally more or less useful for self-control than people with lower trait self-control. The emotion x trait self-control interaction was significant,  $F(1, 251) = 4.35, p = .038, \eta_p^2 = .02$ . Consistent with our predictions, people higher (+1 *SD*) in trait self-control considered negative emotions less useful for self-control (estimated  $M = 2.18$ ) than people lower (-1 *SD*) in trait self-control (estimated  $M = 2.45$ ),  $\beta = -.15, p = .02$ . However, contrary to our predictions, people higher (+1 *SD*) in trait self-control did not



consider positive emotions more useful for self-control (estimated  $M = 4.57$ ) than people lower ( $-1\ SD$ ) in trait self-control (estimated  $M = 4.46$ ),  $\beta = .05$ ,  $p = .42$ .

**Do people with higher trait self-control consider pride and hope to be more useful in self-control situations?** Inconsistent with our predictions, simple regressions demonstrated that people higher in trait self-control did not consider pride ( $\beta = .11$ ,  $p = .079$ ) or hope ( $\beta = .10$ ,  $p = .11$ ) more useful for self-control than people lower in trait self-control, although the beta coefficients were positive in both cases. This is, however, unsurprising given our finding that trait self-control was a non-significant predictor of utility ratings for positive emotions overall.

Thus far, our findings provide evidence that people generally believe that positive emotions are more useful for their self-control success than negative emotions, consistent with the findings of experimental studies on the link between emotions and self-control. We also find evidence that these beliefs differ as a function of trait self-control, but only for negative and not positive emotions, partially supporting our predictions.

### **Exploratory analyses**

**Which emotions do people consider useful in initiatory and inhibitory self-control situations?** To explore this question, we focused on the interaction between emotion and self-control type. The main effect of self-control type was not significant,  $F(1, 251) = 1.80$ ,  $p = .18$ ,  $\eta_p^2 = .007$ , suggesting that people consider emotions equally useful for both self-control types. However, the interaction between emotion and self-control type was significant,  $F(1, 251) = 19.43$ ,  $p < .001$ ,  $\eta_p^2 = .07$ . Exploratory post hoc tests revealed that people rated positive emotions as more useful for situations involving initiation ( $M = 4.64$ ,  $SE = .08$ ) than situations involving inhibition ( $M = 4.43$ ,  $SE = .07$ ),  $t(252) = 4.27$ ,  $p < .001$ ,  $d = .27$ . In contrast, people rated negative emotions as more

useful for situations involving inhibition ( $M = 2.37$ ,  $SE = .06$ ) than situations involving initiation ( $M = 2.22$ ,  $SE = .06$ ),  $t(252) = 3.29$ ,  $p = .001$ ,  $d = -.21$  (See Table 2.1). These findings suggest that, while people generally believe that positive emotions are more useful for self-control than negative emotions, this effect is moderated by the type of self-control required; people believe that positive emotions are more useful for situations involving initiatory self-control than situations involving inhibitory self-control, with the opposite pattern for negative emotions. This provides preliminary evidence that people view these self-control types differently, which might suggest that they also regulate their emotions differently in these situations.

**Does trait self-control moderate the effects of emotions and self-control type on utility ratings?** The interaction between self-control type and trait self-control was non-significant,  $F(1, 251) = 0.61$ ,  $p = .44$ ,  $\eta_p^2 = .002$ , suggesting that people higher and lower in trait self-control provided similar utility ratings of emotions for initiatory and inhibitory self-control. Moreover, the emotion x self-control type x trait self-control interaction was also non-significant,  $F(1, 251) = 3.26$ ,  $p = .07$ ,  $\eta_p^2 = .01$ . While this interaction did not reach significance, we conducted exploratory follow-up analyses to examine whether the significant moderation effects observed in our earlier preregistered analyses were particularly driven by one type of self-control.

Specifically, two ANOVAs were conducted to examine the interaction between self-control type and trait self-control on utility ratings for each emotion separately. The self-control type x trait self-control interaction was significant for negative emotions,  $F(1, 251) = 4.23$ ,  $p = .04$ ,  $\eta_p^2 = .02$ . People higher in trait self-control considered negative emotions less useful for initiatory self-control than people lower in trait self-control,  $\beta = -.19$ ,  $p = .002$ , but people higher and lower in trait self-control provided similar utility ratings of negative emotions for inhibitory self-control,  $\beta = -.10$ ,  $p = .12$ .

The self-control type x trait self-control interaction was not significant for positive emotions,  $F(1, 251) = 1.24, p = .27, \eta_p^2 = .005$ , but this is unsurprising given that people higher and lower in trait self-control provided similar utility ratings of positive emotions for initiatory self-control,  $\beta = .08, p = .24$ , and inhibitory self-control,  $\beta = .03, p = .63$  (see Figure 2.1). These preliminary findings suggest that people higher in trait self-control believe that negative emotions are especially unhelpful for initiatory self-control.

### **Study 2: Confirmatory Evidence**

Study 2 was designed as a confirmatory test of Study 1's findings. The method was identical except that we modified the length and number of the self-control vignettes to allow us to more closely investigate our hypotheses concerning initiatory and inhibitory self-control. Specifically, whereas Study 1 asked participants to consider five descriptions of self-control situations, with only two describing initiation, Study 2 asked participants to consider 18 self-control behaviors, with 10 describing initiation. These changes were made to ensure that Study 2 had a sufficient number of events representing each self-control type to allow us to draw generalizable conclusions concerning initiatory and inhibitory self-control.

Based on the findings of Study 1, we predicted that people would consider positive emotions more useful for initiatory than inhibitory self-control, and negative emotions more useful for inhibitory than initiatory self-control. We also predicted that people with higher trait self-control would consider negative emotions less useful for self-control, particularly in situations involving initiatory self-control.

### **Method**

Study overview, materials, and data can be found at [https://osf.io/97395/?view\\_only=5004af39783d466383caa115009d53dc](https://osf.io/97395/?view_only=5004af39783d466383caa115009d53dc).

## Participants

Participants ( $N = 306$ ) were recruited through MTurk and received \$0.75 cents ( $M_{\text{age}} = 38.21$  years,  $SD_{\text{age}} = 12.35$ ; 169 females; 70% White, 16% Asian/Asian American/Asian European, 9% Black/African American/African European, 3% Hispanic/Latino, 1% Native Hawaiian/Pacific Islander, and 1% Other). Adults living in the USA participated; all participants reported being fluent in English. This study was approved by the local Ethics Committee.

Based on our a priori power analysis<sup>5</sup>, we planned to recruit 300 participants. Our final sample exceeded this because 6 additional people voluntarily completed the study through MTurk.

## Materials

**Trait Self-Control.** Participants completed the same trait self-control scale (Cronbach's  $\alpha = .89$ ) as in Study 1.

**Self-control behaviors.** Participants read 18 short descriptions of self-control behaviors (See Appendix 2) that varied in self-control type. Ten described initiatory self-control (e.g., initiating healthy food choices) and eight inhibitory self-control (e.g., resist late-night eating).<sup>6</sup>

**Expected Emotion Utility.** The utility scale was the same as in Study 1, with one minor change. To ensure that the question was suitable for *behaviors* rather than *situations*, participants rated how much they thought various emotions would help them to do each behavior successfully (e.g., “To what extent do you think feeling hopeful, optimistic, or encouraged would help you to do this behavior successfully?”). The scales were reliable for positive (Cronbach's  $\alpha = .98$ ) and negative (Cronbach's  $\alpha = .98$ ) emotions.

## Procedure

The procedure was identical to Study 1.

## Results and Discussion

### Data Analysis strategy

The goal of Study 2 was to confirm Study 1's findings. Therefore, we conducted the equivalent analyses as in Study 1.

### Preregistered hypothesis tests

**Do people with higher trait self-control consider positive emotions to be more useful in self-control situations, and negative emotions to be less useful?** Here we were interested in the interaction between emotion and trait self-control. Consistent with Study 1, the ANOVA first revealed a significant main effect of emotion,  $F(1, 304) = 792.55, p < .001, \eta_p^2 = .72$ , indicating that people rated positive emotions ( $M = 4.86, SE = .06$ ) as more useful for self-control than negative emotions ( $M = 2.32, SE = .06$ ), and a non-significant effect of trait self-control,  $F(1, 304) = 1.06, p = .30, \eta_p^2 = .003$ . The interaction between emotion and trait self-control was significant,  $F(1, 304) = 25.24, p < .001, \eta_p^2 = .08$ . Consistent with our predictions, people higher (+1 *SD*) in trait self-control considered negative emotions as less useful for self-control (estimated  $M = 2.05$ ) than people lower (-1 *SD*) in trait self-control (estimated  $M = 2.58$ ),  $\beta = -.26, p < .001$ . In contrast to Study 1, people higher (+1 *SD*) in trait self-control also considered positive emotions more useful for self-control (estimated  $M = 5.05$ ) than people lower (-1 *SD*) in trait self-control (estimated  $M = 4.68$ ),  $\beta = .17, p = .003$ , although we did not preregister a hypothesis concerning this relationship in Study 2 given the lack of association between trait self-control and utility ratings for positive emotions in Study 1. These findings suggest that people higher in trait self-control believe that negative

emotions are less useful, and positive emotions more useful, for self-control than people lower in trait self-control.

**Do people with higher trait self-control consider pride and hope to be more useful in self-control situations?** In contrast to Study 1, trait self-control positively predicted utility ratings for both pride ( $\beta = .17, p = .003$ ) and hope ( $\beta = .22, p < .001$ ), suggesting that that people with higher trait self-control consider pride and hope more useful for self-control relative to people with lower trait self-control.<sup>7</sup>

**Which emotions do people consider useful in initiatory and inhibitory self-control situations?** The key test of this hypothesis was the interaction between emotion and self-control type. The main effect of self-control type was significant,  $F(1, 304) = 13.56, p < .001, \eta_p^2 = .04$ , such that people rated emotions as more useful for initiatory ( $M = 3.62, SE = .04$ ) than inhibitory ( $M = 3.56, SE = .04$ ) self-control. Consistent with our predictions, the interaction between emotion and self-control type was significant,  $F(1, 304) = 91.01, p < .001, \eta_p^2 = .23$ . As in Study 1, people rated positive emotions as more useful for situations involving initiation ( $M = 5.00, SE = .06$ ) than for situations involving inhibition ( $M = 4.72, SE = .07$ ),  $t(305) = 9.41, p < .001, d = .29$ , and negative emotions as more useful for situations involving inhibition ( $M = 2.40, SE = .06$ ) than for situations involving initiation ( $M = 2.23, SE = .06$ ),  $t(305) = 6.78, p < .001, d = .38$  (See Table 2.1). These findings support the hypotheses that people would consider positive emotions more useful for initiatory than inhibitory self-control, and that they would consider negative emotions more useful for inhibitory than initiatory self-control.

Table 2.1. *Descriptive statistics for utility ratings of positive and negative emotions for initiatory and inhibitory self-control*

	STUDY 1		STUDY 2	
	Initiation	Inhibition	Initiation	Inhibition
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>
Positive Emotions	4.64(1.22)	4.43(1.18)	5.00(1.06)	4.72(1.23)
Negative Emotions	2.22(1.00)	2.37(1.00)	2.23(1.03)	2.40(1.09)

*Note.* All measures are on 7-point scales.

**Does trait self-control moderate the effects of emotions and self-control type on utility ratings?** Our preregistered prediction was that self-control type would moderate our earlier finding that people higher in trait self-control considered negative emotions to be less useful for self-control; we expected this to be particularly true in situations involving initiatory self-control. Overall, our results did not support this hypothesis. The interactions between self-control type and trait self-control,  $F(1, 304) = 0.85, p = .36, \eta_p^2 = .003$ , and between emotion, self-control type, and trait self-control,  $F(1, 304) = 0.22, p = .64, \eta_p^2 = .001$ , were not significant. However, we also conducted the same follow-up analyses as in Study 1 to examine our specific hypotheses concerning trait self-control, negative emotions, and initiatory self-control. The self-control type x trait self-control interaction was not significant for negative emotions,  $F(1, 304) = 0.007, p = .93, \eta_p^2 = .00$ . People higher in trait self-control considered negative emotions less useful for both initiatory self-control,  $\beta = -.26, p < .001$ , and inhibitory self-control,  $\beta = -.25, p < .001$ , as compared to people lower in trait self-control.

The self-control type x trait self-control interaction was not significant for positive emotions,  $F(1, 304) = 0.67, p = .41, \eta_p^2 = .00$ . That is, people higher in trait self-control considered positive emotions more useful for both initiatory self-control,  $\beta = .17, p = .003$ , and inhibitory self-control,  $\beta = .14, p = .01$ , as compared to people

lower in trait self-control. Together, these findings suggest that people with high trait self-control believe that negative emotions are unhelpful and positive emotions helpful for situations involving initiatory *and* inhibitory self-control. Figure 2.1 shows the plotted estimated means for both two-way interactions (at  $\pm 1$  SD) based on these regression equations.

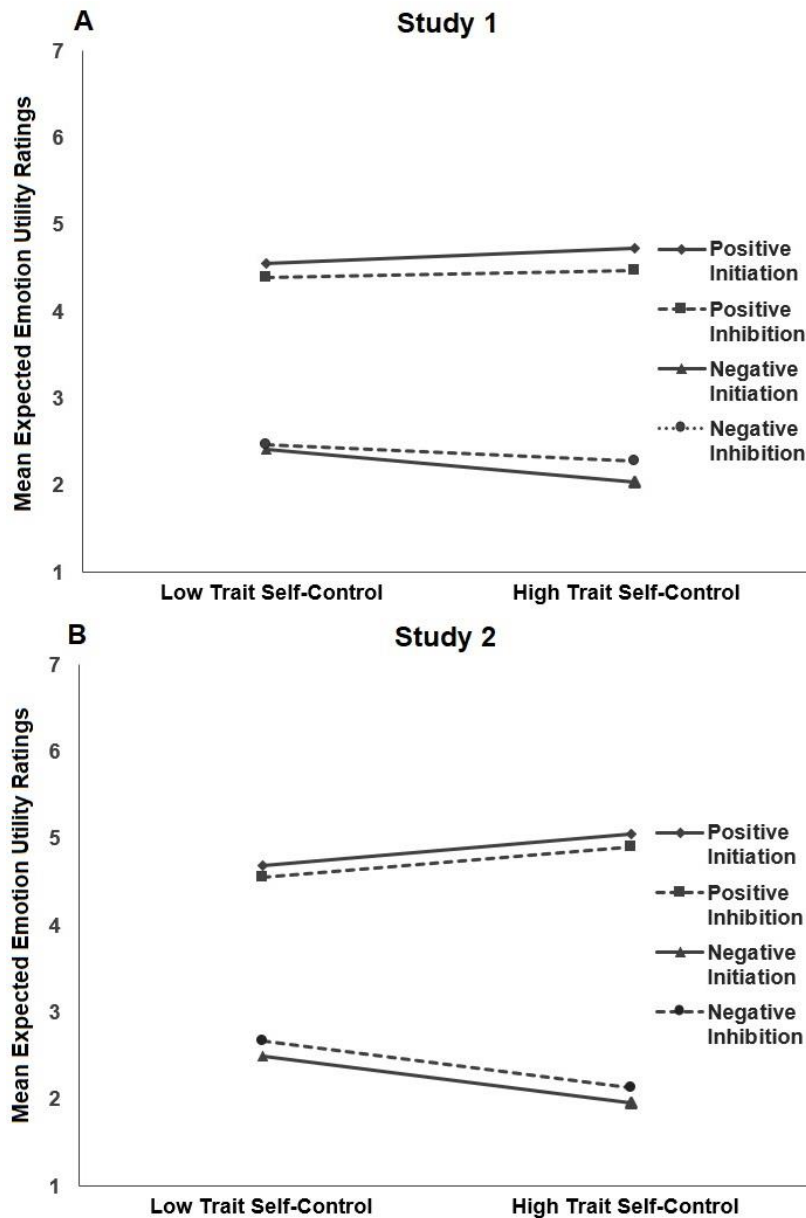


Figure 2.1. Estimated mean expected utility ratings of positive and negative emotions in initiatory and inhibitory self-control situations for participants higher (+1 SD) and lower (-1 SD) in trait self-control in Study 1 (Panel A) and Study 2 (Panel B).



## **General Discussion**

In two preregistered studies, we examined the emotions that people considered useful for inhibitory and initiatory self-control, and how these beliefs differed as a function of trait self-control. Our results showed that people generally believed that positive emotions would be more helpful in everyday situations that involved self-control, but that this effect was moderated by the type of self-control required and by individual differences in trait self-control. Thus, our findings suggest that, contrary to how self-control is often conceptualized in the literature, people are sensitive to whether a situation requires enacting or preventing a behavior and view the demands of these situations differently; and also suggest that people with good self-control may pursue different emotions to help them succeed in these situations.

Specifically, relative to people lower in trait self-control, people higher in trait self-control believed that negative emotions would be less useful for their success in everyday self-control situations (across Studies 1 and 2), with some evidence that they also believed that positive emotions would be more useful for their success in everyday self-control situations, in particular pride and hope (Study 2). Importantly, because people upregulate the emotions they consider useful for the task at hand (e.g., Ford & Gross, 2018; Tamir, Bigman, Rhodes, Salerno, & Schreier, 2015), our findings are likely to have implications for regulatory behaviors and self-control success in real-life situations. That is, based on our findings regarding people's beliefs about the utility of emotions, we speculate that people might upregulate positive and downregulate negative emotions accordingly in self-control situations, and that people with higher trait self-control might be more likely to do this than people lower in trait self-control.

Given that many studies have found that positive emotions facilitate self-control relative to negative emotions (e.g., Winterich & Haws, 2011), our findings might

suggest both that people's beliefs about the utility of emotions for self-control are generally accurate, and that people with high trait self-control might possess a more accurate understanding of how emotions might help or hinder self-control. While future research is needed to demonstrate that these beliefs translate into differences in emotion regulation and subsequent improvements in self-control performance, prior research suggests that beliefs about the utility of emotions do predict actual regulation and improved performance (e.g., Tamir & Ford, 2012; see also Ford & Gross, 2018). Thus, our findings provide tentative evidence that people with good self-control might use emotion regulation as a strategy to succeed at self-control and achieve their goals.

Furthermore, our findings add to self-control research by showing that people believed that positive emotions would be more useful for initiatory than inhibitory self-control, whereas negative emotions would be more useful for inhibitory than initiatory self-control (across Studies 1 and 2). These findings suggest that people distinguish between situations that require them to enact or prevent behaviors in their everyday lives. Participants' beliefs are also consistent with research demonstrating links between positive emotions and action and between negative emotions and inaction in performance contexts (Albarracín & Hart, 2011). Thus, while positive emotions generally seem to be more useful for self-control than negative emotions, it is possible that the link between emotions and self-control performance depends upon the demands of the situation. Specifically, people who experience positive emotions might be particularly likely to succeed at initiating a self-control behavior (e.g., studying) than at inhibiting a self-control behavior (e.g., resisting alcohol at a party), and that the reverse might be true for those who experience negative emotions.

## Limitations and Future Directions

Our study was designed to assess beliefs about how emotions influence self-control, but we did not investigate the *actual* effect of emotions on self-control. Our conclusions about how these beliefs might translate into improvements in self-control in situations requiring the initiation or inhibition of behaviors are therefore speculative, and research is needed to confirm how emotions influence performance in these situations (e.g., by inducing or measuring positive or negative emotions and assessing how these emotions influence inhibitory and initiatory self-control performance). Similarly, although previous evidence suggests that people choose to regulate the emotions they consider useful (Tamir et al., 2015), we did not assess whether participants' beliefs influenced how they regulated their emotions. Future studies should examine not only whether people with high trait self-control are especially likely to upregulate positive emotions, but also which strategies they might use to do so (see Quoidbach, Berry, Hansennea, & Mikolajczak, 2010, for potential strategies). Understanding how people who are successful at self-control achieve this success could inform the design of interventions to help others achieve their goals. This approach has great potential given that many existing interventions that are designed to improve self-control often fail (e.g., Miles et al., 2016).

Moreover, we focused on measuring the extent to which people believe that positive emotions are more or less useful for self-control than negative emotions (for example, participants rated: "To what extent do you think feeling hopeful would help you to do this behavior successfully?"), and we did therefore not measure whether people believe emotions to be useful for their self-control success *at all*. Thus, future studies could include items that ask participants more directly whether they, in fact, believe that emotions can help them to succeed in various self-control situations.

Researchers could, for example, ask participants to imagine themselves in different self-control situations and ask them to rate their agreement with statements such as:

“Emotions could help me to succeed in this situation”, and “Experiencing emotions could enhance my performance in this situation”. That is, rather than assessing whether people consider positive emotions to be more or less useful for self-control than negative emotions we did in the current studies, this procedure would allow us to assess the extent to which people consider emotions to be useful for self-control at all (see Karnaze & Levine, 2017, for items that similarly measure people’s broad beliefs about whether emotions help vs. hinder).

We also took a broad approach in comparing beliefs about how positive emotions benefit self-control relative to negative emotions (see Aspinwall, 1998, for a review), limiting our analysis of specific emotions to those that have been experimentally linked to self-control performance (pride and hope; Patrick et al., 2009; Winterich & Haws, 2011). We chose to do so because much less is known about how other specific emotions (e.g., awe, anger) influence self-control, and thus we did not have any *a priori* hypotheses about the utility of these emotions. Future research could take a more nuanced perspective on the exact emotions people prefer to feel in different self-control situations. Moreover, we did not consider the intensity of emotions, which may moderate the link between emotions and self-control. While we argue that positive emotions generally benefit self-control, some research suggests that extreme positive emotions can impair self-control; for example, positive urgency (i.e., the tendency to act rashly when experiencing extreme positive affect) predicts impulsive behaviors (e.g., problem drinking; Cyders & Smith, 2007), particularly in people with bipolar disorder (Muhtadie et al., 2014). Future research could examine whether people’s emotion utility

beliefs, their regulatory attempts in self-control situations, and their subsequent behavior are moderated not only by emotions but by the intensity of those emotions.

### **Conclusions**

We conclude that, although people generally believe that positive emotions can help them succeed at self-control relative to negative emotions, these beliefs vary as a function of the specific self-control situation and individual differences in self-control. Specifically, people believe that positive emotions are more useful in initiatory than inhibitory self-control situations, whereas they have the opposite beliefs regarding negative emotions, and people with higher trait self-control recognize negative emotions as less useful and positive emotions as more useful for their success in both types of self-control situations. Because beliefs about the utility of emotions influence emotion regulation and ultimately behavior, this research contributes to our understanding of how emotions and emotion regulation might shape everyday self-control success.

### Footnotes

<sup>1</sup> As stated in our preregistration documents, in Study 1, we also collected data on how people generally want to feel (measure available at [https://osf.io/zvtsa/?view\\_only=61b80a8f1dc548df90001e8e074beefe](https://osf.io/zvtsa/?view_only=61b80a8f1dc548df90001e8e074beefe)). Consistent with suggestions made by Ford and Tamir (2014), we found that the emotions people considered useful were also the emotions they generally wanted to experience in their everyday lives (positive emotions:  $r = .30$ ,  $p < .001$ ; negative emotions:  $r = .46$ ,  $p < .001$ ). The exploratory findings of Study 1 led us to focus our confirmatory Study 2 on people's beliefs about the utility of emotions and how these beliefs varied by self-control type and trait self-control, and to leave the question of *why* people believe that certain emotions are helpful or unhelpful for their self-control success for future research. However, data for this measure and all other measures can be found online.

<sup>2</sup> To ensure that our findings were generalizable across life domains, the self-control descriptions varied in life domain (Tsukayama, Duckworth, & Kim, 2013). Study 1's vignettes described self-control situations in the relationship, food, sex, exercise, and work domains, one vignette for each domain. Study 2's behaviors described self-control behaviors in the food, work, relationship, sleep, and exercise domains, four behaviors for each domain (except the exercise domain, which included two initiatory and no inhibitory behaviors given that people do not typically seek to inhibit exercise behaviors).

<sup>3</sup> The five vignettes used in Study 1 were selected by asking undergraduates ( $N = 60$ ) to write about two personal self-control events. Mturk workers ( $N = 49$ ) then imagined themselves in these events and rated them for self-control demand (i.e., "To what degree do you think this event would require you to use self-control?") on a continuous slider scale from 0 (*no self-control at all*) to 100 (*a lot of self-control*). The

five events that received the highest self-control demand scores (each receiving a mean above 67) were included in this study. Mean self-control demand for these five events was 72.87 ( $SD = 20.40$ ). A dependent sample t-test revealed that the initiatory ( $M = 69.17$ ,  $SD = 24.42$ ) and inhibitory ( $M = 69.80$ ,  $SD = 23.19$ ) self-control events did not significantly differ in self-control demand,  $t = .15$ ,  $p = .88$ .

<sup>4</sup> To ensure data quality on MTurk (Peer, Vosgerau, & Acquisti, 2014), we included three instructional attention checks (available at [https://osf.io/zvtsa/?view\\_only=61b80a8f1dc548df90001e8e074beefe](https://osf.io/zvtsa/?view_only=61b80a8f1dc548df90001e8e074beefe)) embedded within the other surveys (Study 1-2). Participants who failed to follow these instructions were immediately thanked and dismissed (Study 1:  $N = 37$ ; Study 2:  $N = 92$ ). That is, they did not complete the remaining tasks and their provided data was immediately disregarded.

<sup>5</sup> A priori power analysis (G\*power: Faul, Erdfelder, Buchner, & Lang, 2009) indicated that a sample size of 128 (assuming power = .80, alpha = .05, effect size  $f = .25$ ) would be sufficient for testing our most central effects (design: emotion x self-control type + trait self-control as a covariate). However, a second power analysis estimated a required sample size of 290 participants (assuming power = .80, alpha = .05, effect size  $f = .25$ ) for detecting the effects of the more complex interactions that we intended to explore (e.g., specific emotion x self-control type + trait self-control as a covariate). We rounded up this target sample size and decided to recruit 300 participants. The effect size ( $f = .25$ ; medium effect; Cohen, 1998) was based on our exploratory study (Study 1), and data from our other similar studies, which generally demonstrated effect sizes ranging from small to medium, with some large effects.

<sup>6</sup> The 18 behaviors were selected by first asking Mturk workers ( $N = 384$ ) to pre-rate 111 self-control behaviors for their self-control demand (i.e., How much self-

control do you think you would you need to use to do this behavior successfully?) on a continuous slider scale of 0 (*no self-control at all*) to 100 (*a lot of self-control*). Some behaviors were adapted from previous studies (Davisson, 2013; Tsukayama et al., 2013), although most were new. We selected 18 behaviors that received high self-control demand ratings (each receiving a mean above 50) and that could be classified as involving either initiation or inhibition (as determined by two trained coders). Mean self-control demand for these behaviors was 55.37 ( $SD = 20.64$ ). A dependent sample  $t$ -test revealed that the initiatory ( $M = 54.93$ ,  $SD = 23.65$ ) and inhibitory ( $M = 54.91$ ,  $SD = 24.72$ ) self-control behaviors did not significantly differ in self-control demand,  $t = .01$ ,  $p = .99$ .

<sup>7</sup> While we preregistered that we were interested in exploring the link between trait self-control and utility ratings for pride, we did not state any directional hypotheses regarding this relationship in Study 2. Moreover, even though we did not preregister an interest in hope specifically, we explored the link between trait self-control and utility ratings for hope in order to be consistent with Study 1's analyses.



**Chapter 3: Paper 2 – The role of beliefs about the utility of emotions and emotion regulation in self-control performance among people higher and lower in trait self-control**

Reference:

Tornquist, M., & Miles, E. (manuscript in preparation). The role of beliefs about the utility of emotions and emotion regulation in self-control performance among people higher and lower in trait self-control.

**Abstract**

How do people with high trait self-control succeed at self-control? Three preregistered studies (Study 1:  $N = 415$ ; Study 2:  $N = 140$ ; Study 3:  $N = 210$ ) aimed to test this by examining whether people with high trait self-control use emotions and emotion regulation to succeed at self-control. Study 1 first examined whether trait self-control predicts beliefs about the utility of emotions in performance contexts that varied in self-control demand, and whether these beliefs translate into preferences to regulate these emotions. Study 2 then examined whether trait self-control predicts choice to regulate emotions in these contexts, and how this choice and subsequent emotions influenced self-control performance. Finally, Study 3 investigated whether trait self-control predicts self-control performance when participants are randomly assigned to regulate emotions. Results showed that people higher, relative to lower, in trait self-control considered positive emotions more useful and negative emotions less useful across situations, although these beliefs did not translate into preferences or choice to regulate emotions. Modest evidence was found that people higher in trait self-control experienced more positive and less negative emotion after a regulatory task, and that these emotional experiences helped them to succeed at self-control. This research contributes to our understanding of how emotions and emotion regulation might facilitate self-control.

*Keywords:* self-control, trait self-control, emotion, emotion regulation, self-control performance

## Introduction

Past work has established that people with good self-control enjoy a wide range of positive life outcomes (de Ridder, Lensvelt-Mulders, Finkenauer, & Baumeister, 2012; Tangney, Baumeister, & Boone, 2004), and that they experience increased happiness, positive moods, and life satisfaction (Cheung, Gillebaart, Kroese, & de Ridder, 2014; Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014). As such, good self-control is considered a blessing (Baumeister & Alquist, 2009), and some have argued that the ability to self-control is “one of the most powerful and beneficial adaptations of the human psyche” (Tangney et al., 2004, p. 272). Nonetheless, *how* people with good self-control succeed in situations that require self-control remains an open question.

This research sought to enhance our understanding of this issue. Because evidence suggests that people with good self-control believe that positive emotions can help them to succeed at self-control (Tornquist & Miles, 2018), that they regulate emotions more effectively in the lab (Paschke et al., 2016), and that they are more likely to regulate emotions in their daily lives (Hennecke, Czikmanti, & Brandstätter, 2018), as compared to people who are less good at self-control, we propose that people with good self-control use their emotions and emotion regulation as tools to succeed in situations that require self-control exertion.

Specifically, in three preregistered studies we test the proposition that people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control, and that this regulation and subsequent emotions facilitate their self-control. Thus, we seek to extend prior work that has shown that people higher and lower in trait self-control differ in their beliefs about which emotions that can help them to succeed at self-control (Tornquist & Miles, 2018) by

examining whether these beliefs translate into emotion regulation and self-control performance, and whether these beliefs generalize to a laboratory self-control situation.

### **What is self-control?**

Self-control is the ability to “override impulses to act as well as the ability to make oneself initiate or persist in boring, difficult, or disliked activity” (Carver, 2010, p.766). In other words, self-control is what stops us from lying and cheating to maintain a romantic partner, what makes us go to the gym instead of watching TV, what helps us choose a side salad instead of a side of fries, and what makes us stay home and study instead of going out with friends. It is not surprising, then, that the ability to self-control leads to numerous positive outcomes such as better physical health, good personal relationships, and improved work and academic performance (Crescioni et al., 2011; Finkel & Campbell, 2001; Tangney et al., 2004), whereas the inability to self-control leads to various negative outcomes such as substance abuse, financial problems, criminal offenses, and health problems (Moffitt et al., 2011). Thus, the ability to self-control seems to serve as a key to human flourishing.

Moreover, although self-control ability may fluctuate due to situational factors (e.g., previous self-control efforts: Muraven & Baumeister, 2000; shift in motivation: Inzlicht, Schmeichel, & Macrae, 2014), people tend to differ in self-control ability, and self-control is therefore considered a stable personality trait, with people higher in trait self-control generally being better able to self-control than people lower in trait self-control, and therefore enjoy its benefits more (de Ridder et al., 2012; Tangney et al., 2004). Furthermore, even though only a few studies have directly tested whether trait self-control predicts self-control ability (i.e., the ability to override impulses and to persist in disliked activity), Schmeichel and Zell (2007) found that people higher, relative to lower, in trait self-control were better at inhibiting the impulse to blink and to

pull their hand out of iced water, and Frieze and Hofmann (2009) found a link between low (but not high) trait self-control and increased snacking in a taste-and-rate task, providing evidence that people higher in trait self-control are better able to self-control than people lower in trait self-control (though the link between trait self-control and self-control ability depends on context: Imhoff, Schmidt, & Gerstenberg, 2014). Providing this self-control success, studying people with high trait self-control forms a promising avenue for understanding which strategies and techniques that people can use to succeed at self-control.

### **Do people with high trait self-control use their emotions to succeed at self-control?**

Consistent with prior work (DeSteno, 2018; Tornquist & Miles, 2018), the current framework suggests that certain emotions are adaptive for self-control and that people can harness these emotions to achieve self-control success. Specifically, we argue that people with high trait self-control regulate their emotions instrumentally to experience more of these adaptive emotions in the context of self-control, and that this regulation and changes in emotions then facilitate their self-control. In what follows, we first present evidence showing that some emotions are particularly adaptive for self-control, and that people with high trait self-control might be particularly likely to harness these emotions. We then discuss potential mechanisms underlying these effects.

Several lines of research suggest that some emotions are more adaptive for self-control than others, with positive emotions generally facilitating self-control relative to negative emotions, both in laboratory settings and in real-life (as reviewed in Tornquist & Miles, 2018; see also Aspinwall, 1998, for a review). Other research has linked high trait self-control with increased and decreased daily experiences of positive and negative emotions, respectively (Hofmann et al., 2014), which might suggest that people higher in trait self-control make use of these emotions, perhaps by regulating

these emotions, to succeed at self-control. Consistent with this idea, recent evidence suggests that people higher in trait self-control believe that positive emotions can help them succeed at self-control, whereas they believe that negative emotions have the opposite effect (Tornquist & Miles, 2018). Thus, because the emotions people consider useful in a particular context *are* useful to them in this context (Ford & Gross, 2018), these findings might suggest that positive emotions help people with high trait self-control to succeed at self-control.

It has further been suggested that certain emotions such as pride and hope might be particularly beneficial for self-control relative to other positive emotions, and there is also some evidence to suggest that guilt sometimes facilitate self-control relative to other negative emotions (also reviewed in Tornquist & Miles, 2018). Nonetheless, we are not aware of any studies showing that positive emotions are *less* beneficial to self-control than negative emotions, suggesting that positive emotions generally enhance self-control compared to negative emotions.

One possible explanation for this comes from Fredrickson's (2001) "broaden-and-build" theory. In this view, contrary to negative emotions, positive emotions inhibit automatic responses and facilitate peoples' creativity, flexible thinking, and problem-solving ability, allowing a person to consider a range of actions to meet a challenge. Relating this to self-control, when faced with a self-control dilemma that requires choosing between an immediate and long-term reward, it is possible that people who experience positive, compared to negative, emotions are better able to inhibit the automatic response to choose the immediate reward and instead consider various strategies that might help them to resolve the self-control dilemma and, as a result, choose the long-term reward, indicating self-control success.

Another theory that favors the idea that positive emotions benefit self-control is the mood-maintenance theory. In this view, people who experience positive emotions are motivated to maintain these emotions by refraining from performing behaviors that may reduce them (Andrade, 2005; Clark & Isen, 1982). Linking this to self-control, because people who experience positive emotions should be more motivated to maintain these emotions than people who experience negative emotions, they may be more likely to refrain from choosing an immediate reward (e.g., watching tv) because, even though this choice feels good *now*, it may also come at the cost of negative emotions (e.g., regret). Thus, people who feel positive emotions may choose the long-term reward (e.g., go to the gym) to be sure to maintain these emotions, indicating self-control success.

**Do people with high trait self-control use emotion regulation to succeed at self-control?**

If positive emotions enhance self-control, it seems plausible that people should be able to upregulate (i.e., increase) positive emotions to succeed at self-control, and that people higher in trait self-control might be particularly likely to do this given their tendency to succeed at self-control. In this section, we first introduce the concepts of emotion regulation and instrumental emotion regulation, which holds that people regulate emotions to attain goals. We then present evidence that people can regulate emotions to succeed at self-control specifically, and that people higher in trait self-control might be particularly likely to do this.

Emotion regulation involves altering which emotions we have, when we have them, and how we experience and express them (Gross 1998, 2015), and is sometimes assumed to be one form of self-control (e.g., Paschke et al., 2016). Even though people generally regulate emotions for hedonic reasons (i.e., to feel good; Gross, Richards, & John, 2006; Larsen, 2000), the theory of instrumental emotion regulation holds that

people regulate emotions for instrumental reasons (i.e., to attain goals; Tamir, 2009a). Specifically, this theory holds that people regulate emotions to increase the emotions they believe to be useful in a particular performance context, or the emotions they typically experience as part of their personality, and that these emotions then *are* useful to their performance in this context (Tamir, 2009a; Tamir, 2009b; Tamir et al., 2015; see also Tornquist & Miles, 2018). Thus, increased beliefs about the utility of emotions in a performance situation predict greater attempts to upregulate these emotions in that situation, and these regulatory attempts then lead to enhanced performance.

Based on these insights, people should similarly be able to regulate emotions to achieve self-control success. Consistent with this, research has shown that adaptive emotion regulation leads to improved self-control, both in the lab (i.e., less food consumption: Evers et al., 2010; Juergensen & Demaree, 2015) and in everyday life (i.e., greater success in aversive activities: Hennecke et al., 2018). In a related vein, research has linked trait self-control with adaptive emotion regulation, demonstrating that people higher, relative to lower, in trait self-control more effectively regulate their emotions in the lab (Paschke et al., 2016) and that they are more likely to use emotion regulation strategies in their everyday lives (Hennecke et al., 2018). Together, these findings suggest that people can regulate emotions to succeed at self-control, that people with high trait self-control might be particularly likely to regulate emotions, and that people with high trait self-control regulate emotions in adaptive ways, although whether this regulation contributes to their self-control success remains an open question.

Some indicative evidence suggests that this might be the case. That is, Tornquist and Miles (2018) found that people higher, relative to lower, in trait self-control believe that positive emotions can help them to succeed at everyday self-control. Thus, given that there is consistent evidence to suggest that people regulate their emotions to



increase the emotions they believe to be useful in a particular context, and that these emotions then are useful to them in this context (Tamir & Ford, 2012; Ford & Gross, 2018), these findings provide initial evidence that people higher in trait self-control regulate their emotions to increase positive emotions in the context of self-control, which might then result in higher levels of positive emotions that facilitate their self-control performance.

### **Present Studies**

Building on our previous study which showed that people higher and lower in trait self-control differ in their beliefs about which emotions they consider useful for their self-control success (Tornquist & Miles, 2018), we aimed to investigate whether these beliefs translate into actual regulation of these emotions, and whether this regulation leads to emotions that facilitate self-control. Thus, in the current investigation we test whether people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control. We also test whether this regulation and subsequent emotions leads to improvements in self-control performance.

To test these central hypotheses, we designed a programme of research consisting of three preregistered studies, with each study drawing on different methods to provide converging evidence for these hypotheses. Broadly, Study 1 examines the emotions that people higher in trait self-control consider useful in performance contexts that are high vs. low in self-control demand, and whether these beliefs translate into preferences to regulate these emotions. Study 2 extends this work by examining whether these beliefs and emotion regulation preferences translate into *actual* choice to regulate emotions in these situations, and whether this regulatory choice and subsequent emotions facilitate self-control. Finally, to test whether the findings of Study 2 replicate

in a carefully controlled environment and when using a different self-control task, Study 3 investigates whether trait self-control predicts self-control performance when participants are randomly assigned to a condition where they receive instructions to regulate emotions, this time also including a neutral control condition. Thus, we test whether people higher and lower in trait self-control regulate emotions differently using self-reports (Study 1), behavioral measures (Study 2), and controlled experimental methods (Study 3), and we assess how emotion regulation influence self-control performance using two different self-control tasks (Study 2 and 3).

Study 1 examines the emotions that people higher in trait self-control consider useful in performance contexts that are high vs. low in self-control demand, and whether these beliefs translate into preferences to regulate these emotions in these situations. Our key measures are therefore people's beliefs about the utility of emotions and their preference to regulate emotions, in which half of the participants respond to the former whereas the other half respond to the latter. Study 1 aimed to extend prior work showing that people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful for their everyday self-control success (Tornquist & Miles, 2018) in several ways. First, Tornquist and Miles (2018) only assessed the emotions people consider useful, but we also assess whether these beliefs translate into preferences to regulate emotions by including a measure of people's regulatory preferences. Second, because real-life self-control might operate differently from lab-based self-control (Imhoff et al., 2014; Miles et al., 2016), we test whether these beliefs about emotions transfer to laboratory self-control situations. Lastly, we include a low self-control demand condition to assess whether these beliefs and regulatory preferences generalize to a performance context that is low in self-control demand. This approach allowed us to test the aspect of the instrumental account

of emotion regulation that holds that beliefs about the utility of emotions and regulatory preferences should be greatest in highly demanding situations (in this case, the high self-control demand context).

Study 2 then examines whether beliefs about the utility of emotions and emotion regulation preferences translate into actual choice to regulate emotions, and how this influence self-control. Specifically, Study 2 examines how people higher in trait self-control *choose* to regulate their emotions in performance contexts that are high vs. low in self-control demand, and whether this choice and subsequent emotions facilitate self-control performance. Thus, while Study 1 provide initial insights into how people higher in trait self-control might regulate emotions in the context of self-control, Study 2 allows us to determine how they *actually* regulate emotions in this context, and whether this leads to emotions that help them to succeed at self-control. Study 2 therefore introduces a behavioral measure of regulatory choice, asks participants to regulate their emotions consistent with this choice by recalling personal events, and then measures their emotions and self-control performance.

Finally, Study 3 investigates whether randomly assigning participants higher and lower in trait self-control to regulate positive, negative, and neutral emotions result in changes in emotions that facilitate self-control. Although Study 2 and Study 3 use similar methodological approaches, the key differences are that participants in Study 3 are randomly assigned to a regulatory condition and that we add a neutral control condition. We made these changes to complement Study 2 on some potential issues. As such, because allowing participants to select themselves into a regulatory group can lead to some biases (e.g., participants who share certain characteristics may choose the same regulatory task due to these characteristics), Study 3 aims to ensure that our regulatory groups are equal at the outset and thus to eliminate these possible biases by randomly

assigning participants to regulatory conditions. Also, following recommendations that the effect of an emotion on various outcomes should be compared with other emotions *and* neutral groups (Lench et al., 2011), we add a neutral control condition in Study 3. This allows us to compare how positive and negative emotions influence self-control relative to a baseline control group. Lastly, to ensure that our findings are generalizable across self-control tasks, we use a different self-control task in Study 3, which requires participants to choose between immediate and delayed rewards. An advantage of this task is that it approximates how self-control might operate in real-life, given that participants are told that they may receive one of their choices, making the decision between immediate and delayed rewards real. These changes allow us to test our hypotheses in a more tightly controlled environment than previously and thus to isolate the effects of emotion regulation, emotions and trait self-control on self-control performance.

### **Study 1**

Consistent with Tornquist and Miles (2018) our preregistered hypotheses in Study 1 were that people higher, relative to lower, in trait self-control would (1) consider positive emotions more useful to their performance on both the high and low self-control demand tasks, but that this effect would be (2) moderated by self-control demand such that they would consider positive emotions particularly useful in the case of the high self-control task. Crucially, we also expected that these beliefs would translate into preferences to regulate emotions and we therefore further predicted that people higher, relative to lower, in trait self-control would demonstrate (3) greater regulatory preferences to increase their positive emotions when expecting to perform both the high and low self-control demand tasks, but that this effect would be (4) moderated by self-control demand such that these preferences would be stronger in the case of the high self-control task.

Moreover, because prior research has emphasized the emotions that people consider *helpful* and therefore *upregulate* in performance contexts, and less is known about the emotions they consider *unhelpful* and therefore *downregulate*, we preregistered that we would explore the link between trait self-control and utility ratings for negative emotions, and the link between trait self-control and regulatory preferences for negative emotions in Study 1, rather than stating directional hypotheses. As such, Study 1 explores whether people higher in trait self-control consider negative emotions less useful, and demonstrate lower preferences to regulate these emotions, in performance contexts that are high and low in self-control demand.

### Method

A study overview, materials, and data can be found via the Open Science Framework ([https://osf.io/nhkcu/?view\\_only=a7cb29bd8dcb4df4a6f0a24ae40ba38e](https://osf.io/nhkcu/?view_only=a7cb29bd8dcb4df4a6f0a24ae40ba38e)). We made one change to our preregistered analysis plan, which did not affect the key conclusions in this study. As described on the OSF website, we initially planned to include current affect as a covariate. Nonetheless, in hindsight we realized that using a single-item survey to measure a construct (in this case, current affect) can be problematic given the amount of measurement error it typically contains (Westfall & Yarkoni, 2016), and we therefore decided to conduct our analyses without current affect as a covariate. Thus, all results reported in this study are without controlling for current affect. Excluding current affect as a covariate from our analyses did not change any of our key conclusions.<sup>1</sup>

### Participants

Participants ( $N = 415$ ) were recruited through Amazon Mechanical Turk (i.e., MTurk) in exchange for \$0.75 ( $M_{\text{age}} = 36.20$  years,  $SD_{\text{age}} = 12.14$ ; 265 females; 73% White, 14% Asian American, 7% African American, 1% Native Hawaiian or Pacific

Islander, and 5% other). To motivate performance in MTurk, all participants were told that they could win a \$25 Amazon Gift Card if they performed well on the tasks. Adults living in the USA participated; all participants reported being fluent in English. This study was approved by the local Ethics Committee.

The required sample size for testing our key effects (design: emotion x self-control demand condition + trait self-control as a covariate), with emotion utility ratings as the dependent variable, was  $N = 128$  (assuming power = .80, alpha = .05, effect size  $f = .25$ ). Similarly, the required sample size for testing our key effects (design: emotion x self-control demand condition + trait self-control as a covariate), with regulatory preference ratings as the dependent variable, was  $N = 128$  (assuming power = .80, alpha = .05, effect size  $f = .25$ ), requiring a total sample of  $N = 256$  for testing our key effects. We set a target sample size of 400 based on the amount of money we were able to spend on the study. Our final sample exceeded our target sample because 15 additional people voluntarily completed our study via MTurk, resulting in a final sample of  $N = 415$ . Out of these 415 participants, 212 participants were assigned to complete the expected emotion utility questionnaire, whereas 203 participants were assigned to complete the regulatory preferences questionnaire.

## Materials

**Current emotions.** Participants rated “How are you feeling right now?” on a 7-point scale (1 = *very bad*, 7 = *very good*).

**Trait self-control.** Trait self-control was measured using the Brief Trait Self-Control Scale (Tangney et al., 2004). Participants rated 13 items (e.g., “Sometimes I can’t stop myself from doing something, even if I know it is wrong”) using a scale ranging from 1 (*not at all like me*) to 5 (*very much like me*). Final scores are the mean of

the 13 items (9 items are reverse scored; Cronbach's  $\alpha = .89$ ), and higher scores indicate greater trait self-control.

**Manipulation of expected self-control demand.** Participants were randomly assigned to expect to perform a task that was either high or low in self-control demand. Based on self-control research suggesting that retyping text while breaking the habit of using certain keys require an individual to use inhibitory self-control (e.g., Muraven, Shmueli, & Burkley, 2006), we used a retyping task as our high self-control demand task. Specifically, participants assigned to the high self-control demand condition were told that they were going to be presented with two paragraphs (each consisting of approximately 150 words) taken from a chemistry textbook, and that they would be expected to retype as much text as possible from these paragraphs in five minutes while following several rules. That is, they were instructed that they would retype the paragraphs without typing a, e or t or hitting the space bar. To ensure that the participants understood that the upcoming task would require self-control exertion, they were presented with two sentences taken from a graduate chemistry textbook and were asked to practice the task by retyping these sentences into a textbox while applying the above rules.

In contrast, participants assigned to the low self-control demand condition were told that they were going to be presented with a short paragraph (consisting of five sentences) taken from a children's science book, and that they would be expected to retype as much text as possible from the paragraph in five minutes. To ensure that the participants understood that the upcoming task would require little or no self-control, they were presented with two sentences taken from a children's book and were asked to practice the task by retyping the sentences into a textbox. Participants in both conditions were told that the sentences were taken from the longer paragraphs and that they would

retype the remaining text later in the experiment. Thus, participants in both conditions received almost identical instructions, with only the self-control demands of the tasks being manipulated. Importantly, a supplemental study ( $N = 26$ ) showed that participants judged the high self-control typing task to involve significantly more self-control demand than the low self-control typing task.<sup>2</sup>

**Expected Emotion Utility.** Following prior work (Tamir, 2005, 2009b; Tornquist & Miles, 2018), we assessed how useful participants thought different emotions would be to their success on their assigned typing task. Emotions were chosen based on the Modified Differential Emotions Scale (Fredrickson et al., 2003), and each emotion was defined by three adjectives (e.g., joy: joyful, glad, or happy). Participants rated how much they thought positive ( $\alpha = .91$ ; hope, inspired, joy, gratitude, love, interest, pride, awe, amusement, and serenity) and negative ( $\alpha = .94$ ; fear, hate, sadness, embarrassment, guilt, disgust, shame, anxiety, anger, and contempt) emotions could help them to succeed on their assigned typing task (e.g., “To what extent do you think feeling hopeful, optimistic, or encouraged will help you to succeed on the typing task?”) on a scale of 1 (*not at all*) to 7 (*extremely*). Scores were averaged to form one composite score for positive emotions, and one for negative emotions. Higher scores indicate greater utility for that emotion.

**Regulatory preferences.** Following Tamir (2005, 2009b), to assess participant’s regulatory preferences, participants rated the extent to which they wanted to recall various personal events that differed in their emotional tone. This served as our measure of preferences to regulate emotions given that autobiographical recall is a common and effective way to induce emotions in participants (Lench, Flores, & Bench, 2011) and because, when people wish to regulate their emotions, they choose to engage in activities that will increase these desired emotions (Tamir 2009b). In addition to



providing these ratings, participants also wrote a short description of each personal experience. To illustrate, participants were first instructed to “Write a short description of a recent personal event that made you feel hopeful, optimistic, or encouraged”. After writing their description into a textbox, they rated the statement “Before you take part in the typing task, to what extent would you like to spend 10 minutes writing about the personal event you just described?” on a scale of 1 (*not at all*) to 7 (*extremely*).

Participants completed this procedure for the same positive ( $\alpha = .93$ ; hope, inspired, joy, gratitude, love, interest, pride, awe, amusement, and serenity) and negative ( $\alpha = .93$ ; fear, hate, sadness, embarrassment, guilt, disgust, shame, anxiety, anger, and contempt) emotions as for the expected emotion utility survey. Scores were averaged to form one composite score for positive emotions, and one for negative emotions. Higher scores indicate greater preferences to increase (upregulate) that emotion.<sup>3</sup>

### **Procedure**

Participants answered questions about basic demographics (age, gender, ethnicity), current affect, and trait self-control. Participants were then instructed that they would complete a typing task and were randomly assigned to either the high or low self-control control demand condition. Participants in both conditions were told that they would practice their task by retyping two sentences taken from the longer paragraphs before proceeding to the next part of the study. Participants then practiced retyping their respective sentences for approximately five minutes.

Following this manipulation, participants were instructed that they would complete a questionnaire before retyping the remaining text. To reduce participants workload, half of the participants were assigned to complete the expected emotion utility questionnaire, whereas the other half were assigned to complete the regulatory preferences questionnaire. Participants assigned to complete the utility questionnaire

rated how much they thought various emotions could help them succeed on the typing task. Participants assigned to complete the regulatory preferences survey rated how much they wanted to recall various emotional events before retyping more text and were told that they would spend 10 minutes writing about one of their highest-rated events right before completing the typing task. After completing their respective questionnaire, all participants were told that they had been assigned to the control condition and that they did not need to complete the remaining tasks (i.e., retype more text and/or write about a personal event for 10 minutes).<sup>4</sup> Participants then rated their current affect, and were thanked and dismissed. Demographics and questions were presented to the participants via Qualtrics software, and the study took about 20 minutes to complete.<sup>5</sup>

## **Results and Discussion**

### **Data analysis**

To test our preregistered and exploratory hypotheses, we conducted two 2(emotion: positive, negative) x 2(self-control demand condition: high, low) Mixed Factorial ANOVAs; the first with utility ratings as the dependent variable, and the second with regulatory preference ratings as the dependent variable. Following Tamir (2005, 2009b), emotion was the within-subjects factor, self-control demand condition the between-subjects factor, and trait self-control (centered) a covariate, allowing us to examine interactions between our within-subjects variables and trait self-control without dichotomizing trait self-control.

### **Expected Emotion Utility**

**Preregistered hypotheses.** Here, we test the hypotheses that people higher, relative to lower, in trait self-control would consider positive emotions more useful to their performance on both the high and low self-control demand tasks, but that they would consider positive emotions particularly useful to their performance on the high self-control demand task. Thus, the key tests of these hypotheses were the interactions

between emotion and trait self-control, and between emotion, trait self-control, and self-control demand condition.

The analysis first revealed a significant main effect of emotion,  $F(1, 208) = 926.74, p < .001, \eta_p^2 = .82$ ; participants considered positive emotions ( $M = 5.05, SE = .08$ ) more useful to their performance than negative emotions ( $M = 1.75, SE = .07$ ). This finding is consistent with prior work (Tornquist & Miles, 2018) and suggests that people generally consider positive emotions more useful to their task performance than negative emotions. The main effect of self-control demand condition was significant,  $F(1, 208) = 6.63, p = .01, \eta_p^2 = .03$ ; participants rated emotions as generally more useful for the task low in self-control demand ( $M = 3.54, SE = .077$ ) than the task high in self-control demand ( $M = 3.26, SE = .08$ ), suggesting that people consider emotions more useful when performing a task low in self-control demand, as opposed to a task high in self-control demand.

Furthermore, the interaction between emotion and self-control demand condition was not significant,  $F(1, 208) = 1.40, p = .24, \eta_p^2 = .007$ , suggesting that participants considered positive emotions more useful than negative emotions, independent of whether the task was high or low in self-control demand. These findings suggest that people believe that positive emotions are more useful to their performance on tasks that are both high and low in self-control demand, as compared to negative emotions (see Figure 3.1).

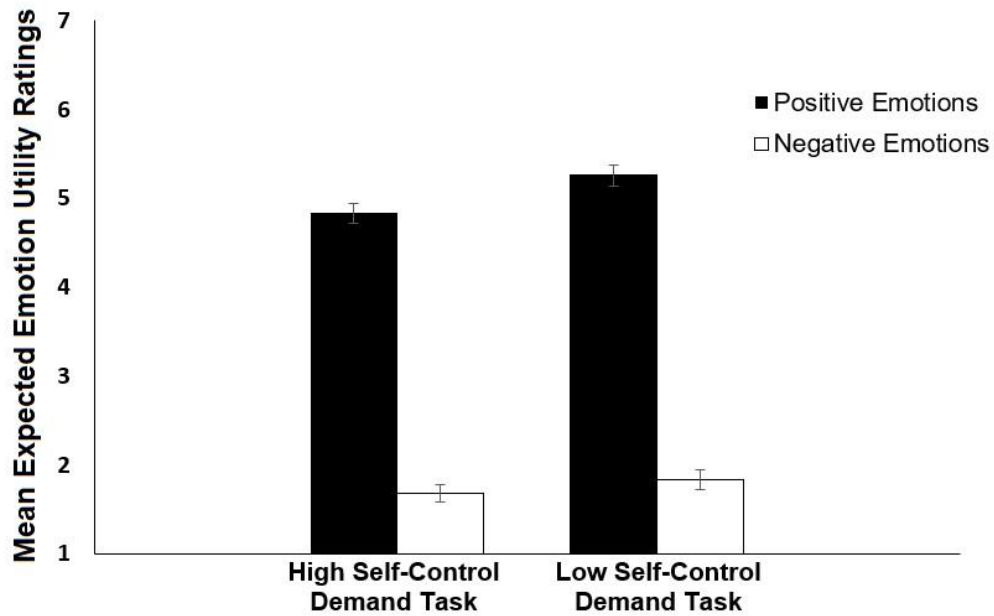


Figure 3.1. Mean expected utility ratings of positive and negative emotions for tasks that are high and low in self-control demand. Each error bar represents mean  $\pm$  standard error.

The main effect of trait self-control was not significant,  $F(1, 208) = 0.07, p = .79, \eta_p^2 = .00$ , suggesting that people higher, relative to lower, in trait self-control did not consider emotions in general to be more useful to their task performance. The interaction between self-control demand condition and trait self-control was also not significant,  $F(1, 208) = 0.00, p = .98, \eta_p^2 = .00$ , suggesting that participants considered emotions more useful to their performance on the low than the high self-control demand task, independent of their level of trait self-control. However, the predicted interaction between emotion and trait self-control was significant,  $F(1, 208) = 28.26, p < .001, \eta_p^2 = .12$ . That is, consistent with our predictions, people higher (+1 *SD*) in trait self-control considered positive emotions more useful for their task performance (estimated  $M = 5.02$ ) than people lower (-1 *SD*) in trait self-control (estimated  $M = 4.66$ ),  $\beta = .23, p = .001$ . Moreover, even though we did not preregister a directional hypothesis regarding

the relationship between trait self-control and utility ratings for negative emotions, exploratory analyses showed that people higher (+1 *SD*) in trait self-control also considered negative emotions less useful for their task performance (estimated  $M = 2.06$ ) than people lower (-1 *SD*) in trait self-control (estimated  $M = 2.59$ ),  $\beta = -.28$ ,  $p < .001$ . Thus, consistent with Tornquist and Miles (2018), these data demonstrate that people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful for their task performance. These data also add to this work by showing that these beliefs are not only true for everyday self-control situations, but that they are also true for lab-based performance situations.

The interaction between emotion, trait self-control, and self-control demand condition was not significant,  $F(1, 208) = 0.09$ ,  $p = .76$ ,  $\eta_p^2 = .00$ , suggesting that people higher, relative to lower, in trait self-control believed that positive emotions would be more useful and negative emotions would be less useful for their performance on both the high and low self-control demand tasks. These findings do therefore not support our prediction that people higher in trait self-control would consider positive emotion particularly useful for their performance on the high self-control demand task.

Hence, our findings demonstrate that people higher in trait self-control consider positive emotions more useful and negative emotions less useful for their success on lab-based tasks that are both high and low in self-control demand. Thus, these findings replicate the findings of Tornquist and Miles (2018) and also extend this work by showing that people's beliefs about the utility of emotions in the context of self-control transfer to lab-based self-control situations, and that these beliefs also extend to another performance situation which was not high in self-control demand.

## Regulatory Preference Ratings

**Preregistered hypotheses.** Here, we test the predictions that people higher, relative to lower, in trait self-control would demonstrate greater regulatory preferences to increase their positive emotions, both when expecting to perform high and low self-control demand tasks, but that these preferences would be stronger in the case of the high self-control demand task. Thus, we were mainly interested in the interactions between emotion and trait self-control, and between emotion, trait self-control, and self-control demand condition.

First, the ANOVA revealed a significant main effect of emotion,  $F(1, 199) = 205.64, p < .001, \eta_p^2 = .51$ , such that participants preferred to recall positive events ( $M = 4.28, SE = .10$ ) more than negative events ( $M = 3.03, SE = .10$ ), suggesting that they preferred to regulate their emotions to increase their positive emotions more than their negative emotions. The main effect of self-control demand condition,  $F(1, 199) = 0.09, p = .77, \eta_p^2 = .00$ , and the interaction between emotion and self-control demand condition,  $F(1, 199) = 1.69, p = .20, \eta_p^2 = .008$ , were not significant, suggesting that people preferred to regulate their emotions to increase their positive emotions more than their negative emotions, independent of whether they expected to perform a high or low self-control demand task (see Figure 3.2).

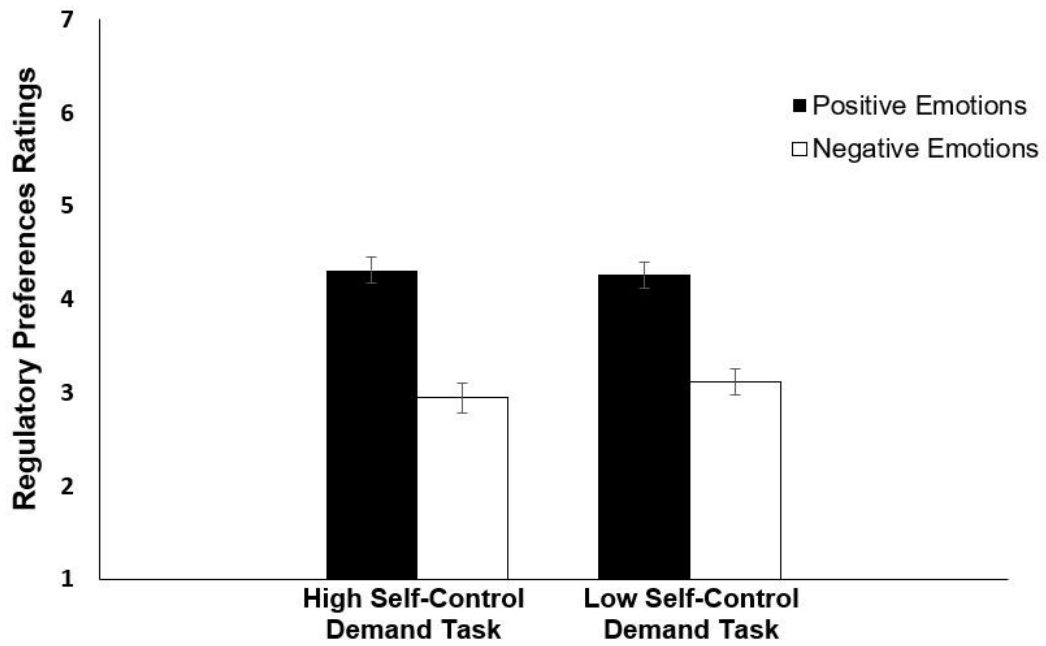


Figure 3.2. Mean regulatory preference ratings of positive and negative emotions for tasks that are high and low in self-control demand. Each error bar represents mean  $\pm$  standard error.

Moreover, the main effect of trait self-control,  $F(1, 199) = 0.66, p = .42, \eta_p^2 = .003$ , the interactions between emotion and trait self-control,  $F(1, 199) = .02, p = .88, \eta_p^2 = .00$ , self-control demand condition and trait self-control,  $F(1, 199) = .20, p = .66, \eta_p^2 = .001$ , and between emotion, self-control demand condition, and trait self-control,  $F(1, 199) = 0.21, p = .64, \eta_p^2 = .001$ , were not significant. Thus, inconsistent with our prediction that people higher in trait self-control would demonstrate greater preferences to upregulate positive emotions than people lower in trait self-control, and that this would be particularly true for the high self-control demand task, we found that trait self-control was unrelated to preferences for recalling emotional events, independent of valence of emotion and self-control demand of the task.<sup>6</sup>

The findings of Study 1 suggest that people generally believe that positive, compared to negative, emotions are more useful to their performance on tasks that are

high and low in self-control demand, and that people demonstrate greater preferences to regulate their emotions to increase their positive, compared to their negative, emotions in these situations. These data support the view that people regulate emotions to increase the emotions they consider useful in a particular context (Ford & Gross, 2018), although these data do not support the idea that these beliefs and regulatory preferences should be particularly evident in situations that are highly demanding.

One possible explanation for why self-control demand failed to moderate these beliefs and regulatory preferences could be due to the nature of the expected self-control task. That is, given that participants who practiced this task were instructed to retype a paragraph without typing a, e or t or hitting the space bar (or to simply retype text if they were assigned to the low self-control demand condition), it is possible that this task is a better measure or manipulation of concentration and focused attention than of self-control demand. If this is true, people may have recognized that emotions could disrupt their concentration and impair their performance on this task, resulting in relatively low and similar ratings of emotion utility beliefs and regulatory preferences for the high and low self-control demand tasks. Consistent with this idea, prior work has linked high levels of negative emotions (e.g., anxiety) with disruptions in concentration in certain performance contexts (see McCarthy, Allen, & Jones, 2013), suggesting that it might have been better to use another self-control task that requires less concentration and attention in Study 1.

Notably, our findings suggest that these beliefs vary by trait self-control; people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful to their performance on tasks that are both high and low in self-control demand. These findings are consistent with Tornquist and Miles (2018) and also extend this work by showing that these beliefs generalize to a lab-based self-control



situation *and* to a performance situation that is low in self-control demand. However, these differences in beliefs between those higher and lower in trait self-control do not seem to translate into differences in preferences to regulate emotions in these situations, as trait self-control failed to predict regulatory preferences.

## Study 2

The findings of Study 1 replicate the findings of Tornquist and Miles (2018) that people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful for their everyday self-control success, and also extend this work by showing that these beliefs transfer to lab-based performance contexts that are high *and* low in self-control demand. However, despite these differences in beliefs, Study 1 found no evidence that people higher and lower in trait self-control differed in their preferences to regulate emotions in these situations, suggesting that their beliefs about the utility of emotions do not translate into preferences to regulate emotions. These findings are puzzling given previous demonstrations that people regulate emotions to increase the emotions they consider useful in a particular context (e.g., Tamir & Ford, 2012). Thus, given that people higher in trait self-control considered positive emotions more useful, they should also have reported greater regulatory preferences to increase positive emotions.

One possible explanation for why people higher in trait self-control did not report greater regulatory preferences to increase positive emotions may be that self-reported regulatory preferences may not be a valid index of people's *actual* attempts to regulate emotions. Consistent with this claim, Tamir and Ford (2012) suggested that preferences may not always correspond with real choices and they therefore conducted tests of both regulatory preferences and regulatory choices.

In light of this, we conducted Study 2, which used a behavioral measure of people's actual regulatory choice, which should more closely approximate people's true

regulatory attempts than the self-reported measure of regulatory preference ratings in Study 1. Specifically, following our preregistration, Study 2 examines whether people higher and lower in trait self-control differ in their choice to regulate emotions in the context of laboratory self-control, and whether regulatory choice and subsequent emotions then facilitate self-control performance. Study 2 therefore also extends Study 1 by testing how regulatory choice and emotions influence self-control performance.

As described in our preregistration, our broad hypotheses in Study 2 were that, when expecting to perform a task high in self-control demand, people higher, relative to lower, in trait self-control would choose to regulate their emotions in (adaptive) ways that would lead to improvements in self-control performance. In other words, we expected to find that the effect of self-control demand condition (high, low) on regulatory choice would vary by trait self-control, such that trait self-control would predict regulatory choice when expecting to perform a task high in self-control demand. We further expected to find that the effect of regulatory choice on self-control performance would vary by trait self-control, such that people higher, relative to lower, in trait self-control would choose to regulate their emotions in ways that would lead to improvements in self-control performance. However, we did not preregister any directional hypotheses regarding these effects.

### **Method**

A study overview, materials, and data can be found via the Open Science Framework ([https://osf.io/9r8jn/?view\\_only=a4c31dbba96646a3bea23e419e525b43](https://osf.io/9r8jn/?view_only=a4c31dbba96646a3bea23e419e525b43)).

### **Participants**

Psychology undergraduate students ( $N = 140$ ) participated in exchange for course credit ( $M_{\text{age}} = 21.61$  years,  $SD_{\text{age}} = 7.16$ , Range = 18-60 years; 121 females; 86%

White, 7% Asian/Asian British, 4% Mixed/Multiple ethnic groups, 3% Black/Black British, and 1% Other). This study was approved by the local Ethics Committee.

A priori power analysis (Gpower: Faul et al., 2009) indicated that a sample size of 92 (power criterion = .80; alpha significance criterion = .05; effect size  $f^2 = .15$ ) would be sufficient for testing our key hypotheses (i.e., the multiple regression including trait self-control, regulatory choice, and their cross-products as predictors, with self-control performance as the outcome). Based on our available resources (i.e., time, assistance with data collection), we decided to recruit 150 participants during two academic terms. We did, however, not reach this target during our data collection time frame, and we decided to stop data collection with a final sample of 140.

## Materials

Herein, our target emotions were pride, hope, serenity, joy, anger, guilt, and anxiety. We chose these emotions because, as reviewed in the introduction, they have been of interest in previous self-control and performance studies, and to obtain a set of emotions that differ in valence and arousal, to be combined to form aggregated subscales of positive and negative emotions.

**Current emotions.** Emotions were chosen from the Modified Differential Emotions Scale (Fredrickson, et al., 2003). Each emotion was defined by three adjectives (e.g., joy: joyful, glad, or happy) to ensure the same understanding of these constructs among the participants. Participants rated how much they currently experienced four positive emotions ( $\alpha = .81$ ; proud, serene, hopeful, joyful) and three negative emotions ( $\alpha = .59$ ; angry, guilty, anxious; e.g., “Right now, to what extent are you feeling proud, confident, or self-assured?”), which was rated on a scale of 1 (*not at all*) to 7 (*extremely*). To avoid drawing participants’ attention to the emotions of interest, participants also rated two filler items (i.e., tired, concentrated) that were

embedded with the other emotions (Tamir & Ford, 2012). Scores were averaged to form one composite score for positive emotions and one for negative emotions, with higher scores indicating greater experiences of that emotion.

**Trait self-control.** Participants completed the same trait self-control scale ( $\alpha = .83$ ) as in Study 1.

**Manipulation of expected self-control demand.** Participants were told that they would be assigned to a music (i.e., low self-control demand) condition or an anagram (i.e., high self-control demand) condition, but that they would be expected to practice both tasks first. We included this practice task to ensure that the participants understood the level of self-control demand that the tasks required, which should allow participants to make more informed judgments about the self-control demand of their assigned task when choosing how to regulate their emotions, as opposed to if we simply told them that they were going to perform a difficult or easy task later in the study. Specifically, all participants listened to a neutral music clip (i.e., Baby Sweetcorn (Come Here) by Howie B; adapted from Tamir & Ford, 2012) for 30 seconds, and were told that they would listen to a longer music clip later in the study if they were assigned to the music condition. Participants also practiced the anagram task, which asked them to generate words from two anagrams (e.g., OPOER; Calef et al., 1992) that were, unbeknownst to the participants, unsolvable, while following a number of rules. That is, the words they generated needed to be real English words and consist of all letters, and no letters could be used twice. Participants were instructed to click the ‘next page’ button when they decided they could no longer generate new words or if they wanted to continue the experiment. Participants were instructed that they would solve more anagrams later in the study if they were assigned to the anagram condition. As part of this manipulation, after practicing both tasks, half of the participants were told that they

had been assigned to listen to more music (low self-control demand condition), whereas the other half were told that they had been assigned to solve more anagrams (high self-control demand condition).

**Emotion regulation paradigm.** This paradigm consisted of three tasks in which participants indicated their preferences for completing different emotion inductions, chose one of these inductions to complete, and completed their chosen emotion induction. The emotion regulation paradigm is described in detail below.

**Regulatory preferences.** As in Study 1, we measured people's preferences for regulating their emotions. Although our key interest in Study 2 was people's actual regulatory choice (as described below), we included this measure to protect against the possibility that all participants would choose to regulate the same emotion, allowing us to, at the very minimum, replicate Study 1's findings using a different (and slightly more difficult) self-control task. Participants were presented with seven short descriptions of everyday events, each event associated with a specific emotion (i.e., pride, serenity, joy, hope, guilt, anxiety, and anger; see Appendix 3), and were asked to write a short description of a *personal* event that matched each of these descriptions. Using pride as an example, rather than explicitly asking participants to write a short description about an event that made them feel *proud* as we did in Study 1, participants in Study 2 were asked to write a short description of a personal event in which they succeeded at something that they had worked hard for (descriptions adapted from Gilead et al., 2016). Participants were presented with descriptions rather than the actual emotions given that we only included seven emotions in Study 2 (as opposed to 20 in Study 1) and thus to avoid drawing participants attention to the emotions of interest. Participants were asked to write short personal descriptions that matched the descriptions of everyday events to ensure that they considered events from their

personal lives before they proceeded to the next task, which involved choosing *one* event to describe in detail. Similar to Study 1, participants rated how much they wanted to spend 10 minutes writing about each of the seven events in detail before completing their assigned task (e.g., “Before solving the anagrams, to what extent would you like to spend 10 minutes writing about the personal event you just described?”) on a scale of 1 (*not at all*) to 7 (*extremely*). Scores were averaged to form one composite score for positive emotions ( $\alpha = .63$ : pride, serenity, joy, and hope) and one for negative emotions ( $\alpha = .40$ : guilt, anxiety, and anger).

The events associated with pride, serenity, joy, anger, and guilt were adapted from Gilead et al. (2016), who found that participants experienced more of the target emotion after writing about each event (e.g., participants felt more proud after writing about the event associated with pride compared to before). The event associated with hope was adapted (but shortened) from Winterich and Haws (2011), who showed that participants felt more hope after writing about this event. The event associated with anxiety was new.

**Regulatory choice.** After providing their regulatory preference ratings, participants were presented with a list of the personal events that they wrote about in the previous part (and that were associated with either pride, serenity, joy, hope, guilt, anxiety, or anger), and were asked to select the *one* event that they wanted to write about in detail before solving more anagrams or listening to more music. Choosing pride, serenity, joy, or hope was considered a positive regulatory choice, and choosing guilt, anxiety, or anger was considered a negative regulatory choice.

**Emotion induction.** Given that personal recall is frequently used to elicit emotions in experimental studies (Lench et al., 2011), participants regulated their emotions by recalling a past personal event. Specifically, after making their regulatory

choice, participants were asked to vividly imagine themselves in that situation and to write about the event in as much detail as possible for 5 to 10 minutes (see Appendix 4).<sup>7</sup>

**Self-Control Performance.** Based on prior research that has suggested that attempting to solve unsolvable anagrams requires self-control (Muraven, Tice, & Baumeister, 1998), and particularly the use of initiatory self-control (Imhoff et al., 2014), we used an anagram task to measure self-control performance. Specifically, participants were asked to generate as many words as possible from seven anagrams, while following the rules described above. Unbeknownst to the participants, five of the anagrams were unsolvable (e.g., RATKN), whereas two were solvable (e.g., AHTRE), so as not to make the task seem impossible. The anagrams were adapted from Calef and colleagues (1992), and time spent on the task (i.e., persistence in the face of failure; Muraven et al., 1998), as opposed to number of words generated, was our measure of self-control performance. That is, we operationalized self-control performance as persistence on the anagram task. Average time spent on the anagram task in the current sample was 6.06 minutes ( $SD = 3.32$ ).

Importantly, a supplemental study showed that participants ( $N = 26$ ) judged the anagram task to involve significantly more self-control demand than the music task.<sup>8</sup> The anagram task was chosen over the typing task used in Study 1 because the anagram task allowed us to measure self-control performance (i.e., persistence), which the retyping task did not.

## **Procedure**

After reading and signing the consent form, participants answered questions about demographics (age, gender, ethnicity, native language), current emotions, and trait self-control. Participants were then instructed that they would be assigned to either

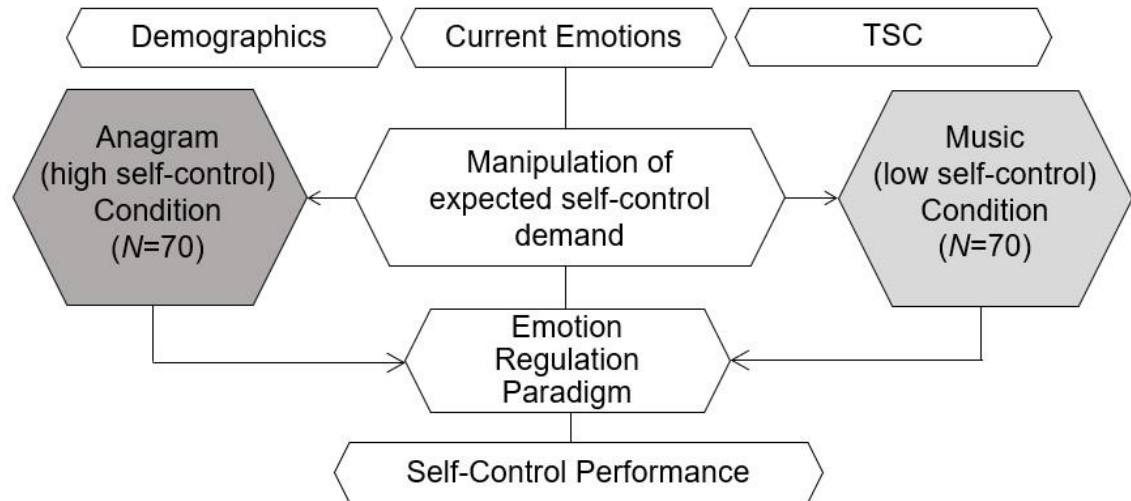
solve anagrams or listen to music later in the study, but that they would practice both tasks first. Thus, after practicing solving the anagrams and after listening to a short instrumental music clip (in that order), half of the participants were randomly assigned to the high self-control demand condition and were told that they were going to solve more anagrams, whereas the other half were randomly assigned to the low self-control demand condition and were told that they were going to listen to more music.

Participants in both conditions were instructed that they would complete a writing task before solving more anagrams or listening to more music. Hence, they next completed the three-part emotion regulation paradigm. As outlined above, participants first provided descriptions of personal events before rating how much they would prefer to write about each one (regulatory preferences), they then selected the event that they wanted to describe in detail (regulatory choice), and then spent 5-10 minutes writing about their selected event in detail (emotion induction). A timer was displayed above the textbox to remind the participants of the time. To ensure that the emotion induction was successful, participants next rated their current emotions.

Participants who were assigned to the low self-control demand (i.e., music) condition were then told that a change had occurred and that they had been assigned to solve the remaining anagrams instead of listening to more music. They were told to click the ‘next page’ button if they accepted the change, or to inform the experimenter if they wished to stop the experiment or if they had any questions. All participants chose to continue the experiment despite this change.<sup>9</sup> Thus, *all* participants then performed the self-control task. Participants were instructed to click the ‘next page’ button when they decided they could no longer generate new words or if they simply wanted to stop the task and continue the experiment. Once they clicked ‘next page’, participants advanced to a new screen which informed them that they had completed the experiment.



Participants were debriefed, thanked and dismissed. All tasks were completed through Qualtrics on a desktop computer and took up to one hour to complete. Figure 3.3 demonstrates all measures and tasks administered at the various stages during the experiment.



*Figure 3.3.* Flowchart demonstrating measures and tasks administered at various stages during the experiment. TSC = trait self-control. The emotion regulation paradigm consisted of the measure of regulatory preferences, the measure of regulatory choice, the emotion induction, and the measure of current emotions (in that order).

## Results and Discussion

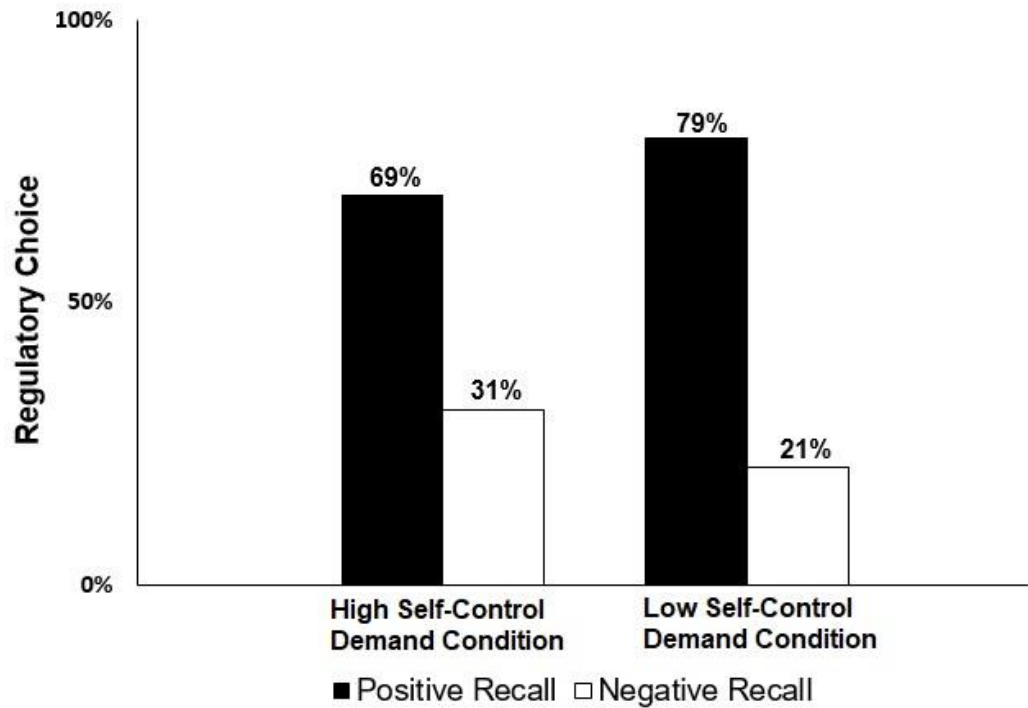
In what follows, we first conduct a logistic regression to examine how people choose to regulate emotions in performance contexts that are high and low in self-control demand, and whether trait self-control moderates this effect. We then perform a MANCOVA to examine how people's regulatory choice influences their subsequent emotions (i.e., manipulation check), as well as exploratory multiple regressions to examine how regulatory choice influences the emotions of people higher and lower in trait self-control specifically. Lastly, we conduct multiple regressions to examine how people's regulatory choice and subsequent emotional experiences influence self-control performance, and whether these effects are moderated by trait self-control.

### Preregistered analyses

**How did people generally choose to regulate emotions?** A chi-square test first showed that participants were generally more likely to choose positive recall (74%) than negative recall (26%),  $\chi^2(1) = 31.11, p < .001$ .

**How did people choose to regulate emotions when they expected to perform a task that was high vs. low in self-control demand, and was this moderated by trait self-control?** To test whether trait self-control predicted regulatory choice when expecting to perform a task high in self-control demand, we conducted a logistic regression where self-control demand condition (high, low), trait self-control (centered), and their cross-product were the predictors, and regulatory choice (positive, negative) was the outcome.

The model was not significant, Nagelkerke  $R^2 = .04, \chi^2(3) = 3.64, p = .30$ . That is, the simple effects of self-control demand condition,  $\chi^2(1) = 2.10, p = .15, \text{Exp}(B) = 1.78$ , and trait self-control,  $\chi^2(1) = .81, p = .37, \text{Exp}(B) = 1.46$ , and their cross-product,  $\chi^2(1) = 0.05, p = .83, \text{Exp}(B) = 1.16$ , did not predict regulatory choice. Figure 3.4 shows descriptive statistics of participants' choice to regulate positive and negative emotions in the two conditions.



*Figure 3.4.* Regulatory choice (positive recall, negative recall) in the high and low self-control demand conditions.

Together, these findings suggest that participants were more likely to choose to recall positive events than negative events, both when they expected to perform a task that was high and low in self-control demand, which might suggest that they were more likely to attempt to regulate their emotions to increase their positive, compared to their negative, emotions in these situations. Our findings further suggest that trait self-control does not moderate these effects, suggesting that people higher in trait self-control do not differ from those lower in trait self-control in their choice to regulate emotions in these situations. These data are inconsistent with our prediction that trait self-control would predict regulatory choice when they expected to perform a task high in self-control demand.

**Manipulation check: how did regulatory choice influence subsequent emotions?** To examine how people's regulatory choice influence their subsequent emotions, we conducted a two-way MANCOVA where self-control demand condition

(high, low) and regulatory choice (positive, negative) were between-subject factors, baseline positive and negative emotions were covariates, and positive and negative emotions experienced after the emotion induction were dependent variables.

The multivariate effect of regulatory choice was significant,  $F(2, 133) = 33.77$ , Wilks'  $\lambda = .66$ ,  $p < .001$ ,  $\eta_p^2 = .34$ ; participants who chose positive recall reported more positive emotions ( $M = 4.47$ ,  $SE = .09$ ) than participants who chose negative recall ( $M = 3.10$ ,  $SE = .16$ ),  $F(1, 134) = 55.46$ ,  $p < .001$ ,  $\eta_p^2 = .29$ , and participants who chose negative recall reported more negative emotions ( $M = 2.46$ ,  $SE = .11$ ) than participants who chose positive recall ( $M = 1.64$ ,  $SE = .07$ ),  $F(1, 134) = 38.05$ ,  $p < .001$ ,  $\eta_p^2 = .22$ , suggesting that the emotion inductions were successful. The effect of self-control demand condition,  $F(2, 133) = 0.88$ , Wilks'  $\lambda = .99$ ,  $p = .42$ ,  $\eta_p^2 = .01$ , and the regulatory choice x self-control demand condition interaction,  $F(2, 133) = 1.17$ , Wilks'  $\lambda = .98$ ,  $p = .31$ ,  $\eta_p^2 = .02$ , were not significant, indicating that the emotion inductions influenced participant's emotions similarly in the two conditions.

**Did trait self-control moderate the effect of regulatory choice on subsequent emotions?** We preregistered that we would explore how regulatory choice influenced the subsequent emotions of people higher and lower in trait self-control. If people higher and lower in trait self-control regulate their emotions differently in the context of self-control as suggested in this article, it seems plausible that they also experience emotions differently after taking part in a regulatory task and when expecting to perform a self-control task. We conducted exploratory multiple regressions to test this; trait self-control, self-control demand condition, regulatory choice, and their cross-products were predictors; baseline positive and negative emotions were covariates; and experiences of either positive or negative emotions after the recall were outcomes. We

chose not to enter trait self-control into the MANCOVA above because that analysis only allows us to enter trait self-control as a continuous covariate and would therefore not generate the interactions of interest. Thus, to avoid repeating the results from the analysis above, here we concentrate on the effects that involve trait self-control.

**Positive emotions.** The multiple regression was significant,  $R^2 = .55$ ,  $F(9, 130) = 17.84$ ,  $p < .001$ . That is, greater trait self-control predicted increased experiences of positive emotions,  $\beta = .18$ ,  $p = .048$ , while controlling for baseline emotions. However, trait self-control did not interact with self-control demand condition,  $\beta = -.14$ ,  $p = .12$ , or with regulatory choice,  $\beta = .05$ ,  $p = .58$ , to predict positive emotions, and the interaction between trait self-control, self-control demand condition, and regulatory choice was also not significant,  $\beta = -.008$ ,  $p = .93$ . These data suggest that people higher in trait self-control experience more positive emotions than people lower in trait self-control after completing a regulatory task, when controlling for their baseline emotions, independent of the self-control demands of the expected task and their regulatory choice.

**Negative emotions.** The multiple regression was significant,  $R^2 = .48$ ,  $F(9, 130) = 13.14$ ,  $p < .001$ . That is, trait self-control did not predict negative emotions,  $\beta = -.08$ ,  $p = .42$ , and trait self-control did not interact with self-control demand condition,  $\beta = -.03$ ,  $p = .78$ , but trait self-control interacted with regulatory choice to predict negative emotions,  $\beta = -.28$ ,  $p = .002$ , while controlling for baseline emotions; people higher in trait self-control experienced less negative emotion than people lower in trait self-control after recalling negative events,  $\beta = -.32$ ,  $p = .029$ , but not after recalling positive events,  $\beta = -.09$ ,  $p = .27$ . Importantly, these effects were qualified by a significant interaction between trait self-control, self-control demand condition, and regulatory choice,  $\beta = .19$ ,  $p = .035$ . That is, for participants who chose negative recall, the interaction between trait self-control and self-control demand condition approached

significance,  $\beta = .33$ ,  $p = .066$ , such that greater trait self-control predicted less negative emotion in the high self-control demand condition,  $\beta = -.61$ ,  $p = .002$ , but not in the low self-control demand condition,  $\beta = .06$ ,  $p = .82$ . In contrast, for participants who chose positive recall, trait self-control did not interact with self-control demand condition to predict negative emotions,  $\beta = .03$ ,  $p = .77$ . These data suggest that people higher in trait self-control experience *less* negative emotion than people lower in trait self-control after completing a regulatory task intended to *increase* negative emotions, but only when the expected task is high (but not low) in self-control demand.<sup>10</sup>

**How did regulatory choice influence self-control performance, and was this moderated by trait self-control?** A bivariate correlation first showed that greater trait self-control was related to increased self-control performance in the entire sample,  $r = .17$ ,  $p = .04$ . However, here we were mainly interested in testing the predicted effect that the influence of regulatory choice on self-control performance would vary by trait self-control. To test this, we entered self-control demand condition (high, low), regulatory choice (positive, negative), trait self-control (centered), and their cross products into multiple regression to predict self-control performance.

The multiple regression was not significant,  $R^2 = .04$ ,  $F(6, 133) = 1.00$ ,  $p = .43$ . That is, self-control demand condition,  $\beta = .06$ ,  $p = .52$ , regulatory choice,  $\beta = .02$ ,  $p = .85$ , trait self-control,  $\beta = .17$ ,  $p = .21$ , and the interactions between self-control demand condition and trait self-control,  $\beta = .07$ ,  $p = .61$ , regulatory choice and trait self-control,  $\beta = -.11$ ,  $p = .93$ , and between self-control demand condition, regulatory choice, and trait self-control,  $\beta = -.09$ ,  $p = .45$ , were not significant. These findings suggest that regulatory choice does not influence self-control performance, and that this relationship does not vary by trait self-control. These findings are inconsistent with the prediction

that people higher, relative to lower, in trait self-control would choose to regulate their emotions in ways that would lead to improvements in self-control performance.

**How did emotional experiences influence self-control performance, and was this moderated by trait self-control?** Notably, the above analyses are based on the assumption that people who chose to recall a positive event experienced increased positive emotions after the recall, and that people who chose to recall a negative event experienced increased negative emotions after the recall, but our exploratory analyses showed that people higher and lower in trait self-control differed in their emotional experiences after the regulatory task, suggesting that it might be important to also consider whether people's emotional experiences after the recall, rather than their regulatory choice, influence self-control performance, and whether this effect varies by trait self-control.

Moreover, because people higher, relative to lower, in trait self-control experienced more positive emotions after the regulatory task, independent of their regulatory choice and the self-control demands of the expected task, and that they experienced less negative emotions after the negative recall when the expected task was high in self-control demand, we were particularly interested in whether these particular emotional experiences enhanced the self-control performance of people with high trait self-control. These analyses are consistent with our preregistration as we expressed an interest in exploring how subsequent emotions (i.e., emotions experienced after the regulatory tasks) influence the self-control performance of people higher, relative to lower, in trait self-control.

Thus, we conducted exploratory analyses to test whether the effects of positive and negative emotions on self-control performance are moderated by trait self-control. That is, these analyses test the same research question as above, although in these

analyses we used experiences of positive and negative emotions as predictors, rather than regulatory choice, to predict self-control performance. Specifically, we entered self-control demand condition (high, low), experiences of either positive or negative emotions (centered), trait self-control (centered), and their cross products simultaneously into exploratory multiple regressions to predict self-control performance, while controlling for baseline positive and negative emotions.

**Positive emotions.** The multiple regression was significant for positive emotions,  $R^2 = .11$ ,  $F(8, 131) = 2.08$ ,  $p = .04$ . The simple effects of self-control demand condition,  $\beta = .10$ ,  $p = .22$ , positive emotions,  $\beta = -.11$ ,  $p = .30$ , and trait self-control,  $\beta = .16$ ,  $p = .16$ , and the interaction between self-control demand condition and trait self-control,  $\beta = -.001$ ,  $p = .99$ , did not predict self-control performance, but the interaction between positive emotions and trait self-control approached significance,  $\beta = .17$ ,  $p = .07$ . Simple slope tests showed that people higher in trait self-control demonstrated better self-control performance (estimated  $M = 6.98$ ) than people lower in trait self-control (estimated  $M = 5.67$ ) when they experienced high levels of positive emotions (+1  $SD$ ),  $\beta = .24$ ,  $p = .038$ . In contrast, people higher in trait self-control did not demonstrate better self-control performance (estimated  $M = 6.86$ ) than people lower in trait self-control (estimated  $M = 6.36$ ) when they experienced low levels of positive emotions (-1  $SD$ ),  $\beta = .09$ ,  $p = .42$ . The interaction between self-control demand condition, positive emotions, and trait self-control was not significant,  $\beta = -.16$ ,  $p = .087$ . These findings suggest that people higher in trait self-control demonstrate better self-control performance than people lower in trait self-control when they experience high (but not low) levels of positive emotions, independent of whether they initially expected this task to be high or low in self-control demand.



**Negative emotions.** The multiple regression was significant for negative emotions,  $R^2 = .10$ ,  $F(8, 131) = 2.34$ ,  $p = .02$ . The simple effects of self-control demand condition,  $\beta = -.14$ ,  $p = .12$ , negative emotions,  $\beta = -.15$ ,  $p = .17$ , and trait self-control,  $\beta = .06$ ,  $p = .64$ , and the interaction between self-control demand condition and trait self-control,  $\beta = .05$ ,  $p = .69$ , were not significant. However, there was a significant interaction between negative emotions and trait self-control,  $\beta = -.26$ ,  $p = .03$ , such that people higher in trait self-control demonstrated better self-control performance than people lower in trait self-control when they experienced low levels of negative emotions ( $-1 SD$ ),  $\beta = .21$ ,  $p = .07$ , although this effect only approached significance, but they did not demonstrate better self-control performance when they experienced high levels of negative emotions ( $+1 SD$ ),  $\beta = .02$ ,  $p = .88$ . However, these effects were qualified by a significant interaction between self-control demand condition, negative emotions, and trait self-control  $\beta = .19$ ,  $p = .02$ .

That is, there was a significant interaction between negative emotions and trait self-control in the high self-control demand condition,  $\beta = -.36$ ,  $p = .01$ . Simple slope tests showed that people higher in trait self-control demonstrated better self-control performance (estimated  $M = 8.29$ ) than people lower in trait self-control (estimated  $M = 6.51$ ) when they experienced low levels of negative emotions ( $-1 SD$ ),  $\beta = .32$ ,  $p = .025$ . In contrast, people higher in trait self-control did not demonstrate better self-control performance (estimated  $M = 2.42$ ) than people lower in trait self-control (estimated  $M = 4.31$ ) when they experienced high levels of negative emotions ( $+1 SD$ ),  $\beta = -.34$ ,  $p = .12$ . In the low self-control demand condition, the interaction between negative emotions and trait self-control was not significant,  $\beta = .13$ ,  $p = .33$ , suggesting that lower levels of negative emotions did not enhance the self-control performance of people higher in trait self-control when they initially expected this task to be low in self-

control demand. These findings suggest that, when expecting to perform a task high in self-control demand, people higher in trait self-control demonstrate better self-control performance on this task than people lower in trait self-control when they experience low (but not high) levels of negative emotions.

So far, these data suggest that people higher in trait self-control generally experience more positive emotions than people lower in trait self-control after completing a regulatory task, while controlling for baseline emotions, with one potential explanation being that they are more likely to upregulate these emotions during the task, independent of whether they chose to recall a positive or negative event. These data further suggest that these increased experiences of positive emotions then help people higher, relative to lower, in trait self-control to succeed at self-control, such that people higher in trait self-control perform better on a self-control task than people lower in trait self-control when they experience high (but not low) levels of positive emotions.

These findings further suggest that people higher in trait self-control experience less negative emotions than people lower in trait self-control after completing a regulatory task intended to increase negative emotions, but only when expecting to perform a task high (but not low) in self-control demand, with one potential explanation being that people with high trait self-control are more likely to downregulate these emotions during the task, and that they do so in the context of self-control specifically. In addition, these findings also suggest that these decreased experiences of negative emotions then help people higher, relative to lower, in trait self-control to succeed at self-control, such that people higher in trait self-control perform better on a self-control task than people lower in trait self-control when they experience low (but not high) levels of negative emotions. These findings are discussed in more detail in the General Discussion.<sup>11</sup>

### Study 3

Study 3 aims to investigate how assigning participants to various emotion regulation conditions influence self-control. Specifically, Study 3 investigates whether randomly assigning participants to either a positive, negative, or a neutral emotion regulation condition, leads to changes in emotions that help them to succeed at self-control, and whether this effect is moderated by trait self-control. We preregistered two sets of hypotheses, using two different predictors, to test this overarching research question. Specifically, using emotion regulation condition as the predictor, we hypothesized that the effect of emotion regulation condition on self-control performance would vary by trait self-control, such that people higher, relative to lower, in trait self-control would demonstrate increased self-control performance after taking part in the positive-inducing task, as compared to the negative-inducing task. We did not make any hypotheses regarding the neutral control condition given that Study 3 is the first herein to include a neutral control condition. Furthermore, using actual emotions as predictors, we also hypothesized that the effects of positive and negative emotions on self-control performance would vary by trait self-control, such that people higher, relative to lower, in trait self-control would demonstrate increased self-control performance when they experienced high levels of positive emotions, and low levels of negative emotions.

Thus, even though these hypotheses are just different approaches to test our research questions, the first hypothesis focuses on the effects of the emotion induction condition on self-control, whereas the latter emphasizes the effects of actual emotions (experienced immediately after the emotion inductions and thus right before performing a self-control task) on self-control. This is because Study 2 showed that trait self-control predicted differences in emotions after completing the regulatory tasks, and that these emotional experiences predicted their self-control performance. Therefore, we preregistered that, if Study 3 similarly shows that trait self-control predicts differences

in emotions after the emotion inductions, we would test both sets of the hypotheses stated above (otherwise we would test the first hypothesis). However, in hindsight we realized the importance of being consistent with Study 2's analyses in order to fully contrast the results of the two studies and we therefore decided to test both sets of hypotheses independent of whether trait self-control predicts differences in emotions after the inductions.

### **Method**

A study overview, analysis plan, and all materials used in this study can be found via the Open Science Framework ([https://osf.io/s7k2d/?view\\_only=f8e639f9a28c4c418a26389565f4b203](https://osf.io/s7k2d/?view_only=f8e639f9a28c4c418a26389565f4b203)).

### **Participants**

Participants ( $N = 210$ ) were recruited through MTurk in exchange for a small reward ( $M_{\text{age}} = 42.04$  years,  $SD_{\text{age}} = 13.58$ ; 134 females; 82% White, 9% African American, 5% Asian American, 4% Hispanic/Latino, and 1% Other). Adults living in the USA and who were fluent in English were eligible to participate.

Our sample size was determined by a priori power analysis (Gpower: Faul et al., 2009), which indicated that a sample size of 204 (assuming  $\alpha = \beta = .05$ ; effect size  $f = .10$ ) would be sufficient for testing our key hypotheses. Nonetheless, in our preregistration we stated that we planned to recruit 100 participants in each condition, resulting in a target sample of 300 participants. However, after collecting data from 300 participants, we discovered that several participants had completed the study more than once (as discovered by identical IP addresses and demographics), and that people reported that they lived in the USA when they lived in other parts of the world (as discovered by latitudes and longitudes of locations not being in the USA). Thus, because we were concerned about the validity of the data provided by these participants

(e.g., duplicate responses may lead to Type 1 and Type 2 errors, participants who respond falsely about one aspect of the study may also respond falsely about other aspects, which could have a large impact on the validity of the study), we decided to delete these participants ( $N = 90$ ) prior to conducting any analyses, resulting in a final sample of 210 participants.

## **Materials**

**Current emotions.** To assess participants' current emotions, we used the same scale and list of positive (hope, joy, pride, serenity) and negative (guilt, anxiety, anger) emotions as in Study 2, although we added sadness to our list of negative emotions to ensure an equal number of positive and negative emotions.

**Trait self-control.** Participants completed the same trait self-control scale as in Study 1 and Study 2.

**Emotion induction.** As in Study 2, emotions were induced by asking participants to recall a personal event. However, rather than allowing participants to choose which type of event to recall, participants in Study 3 were randomly assigned to recall a positive, negative or neutral personal event (i.e., positive, negative, and neutral emotion regulation conditions). Participants assigned to the positive and negative emotion regulation conditions were asked to recall a personal event that made them feel *very proud* and *very guilty*, respectively. Participants assigned to the neutral emotion regulation (control) condition were asked to describe the last time they went grocery shopping (Lench & Levine, 2005). Participants spent 10 minutes writing about their experiences.

We chose pride as our positive emotion because prior work (e.g., Patrick et al., 2009) and our own work has suggested that pride might be particularly beneficial for self-control. In addition, we chose guilt as our negative emotion because researchers

have been interested in how guilt influences self-control (e.g., Giner-Sorolla, 2001) and because guilt is often used as a comparison emotion with pride (e.g., Hofmann & Fisher, 2012). Moreover, even though our writing tasks in Study 2 and Study 3 both involved recalling a past event, we used different writing instructions to induce emotions in Study 3 (see Appendix 5). This is because we wanted the instructions for this task to be relatively short given that Study 3 was conducted online, and because the writing task we chose for Study 3 has been effective in inducing emotions in several prior studies (Forgas, 1999; Forgas, 2011; Lench & Levine, 2005).

**Self-control performance.** We used a delay discounting task to measure self-control performance. That is, participants were asked to choose between receiving a smaller hypothetical amount of money (e.g., \$67) the next day or receiving a larger hypothetical amount of money (e.g., \$85) later in time (e.g., in 70 days; Li, 2008; Tuk, Trampe, & Warlop, 2011). Consistent with prior work, we incentivized participants to express their true preferences by informing them that they could receive one of their choices at the end of the study (e.g., Kirby, Petry, & Bickel, 1999; Li, 2008). Participants made eight choices in total (adapted from Li, 2008; Tuk et al., 2011; see Appendix 6).

Participants who choose smaller immediate rewards in this task are thought to lack self-control, because they fail to inhibit their desire for an immediate payoff in favor of a long-term more beneficial one. This task therefore requires a person to use inhibitory self-control (Tuk et al., 2015). Thus, the number of times participants chose the delayed reward over the immediate reward is our measure of self-control performance (Tuk, Zhang, & Sweldens, 2015). A score of zero indicates that the participant always chose the immediate reward and that he or she lacks self-control, whereas a score of eight indicates that the participant always chose the delayed reward

and that he or she exhibits great self-control. Thus, a higher score on this task indicates increased self-control performance.<sup>12</sup>

### **Procedure**

The first part of the procedure was similar to the procedure used in Study 2. That is, participants completed demographics questions, current emotions, and trait self-control. Participants were then told that they would practice a choice task, and that they would complete the actual choice task later. Thus, participants were presented with three (practice) choices, each asking them to choose between a small-immediate reward and a larger-delayed reward (e.g., they chose whether they would prefer to get \$40 tomorrow or \$55 in 62 days). Participants were told that they were going to make very similar choices later in the study, and were asked to take the choices seriously given that they could receive one of their choices in the form of a payment after completing the study.<sup>13</sup> After making their three choices, participants were told that they would complete a writing task, which would involve recalling a past event. Participants were then randomly assigned to either the positive, negative, or neutral emotion regulation conditions, in which they were instructed to write about a positive, negative, or neutral personal event, respectively, for 10 minutes. This part differs from Study 2, in which participants chose which personal event they wanted to recall (and thus which emotion to regulate) before writing about their chosen event for 10 minutes. As in Study 2, participants then indicated their current emotions (i.e., manipulation check) and completed the self-control task, which asked them to make eight choices between a small-immediate reward and a large-delayed reward. Each pair of choices were presented on a separate page, and the small-immediate choice was presented on the left, and the large-delayed choice on the right. Participants made each choice by clicking on it, before proceeding to the next choice. After making their choices, participants were

thanked and dismissed. All tasks were completed online via Qualtrics and took about 20 minutes to complete. After data collection was completed, three participants were randomly selected to receive one of their choices in the form of a payment. The specific choice they received was randomly determined, and the amount was added to their MTurk account at the corresponding time.

## Results and Discussion

### Choices of immediate versus delayed rewards

In the current sample, participants' mean delayed discounting score was 3.34 ( $SD = 2.15$ ), indicating that people were generally more likely to choose immediate rewards over delayed rewards (see Table 3.1).

Table 3.1. *Percentage of participants choosing immediate versus delayed rewards*

Condition	Immediate versus Delayed Monetary Choices															
	Choice 1 \$10 \$12		Choice 2 \$67 \$85		Choice 3 \$34 \$35		Choice 4 \$48 \$55		Choice 5 \$40 \$70		Choice 6 \$16 \$30		Choice 7 \$30 \$35		Choice 8 \$15 \$35	
Positive	90	10	59	41	96	4	77	23	25	75	30	70	70	30	16	84
Negative	82	19	71	29	94	6	80	20	26	74	29	71	82	19	20	80
Neutral	86	15	70	30	93	7	75	25	17	83	26	74	79	21	9	91
Total	86	14	67	33	94	6	77	23	22	78	29	71	77	23	15	85

*Note.* Choice 1 = \$10 tomorrow vs. \$12 in 25 days; Choice 2 = \$67 tomorrow vs. \$85 in 70 days; Choice 3 = \$34 tomorrow vs. \$35 in 43 days; Choice 4 = \$48 tomorrow vs. \$55 in 45 days; Choice 5 = \$40 tomorrow vs. \$70 in 20 days; Choice 6 = \$16 tomorrow vs. \$30 in 35 days; Choice 7 = \$30 tomorrow vs. \$35 in 20 days; Choice 8 = \$15 tomorrow vs. \$35 in 10 days.

### Preregistered analyses

#### Manipulation check: how did emotion regulation condition influence

**subsequent emotions?** As in Study 2, we conducted a MANCOVA to test this.

Emotion regulation condition (positive, negative, neutral) was a between-subject factor, baseline positive and negative emotions were covariates, and experiences of positive and negative emotions after the emotion induction were dependent variables. Our preregistered hypotheses were that participants in the positive emotion regulation condition would experience more positive emotions than participants in the negative



and neutral emotion regulation conditions, and that participants in the negative emotion regulation condition would experience more negative emotions than participants in the positive and neutral emotion regulation conditions.

The analysis revealed a significant multivariate effect of emotion regulation condition,  $F(4, 408) = 31.94$ , Wilks'  $\lambda = .58$ ,  $p < .001$ ,  $\eta_p^2 = .24$ ; there was a univariate effect of emotion regulation condition on positive emotions  $F(2, 205) = 42.21$ ,  $p < .001$ ,  $\eta_p^2 = .29$ , and a univariate effect of emotion regulation condition on negative emotions,  $F(2, 205) = 42.31$ ,  $p < .001$ ,  $\eta_p^2 = .29$ . Consistent with our predictions, simple effect tests showed that participants in the positive emotion regulation condition experienced more positive emotions ( $M = 4.84$ ,  $SE = .11$ ) than participants in the negative ( $M = 3.35$ ,  $SE = .12$ ;  $p < .001$ ) and neutral ( $M = 4.20$ ,  $SE = .11$ ;  $p < .001$ ) emotion regulation conditions. Participants in the neutral control condition experienced more positive emotions than participants in the negative emotion regulation condition ( $p < .001$ ), although we did not preregister any predictions regarding this effect. Consistent with our predictions, participants in the negative emotion regulation condition experienced more negative emotions ( $M = 2.68$ ,  $SE = .09$ ) than participants in the positive ( $M = 1.69$ ,  $SE = .09$ ;  $p < .001$ ) and neutral ( $M = 1.65$ ,  $SE = .09$ ;  $p < .001$ ) emotion regulation conditions. Participants in the positive- and neutral emotion regulation conditions did not differ in negative emotions ( $p = .75$ ), although we stated no predictions regarding this effect. These findings are shown in Figure 3.5 and suggest that participants experienced more of the emotion that they were instructed to regulate, suggesting that the emotion induction was successful.

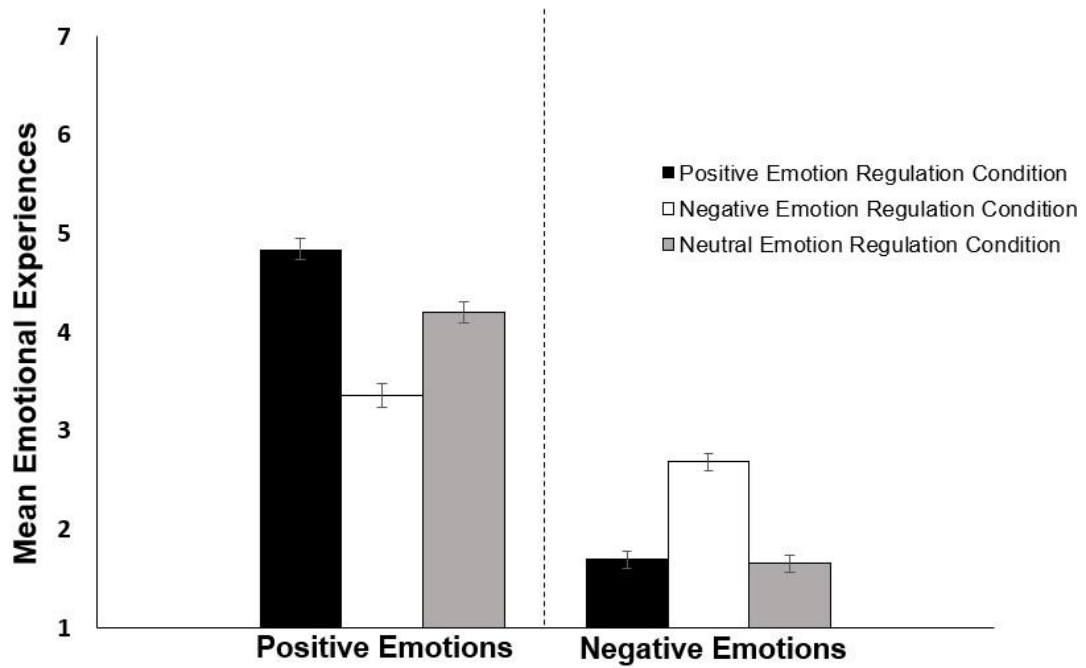


Figure 3.5. Mean experiences of positive and negative emotions for participants assigned to the positive, negative, and neutral emotion regulation conditions.

**Did trait self-control moderate the effect of emotion regulation condition on subsequent emotions?** As in Study 2, we conducted exploratory multiple regressions to examine whether trait self-control predicts differences in emotions after the emotion inductions. Two dummy variables were created; the first compared the negative emotion regulation condition (coded as 1) with the positive emotion regulation condition (coded as 0), and the second compared the neutral emotion regulation condition (coded as 1) with the positive emotion regulation condition (coded as 0). These dummy variables were entered into the regression along with trait self-control and their cross products to predict experiences of either positive or negative emotions, while controlling for baseline positive and negative emotions. To avoid repeating the results from the manipulation check above, below we report the effects that involve trait self-control only.

**Positive emotions.** The multiple regression was significant,  $R^2 = .70$ ,  $F(7, 202) = 67.50$ ,  $p < .001$ . However, trait self-control did not predict positive emotions ( $\beta = -.08$ ,  $p$

= .24), when controlling for baseline emotions. This finding differs from Study 2 in which greater trait self-control generally predicted increased positive emotions after recalling the events. Moreover, the first dummy variable, which compared the negative emotion regulation condition with the positive emotion regulation condition, was not moderated by trait self-control to predict positive emotions,  $\beta = .15$ ,  $p = .51$ , suggesting that the positive emotions of people higher, relative to lower, in trait self-control did not differ in the negative vs. positive emotion regulation conditions. The second dummy variable, which compared the neutral emotion regulation condition with the positive emotion regulation condition, was marginally moderated by trait self-control,  $\beta = .42$ ,  $p = .07$ , such that greater trait self-control was marginally related to greater positive emotions in the neutral emotion regulation condition compared to the positive emotion regulation condition.

**Negative emotions.** The multiple regression was significant,  $R^2 = .66$ ,  $F(7, 202) = 56.71$ ,  $p < .001$ . Nonetheless, trait self-control did not predict negative emotions,  $\beta = -.02$ ,  $p = .76$ , while controlling for baseline emotions. This finding is inconsistent with Study 2, which showed that greater trait self-control predicted less negative emotion after recalling negative events and when the expected task was high in self-control demand. Likewise, the first dummy variable, which compared the negative emotion regulation condition with the positive emotion regulation condition, was not moderated by trait self-control,  $\beta = .16$ ,  $p = .51$ , and the second dummy variable, which compared the neutral emotion regulation condition with the positive emotion regulation condition, was also not moderated by trait self-control,  $\beta = .03$ ,  $p = .92$ , suggesting that the negative emotions of participants higher, relative to lower, in trait self-control did not differ in the negative vs. positive emotion regulation conditions, or in the neutral vs. positive emotion regulation conditions.

Together, these findings generally suggest that people higher and lower in trait self-control experienced similar degrees of positive and negative emotions after being instructed to regulate their emotions to increase their positive, negative, and neutral emotions.

**How did emotion regulation condition influence self-control performance, and was this moderated by trait self-control?** To test our preregistered hypotheses that people higher, relative to lower, in trait self-control would demonstrate increased self-control performance after taking part in the task intended to increase positive emotions, compared to after taking part in the task intended to increase negative emotions, we conducted a multiple regression. The same dummy variables as described above, along with trait self-control and their cross products, were entered as simultaneous predictors into a multiple regression to predict self-control performance.

The multiple regression was not significant,  $R^2 = .03$ ,  $F(5, 204) = 1.20$ ,  $p = .31$ . However, greater trait self-control predicted worse self-control performance,  $\beta = -.24$ ,  $p = .047$ . Moreover, the first dummy variable, which compared the negative emotion regulation condition with the positive emotion regulation condition, was not significant,  $\beta = -.05$ ,  $p = .54$ , and this effect was not moderated by trait self-control,  $\beta = .07$ ,  $p = .48$ . Thus, inconsistent with our predictions, these findings suggest that participants in the negative- and positive emotion regulation conditions performed similarly on the self-control task, independent of their level of trait self-control. Moreover, the second dummy variable, which compared the neutral emotion regulation condition with the positive emotion regulation condition, was not significant,  $\beta = -.006$ ,  $p = .94$ , suggesting that participants in the neutral- and positive emotion regulation conditions performed similarly on the self-control task. However, this effect was moderated by trait self-control,  $\beta = .19$ ,  $p = .05$ , such that the slope of trait self-control was significantly steeper

(and increasing) in the neutral condition than the slope of trait self-control in the positive emotion regulation condition. These findings suggest that high trait self-control was related to worse self-control performance in the positive emotion regulation condition, relative to the neutral emotion regulation condition (in fact, the neutral condition was the only condition in which people with high trait self-control did not perform worse on the self-control task than people with low trait self-control; see Figure 3.6).

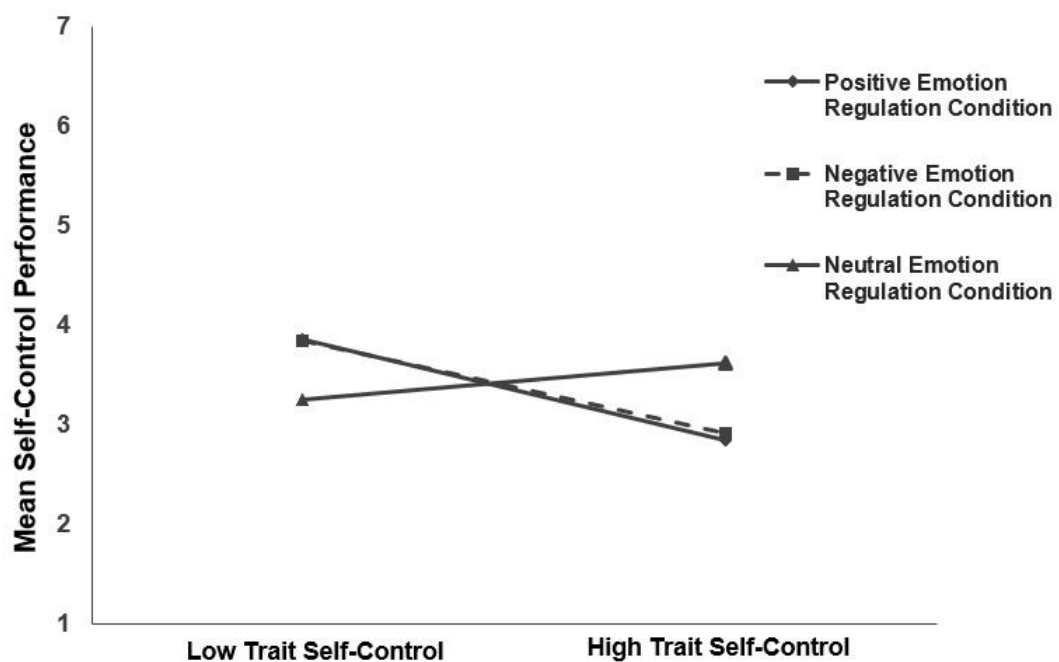


Figure 3.6. Estimated mean self-control performance for participants higher (+1 *SD*) and lower (-1 *SD*) in trait self-control in the positive, negative, and neutral emotion regulation conditions.

These findings are inconsistent with our prediction that people higher, relative to lower, in trait self-control would demonstrate increased self-control performance after taking part in the task intended to increase positive emotions, compared to the task intended to increase negative emotions. Instead, Study 3 showed that greater trait self-control predicted worse performance on the self-control task after taking part in the task

intended to increase positive emotion, compared to the neutral control task, suggesting that positive emotions were unhelpful to their self-control performance in Study 3.

**How did emotional experiences influence self-control performance, and was this moderated by trait self-control?** Here we test the same research questions as above, although this time we use actual emotional experiences following the emotion induction as predictors, rather than emotion regulation condition. That is, to test the hypotheses that people higher, relative to lower, in trait self-control would demonstrate enhanced self-control performance when they experienced high levels of positive emotions and low levels of negative emotions, we entered trait self-control (centered), experiences of either positive or negative emotions (centered), and their cross products simultaneously into multiple regressions, to predict self-control performance.

**Positive emotions.** The multiple regression was not significant for positive emotions,  $R^2 = .01$ ,  $F(3, 206) = 0.89$ ,  $p = .45$ . That is, the simple effects of positive emotions  $\beta = -.08$ ,  $p = .29$ , and trait self-control,  $\beta = -.06$ ,  $p = .38$ , were not significant, and the interaction between positive emotions and trait self-control was also not significant,  $\beta = .04$ ,  $p = .61$ . Thus, contrary to our hypotheses and the findings of Study 2, these findings suggest that high levels of positive emotions do not help people higher, relative to lower, in trait self-control to succeed at self-control.

**Negative emotions.** The multiple regression was not significant for negative emotions,  $R^2 = .008$ ,  $F(3, 206) = 0.54$ ,  $p = .66$ . That is, the simple effects of negative emotions,  $\beta = .01$ ,  $p = .85$ , and trait self-control,  $\beta = -.07$ ,  $p = .37$ , were not significant, and the interaction between negative emotions and trait self-control was also not significant,  $\beta = .03$ ,  $p = .72$ . Thus, inconsistent with our predictions and the findings of Study 2, these findings suggest that low levels of negative emotions do not help people higher, relative to lower, in trait self-control to succeed at self-control.

Inconsistent with Study 2, the findings obtained in Study 3 suggest that emotions (assessed through both emotion regulation condition and actual emotions experienced after the emotion induction) do not help people higher, relative to lower, in trait self-control to succeed at self-control on a task that requires them to delay monetary rewards. Instead, it seems that being assigned to a positive emotion regulation condition might be detrimental to the performance of people with high trait self-control on this particular self-control task.

### **General Discussion**

Building on insights from the instrumental theory of emotion regulation (Tamir, 2009a), in three preregistered studies we examined whether people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control, and whether this regulation and subsequent emotions facilitate self-control performance.

Study 1 showed that people higher, relative to lower, in trait self-control considered positive emotions more useful and negative emotions less useful for their performance, although these beliefs did not translate into regulatory preferences. Study 2 showed that, although trait self-control did not predict regulatory choice, trait self-control predicted differences in emotions after the emotion regulation task; greater trait self-control predicted increased positive emotions overall and decreased negative emotions after the negative emotion regulation task in the high self-control demand situation. Study 2 further showed that people higher in trait self-control demonstrated enhanced self-control when they experienced increased positive and decreased negative emotions, though the latter was specific to the high self-control demand situation. However, a different pattern emerged when participants were randomly assigned to regulate emotions and performed another self-control task in Study 3; trait self-control

did not predict differences in emotions after the emotion regulation task, and emotions did not enhance the self-control performance of people higher in trait self-control.

### **Expected emotion utility beliefs in the context of self-control**

Tornquist and Miles (2018) showed that people generally consider positive emotions more useful for their everyday self-control success than negative emotions, and that people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful in these situations. Study 1 extends this work by showing that these beliefs transfer to a laboratory self-control task, as well as a performance task that does not require self-control. In particular, Study 1 showed that participants considered positive emotions more useful to their performance on lab tasks that were both high and low in self-control demand, as compared to negative emotions, and that people higher in trait self-control considered positive emotions more useful and negative emotions less useful to their performance in these situations, as compared to people lower in trait self-control.

### **Emotion regulation in the context of self-control**

In extending Tornquist and Miles's (2018) study, our data allowed us to test whether beliefs about the utility of emotions translate into preferences and choice to regulate emotions. As such, we found that participants demonstrated greater *preferences* to engage in activities aimed at increasing their positive, compared to negative, emotions (i.e., recalling positive vs. negative events; Study 1 and 2), and that they were more likely to *choose* to engage in activities aimed at increasing their positive, compared to negative, emotions (i.e., recalling positive vs. negative events; Study 2), when expecting to perform tasks high and low in self-control demand. Together, our findings suggest that people's beliefs that positive (vs. negative) emotions will enhance their performance in situations that are high and low in self-control demand *do* translate



into greater preferences and choice to regulate positive (vs. negative) emotions in these situations. These findings therefore support the view that people attempt to upregulate the emotions they consider useful in performance contexts (Tamir et al., 2015), although our findings do not support the view that these findings should be particularly evident in highly demanding situations.

However, one may argue that these preferences and choices to engage in emotion-eliciting activities may reflect people's *general* preferences to engage in these activities, rather than their preferences to engage in these activities because they are *functional* for the upcoming tasks. Prior research into instrumental emotion regulation has similarly assessed people's preferences and choices to engage in emotion-eliciting activities (e.g., listen to music, recall a personal event, watch film clips, and read articles, that vary by emotion) in performance situations that are high vs. low in demand (Tamir, 2005; Tamir, 2009b; Tamir & Ford, 2012; Tamir et al., 2015; Tamir et al., 2008), and have typically found that these preferences and choices are specific to situations that are highly demanding, ruling out the possibility that these preferences and choices reflect people's general preferences to engage in these activities.

In contrast, people's preferences and choices were *not* moderated by self-control demand in the current studies. Hence, in order to rule out this alternative interpretation and to ensure that people's preferences and choices reflect their preferences to engage in these emotion-eliciting activities because they are *functional* for the upcoming self-control task, future research might benefit from providing participants with material that informs them that people sometimes decide to engage in activities that they believe will facilitate their performance, and that they should keep this in mind when making their own choices to engage in various activities before completing their assigned performance task. In a related vein, in addition to including items that measure people's

preferences and choices to engage in emotion-eliciting activities, future studies should include items that ask participants whether they believe that engaging in these activities could help them to succeed on the upcoming self-control task. This approach would allow us to more directly assess whether people's preferences and choices to engage in emotion-eliciting activities reflect their preferences to engage in these activities because they believe that these activities are *functional* for the upcoming self-control task.

Important to our purposes, these preferences and choice to regulate emotions did not vary by trait self-control (Study 1 and 2), suggesting that, even though trait self-control predicted differences in beliefs about the utility of emotions, these differences in beliefs did not translate into differences in preferences and choice to regulate emotions. Inconsistent with the instrumental emotion regulation framework, our findings therefore suggest that beliefs about the utility of emotions does not translate into attempts to regulate emotions for people with high trait self-control, indicating that individual differences in trait self-control might moderate the link between beliefs about the utility of emotions and attempts to regulate emotions.

These findings raise the question of why people higher, relative to lower, in trait self-control rated positive emotions as more useful to their performance but were then not more likely to choose to regulate their emotions to increase their positive emotions. One possible explanation might be that people with high trait self-control regulate their emotions more implicitly, as opposed to making deliberate choices about how to regulate emotions. There is indeed growing evidence that suggests that emotion regulation can operate on automatic or implicit levels (Koole, Webb, & Sheeran, 2015). Specifically, implicit emotion regulation is the enactment of emotion regulation without the need for deliberation about how to regulate emotions. Implicit emotion regulation occurs when a person has consistently and frequently used an emotion regulation

strategy in a particular situation, and the use of this strategy in that situation has therefore become habitual and unconscious (Gyurak, Gross, & Etkin, 2011; Koole, Webb, & Sheeran, 2015). For example, a young boy who feels anxious and sad when his parents drop him off at preschool might deliberately and repeatedly seek to downregulate these emotions by distracting himself with a comforting toy in this situation. However, over time, he may enact distraction without conscious control to reduce these negative emotions (he may, for example, automatically look away when his parents leave), indicating implicit emotion regulation. Thus, given the evidence that emotion regulation can operate on automatic or implicit levels (Koole, Webb, & Sheeran, 2015) and that people higher in trait self-control are more likely than others to rely on habitual automatic behaviors to achieve their goals (de Ridder et al., 2012; Gillebaart & de Ridder, 2015), it is possible trait self-control failed to predict choice to regulate emotions because making such choices may not be a part of a high trait self-control person's daily routines, who may instead regulate emotions without awareness and conscious control.

Based on these accounts, future studies should seek to further our understanding of whether people with high trait self-control are generally more likely than others to regulate their emotions habitually and implicitly, both in the lab and in real-life (see Gyurak, Gross, & Etkin, 2011, for an overview of habitual emotion regulation). Moreover, important to our purposes, future studies that aim to study people with high trait self-control using the instrumental emotion regulation framework should use a more implicit measure of emotion regulation to assess how people with high trait self-control regulate their emotions when expecting to perform a self-control task. For example, given that primes are often used to implicitly elicit emotions in people (e.g., emotional prime words or pictures; Lench et al., 2011), researchers could present

participants with subtle pictures that vary in emotional content (e.g., a picture of an extended middle finger would represent anger), and ask participants to press the spacebar when they see a picture category that they want to see more of before completing the self-control task. More responses for pictures representing anger would indicate an (implicit) attempt to upregulate this emotion (see Gyurak, Gross, & Etkin, 2011, for other implicit emotion regulation tasks). This approach would help us understand whether and how people higher, relative to lower, in trait self-control regulate their emotions implicitly in the context of self-control.

Another possibility that could explain why trait self-control failed to predict regulatory choice is that making choices can be difficult and taxing (Vohs et al., 2008). Indeed, the ego depletion model predicts that using self-control on a first task (e.g., a choice task) leads to self-control failure on a second task (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Hence, it is possible that people with high trait self-control in the current study refrained from making these difficult choices about emotion regulation to avoid failing on the upcoming performance task, resulting in these null findings. Again, using a more implicit measure of regulatory attempts that does not involve making deliberate choices might help to overcome this potential caveat given that implicit measures are thought to be effortless and thus non-depleting.

Interestingly, rather than predicting preferences and choice to regulate emotions, Study 2 showed that trait self-control predicted differences in emotions immediately after the regulatory tasks and thus right before performing the self-control task. That is, greater trait self-control predicted increased positive emotions after recalling the events overall, and greater trait self-control also predicted decreased negative emotions after recalling negative events in the situation that was high (but not low) in self-control demand, after controlling for baseline emotions. Thus, it seems that trait self-control

predicts beliefs about the utility of emotions and that these beliefs translate into differences in emotions after completing a regulatory task.

One potential explanation for why trait self-control predicted differences in emotions may be that people higher and lower in trait self-control regulated their emotions differently during the recall, resulting in differences in emotions. Specifically, it is possible that people higher, relative to lower, in trait self-control regulated their emotions in ways that led to increased positive emotions overall, and that they regulated their emotions in ways that led decreased negative emotions when recalling a negative event and when expecting to perform a task high in self-control demand. This interpretation that trait self-control predicted differences in emotion regulation, which then resulted in differences in emotions, is consistent with prior work that has shown that trait self-control predicts differences in emotion regulation, such that people high in trait self-control regulate emotions more effectively in the lab and use emotion regulation more frequently in real-life, as compared to people low in trait self-control (Hennecke et al., 2018; Paschke et al., 2016).

Another possible interpretation is that, rather than *regulating* emotions differently, people higher and lower in trait self-control *responded* differently to the emotion inductions, resulting in differences in emotions. For example, prior research has shown that adolescents higher, relative to lower, in trait self-control respond differently (i.e., demonstrate less reactivity) to daily stressors (Galla & Wood, 2015), indicating that they better cope with negative experiences, which could help explain why people with high trait self-control felt less negative emotions after the negative recall in this study. Others have similarly examined individual differences in response to emotion inductions and have found that high extraversion predicts increased positive emotions after completing an induction aimed at increasing positive emotions, and that

high neuroticism predicts increased negative emotions after completing an induction aimed at increasing negative emotions (Larsen & Ketelaar, 1991; see also Blackburn, Cameron, & Deary, 1990; Scherrer & Dobson, 2009). These data underline the importance of considering individual differences when using emotion inductions to manipulate emotions and, more importantly, warrant continued research into whether trait self-control predicts emotions in response to emotion inductions. Such research could help disentangle whether the observed differences in emotions in this study are due to emotion regulation or reactivity to emotional events.

It is, of course, also possible that greater trait self-control predicted more positive and less negative emotion after the recall (while controlling for baseline emotions) because people with high trait self-control had more positive and fewer negative experiences to write about, as compared to people with low trait self-control (given the link between high trait self-control and positive life outcomes: Tangney et al., 2004). Nonetheless, exploratory analyses partially ruled out this possibility by showing that the positive and negative content in the essays did not vary by trait self-control.<sup>10</sup> It therefore seems more plausible that the observed differences in emotions following the recall are due to differences in emotion regulation or differences in reactivity to emotional events.

However, the findings that trait self-control predicted differences in emotions should be regarded cautiously as they failed to replicate in Study 3. That is, when participants were assigned to (rather than choosing) emotion regulation conditions in Study 3, trait self-control did not predict differences in emotions after recalling positive, negative, and neutral events, with one potential explanation being that they regulated their emotions similarly during the tasks, resulting in similar emotions. Based on these data, it is possible that whether trait self-control predicts differences in emotions after

recalling emotional events might depend on whether they *choose* or are *instructed* how to regulate emotions, such that trait self-control only predicts differences in emotions in the case of the former, perhaps because people higher and lower in trait self-control only regulate emotions differently in this situation.

One potential reason for why trait self-control failed to predict differences in emotions after being instructed how to regulate emotions might be that people higher in trait self-control are more likely to stick to rules (e.g., keeping the speed limit, wearing seatbelts; de Ridder et al., 2012), which may suggest that, when receiving instructions about how to regulate, people higher in trait self-control may have focused on regulating their emotions consistent with these instructions, rather than consistent with their emotional preferences, resulting in similar emotions as people lower in trait self-control.

An alternative explanation might be that people higher in trait self-control did not attempt to regulate emotions in this situation, perhaps because they believed that such attempts would be unhelpful to their self-control performance in Study 3, resulting in similar emotions as people lower in trait self-control. Thus, throughout this article we have argued that people with high trait self-control use emotions and emotion regulation as tools to succeed at self-control in general, but it actually seems more plausible that these tools may only be helpful in *certain* self-control situations, and that other tools may be more adaptive in these situations. Hence, perhaps the most effective way to succeed at the self-control task in Study 3 was to use other tools. If this is true, people higher in trait self-control may have recognized this and decided *not* to regulate emotions in this situation, resulting in similar emotions as those lower in trait self-control. These speculations warrant further investigation; future studies could, for instance, explore which strategies people with high trait self-control might use in this situation, and test the effectiveness of these strategies in an experimental setting.

Hence, these data provide modest evidence that people higher in trait self-control differ in emotions from those lower in trait self-control following an emotion regulation task, with one possible explanation being that they regulate their emotions differently during the task, although whether and how people with high trait self-control regulate emotions in the context of self-control seem to depend on contextual factors such as whether they expect to perform a task that is high or low in self-control demand, the nature of the expected self-control task (i.e., anagram vs. delay task), and whether they choose or are instructed how to regulate emotions.

### **Trait self-control and self-control performance**

Consistent with research suggesting that people higher in trait self-control perform better on self-control tasks than people lower in trait self-control (e.g., Frieze & Hofmann, 2009; Schmeichel & Zell, 2007), Study 2 found that greater trait self-control predicted better self-control performance. In contrast, Study 3 found that greater trait self-control predicted *worse* self-control performance, which is more consistent with work showing that people higher in trait self-control are more likely to fail at self-control, as compared to people lower in trait self-control (e.g., Imhoff et al., 2014).

One possible explanation for these contradictory findings is that the self-control performance of people with high trait self-control depends on the demands of the self-control task. For example, Imhoff et al. (2014) suggested that people higher in trait self-control might be bad at tasks that require them to inhibit temptations, and that they might be good at tasks that require them to initiate short-term efforts. The current data supports this idea, as we found that people higher in trait self-control demonstrated enhanced self-control performance on a task that required initiation (i.e., generate anagram solutions; Study 2), but that they demonstrated impaired self-control performance on a task that required inhibition (i.e., resist immediate rewards; Study 3).



These findings underline the importance of considering the self-control demands of the task (along with other plausible moderators) when examining whether trait self-control predict self-control performance (see also de Boer, van Hooft, & Bakker, 2011; Tornquist & Miles, 2018).

### **Emotions and self-control performance**

Contrary to prior work showing that participants assigned to a positive emotion induction demonstrate better self-control performance than those assigned to a negative emotion induction (e.g., Winterich & Haws, 2011), in Study 2 we did not find that participants in the positive emotion regulation condition performed better on the self-control task than participants in the negative emotion regulation condition, and this effect did also not vary by trait self-control, suggesting that the self-control performance of people higher, relative to lower, in trait self-control was unaffected by whether they chose to recall positive or negative events.

There was similarly no effect of emotion regulation condition on self-control in Study 3, suggesting that participants in the positive, negative, and neutral emotion regulation conditions demonstrated similar self-control performance, although, in contrast to Study 2, this effect varied by trait self-control in Study 3. That is, high trait self-control predicted worse self-control performance after being instructed to recall positive events, as compared to after being instructed to recall neutral events. However, inconsistent with our predictions, greater trait self-control did not predict enhanced self-control performance after being instructed to recall positive events, compared to after being instructed to recall negative events. Thus, contrary to the view that positive emotions should boost the self-control performance of people higher, relative to lower, in trait self-control, these findings suggest that positive emotions are detrimental to the self-control performance of people with high trait self-control.

Interestingly, a different pattern emerged when regressing participants' actual emotions, rather than their choice to regulate emotions, on self-control performance in Study 2. That is, we found that the effects of positive and negative emotions on self-control performance varied by trait self-control; people higher, relative to lower, in trait self-control demonstrated better self-control performance when they were high in positive emotions across situations, and when they were low in negative emotions in the situation high in self-control demand. These data provide tentative evidence that, when using actual emotions as predictors, increased positive and decreased negative emotions help people with high trait self-control to succeed at self-control, as compared to people with low trait self-control. These findings might also provide clarity as to why people higher in trait self-control (presumably) regulated their emotions in ways that resulted in increased positive and decreased negative emotions after the recall; because these emotions facilitate their self-control. However, these findings should be accepted cautiously given that they failed to replicate when participants were instructed how to regulate emotions and when performing another self-control task in Study 3. Thus, more data is needed to confirm whether emotion regulation and emotions help people with high trait self-control to succeed at self-control.

One possible reason for why positive emotions helped people higher, relative to lower, in trait self-control to succeed at self-control in Study 2 but not in Study 3 might be that it is more adaptive for people with high trait self-control to choose, rather than being instructed, how to regulate emotions. For example, given that participants in Study 2 were able to flexibly choose among various positive and negative regulatory options, rather than being assigned *one* emotion to regulate as in Study 3, the emotion regulation task in Study 2 may have allowed for more flexible emotion regulation (that

is, to choose the emotion regulation option that best fit that particular situation) which might be beneficial to the self-control performance of people with high trait self-control.

Indirect support for this idea comes from research on emotion regulation flexibility and research that has linked psychological flexibility with self-control. That is, researchers have suggested that the most adaptive way to regulate emotions is being able to flexibly regulate emotions in ways that best fit the situation (Aldao, 2013; Bonanno & Burton, 2013). Others have suggested that people who score high in psychological flexibility (also called flexibility), which broadly refers to the ability to persist or change a behavior depending on what the situation affords (see Kashdan & Rottenberg, 2010, for an overview of this construct), persist longer on a cold pressor task (Feldner et al., 2006), indicating that greater flexibility predicts enhanced self-control. It has further been suggested that people higher in trait self-control are generally more flexible than people lower in trait self-control (Kashdan & Rottenberg, 2010). These lines of research may help explain why emotions boosted the self-control performance of people with high trait self-control in Study 2 but not in Study 3: because the flexible and autonomous nature of the regulatory task in Study 2 was a more adaptive and natural way for them to regulate emotions than the instructed regulatory task in Study 3, which then facilitated their self-control performance.

One possible explanation for why flexibility (although not emotion regulation flexibility *per se*) might facilitate self-control comes from Kashdan and Rottenberg (2010) who argued that flexibility in the form of being able to shift from a present orientation (e.g., wanting fattening food now) to a future orientation (e.g., wanting to train properly for a marathon) is crucial for long-term goal pursuit (e.g., successfully complete a marathon). Nonetheless, given that these ideas are very speculative, future studies should directly test whether trait self-control predicts flexibility, particularly

emotion regulation flexibility, in the context of self-control and whether this flexibility leads to improvements in self-control.

Another plausible explanation for why positive emotions helped people higher, relative to lower, in trait self-control to succeed at self-control in Study 2 but not in Study 3, is that the influence of positive emotions on self-control might depend on the self-control task. For example, the effect of positive emotions on self-control may depend on whether the task requires initiatory or inhibitory self-control, as we found that positive emotions were helpful to people's performance on the anagram task in Study 2, which is assumed to involve initiatory self-control (Imhoff et al., 2014), but unhelpful to people's performance on the delay discounting task in Study 3, which is assumed to involve inhibitory self-control (Tuk et al., 2015). This idea is consistent with prior work showing that people believe that positive emotions are more likely to help them succeed in initiatory than inhibitory self-control situations (Tornquist & Miles, 2018), and other research providing evidence to link positive emotions with initiatory self-control (de Boer et al., 2011) or with initiation in general (Albarracín & Hart, 2011; Fredrickson, 2001). This could help explain why people higher in trait self-control performed particularly bad on the self-control task in the positive-regulatory condition in Study 3; because positive emotions might be unhelpful for this inhibitory self-control task. Future studies should therefore examine whether positive emotions enhance self-control more when the task involves initiatory vs. inhibitory self-control, and how this vary by trait self-control. For example, researchers could induce positive emotions in participants and have them perform tasks that requires initiatory and inhibitory self-control, and test whether positive emotions benefit the former more than the latter.

Thus far, we have argued that the anagram task in Study 2 requires initiatory self-control and that the delay discounting task in Study 3 requires inhibitory self-

control, that people with high trait self-control might be better at initiatory self-control than inhibitory self-control, and that positive emotions might benefit the former more than the latter. Broadly, this suggests that it is important to distinguish between these two types of self-control in the self-control literature (see also Davisson, 2013; de Boer, van Hooft, & Bakker, 2011), although it is also important to point out that this distinction may not always be clear-cut and that these self-control types may depend on each other (Davisson, 2013). Using the anagram task in Study 2 as an example, to succeed on this task a person may first need to inhibit a behavior (e.g., resist playing with their smartphone in the lab) in order to initiate another (e.g., generate as many anagram solutions as possible), suggesting that these self-control types rely on each other. In addition, it also seems equally important to further our understanding of whether there are additional types of self-control. For example, it seems plausible that initiating a behavior (e.g., go for a run) is somewhat different from persisting in a behavior (e.g., keep running when feeling tired), and that persistence may therefore be categorized as a separate, but related, form of self-control. These ideas provide interesting avenues for future research. Thus, in order to fully understand how self-control operates, future studies should investigate whether people typically inhibit self-control behaviors in order to initiate other self-control behaviors (or vice versa), and whether there are additional distinct forms of self-control (e.g., persistence).

In a related vein, given that we used three different self-control tasks in this investigation, which are not only likely to vary in initiation and inhibition, but also in self-control demand, it is possible that the effects of positive emotions on self-control depend on the extent to which the tasks require a person to use self-control. For example, it might require a person to use more self-control to resist the opportunity to receive money the next day (delay discounting task; Study 3) than persisting on an

unsolvable task in the lab (anagram task; Study 2), which might indicate that positive emotions are more beneficial for performance on tasks that require moderate degrees of self-control, as compared to tasks that require a great deal of self-control. Thus, future research should test whether the extent to which a task requires self-control exertion moderates the links between positive emotions, trait self-control, and self-control performance.

It is also possible that positive emotions failed to enhance self-control on the delay discounting task in Study 3 because our participants were U.S. Mturk workers, who have lower income than the general U.S. population and often use MTurk as a source of income (Paolacci, Chandler, & Ipeirotis, 2010). Thus, it is possible that our participants in Study 3 were particularly motivated to make money fast and therefore chose the immediate rewards, independent of their positive emotions (i.e., the motivation to make money was too strong for positive emotions to be helpful), as compared to our undergraduates in Study 2 who were given course credit for participating regardless of their performance. Indeed, the mean delayed discounting score in the sample was 3.34 ( $SD = 2.15$ ; scale 0-8, with a score of zero indicating that the person always chose immediate rewards), indicating that our participants were indeed motivated to receive money the next day.

This idea is consistent with prior work showing that positive emotions only boost performance on this task when the delayed reward is much greater than the immediate reward (Pyone & Isen, 2011), confirming that positive emotions are only useful to performance on this task under certain circumstances (i.e., when the reward is large enough to be worth waiting for). This might suggest that the nature of the reward determine people's attempts to regulate positive emotions, such that they may only attempt to upregulate positive emotions when the long-term rewards are much greater

than the short-term rewards. Thus, future studies could measure, and control for, participants income, and also seek to include more and larger monetary choices when examining how emotion regulation behaviors influence this particular self-control task.

Thus, this suggests that positive emotions may indeed help people higher, relative to lower, in trait self-control to achieve self-control success, but that this is only true in certain self-control situations such as in the anagram situation in Study 2. That is, this was not observed in the delay discounting situation in Study 3, perhaps due to the particular sample used in this study, or because this task required inhibition, or because this task was too high in self-control demand, or because the reward was not large enough for positive emotions to be helpful.

## **Conclusions**

We conclude that people generally believe that positive emotions are more useful to their performance than negative emotions across contexts, and that these beliefs translate into greater attempts to regulate emotions to increase their positive, compared to negative, emotions, in these situations. We further conclude that people higher, relative to lower, in trait self-control believe that positive emotions are more useful and that negative emotions are less useful to their performance across contexts, although these differences in beliefs do not translate into differences in attempts to regulate these emotions, perhaps because people with high trait self-control rely more on implicit emotion regulation or because making choices about emotion regulation is taxing and may have negative consequences on subsequent self-control. Notably, modest evidence was found that people higher in trait self-control experienced more positive and less negative emotion after a regulatory task, with one interpretation being that they regulated emotions differently. Tentative evidence was also found that increased positive and decreased negative emotions helped people higher in trait self-

control to succeed at self-control, though these effects seem to depend on contextual factors.



### Footnotes

<sup>1</sup> As described in the main text, the emotion x trait self-control interaction was significant without controlling for current affect,  $F(1, 208) = 28.26, p < .001, \eta_p^2 = .12$ ; trait self-control predicted utility ratings for positive,  $\beta = .23, p = .001$ , and negative,  $\beta = -.28, p < .001$ , emotions across tasks. This interaction remained significant when controlling for current affect,  $F(1, 208) = 22.94, p < .001, \eta_p^2 = .10$ ; trait self-control predicted utility ratings for positive,  $\beta = .17, p = .01$ , and negative,  $\beta = -.29, p < .001$ , emotions across the tasks. Thus, excluding current affect as a covariate from our analyses did not change our key conclusion that people higher in trait self-control consider positive emotions more useful and negative emotions less useful to their performance across situations.

<sup>2</sup> The typing tasks used in Study 1 were selected by presenting undergraduates ( $N = 26$ ) with four potentially high self-control tasks that are often used as dependent measures of self-control in self-control research (i.e., retyping text while following complex rules, solving unsolvable anagrams, and tracing an unsolvable maze and an unsolvable figure) and four potentially low self-control tasks (i.e., retyping text, watching a video clip, playing Tetris, and listening to music) and asking them to rate the tasks for their self-control demand on a scale of 1 (*not at all*) to 7 (*extremely*). The high self-control typing task in Study 1 (along with the anagram task) received a high mean self-control demand score relative to the other high self-control tasks, whereas the low self-control typing task in Study 1 (along with the music task) received a low mean self-control demand score relative to the other low self-control tasks. Notably, participants judged the high self-control typing task to involve more self-control demand ( $M = 4.45, SD = .1.27$ ) than the low self-control typing task ( $M = 2.78, SD = 1.14$ ),  $t(25) = 5.39, p < .001, d = 1.06$ .

<sup>3</sup> To ensure data quality on MTurk (Peer, Vosgerau, & Acquisti, 2014), in Study 1 we included several instructional attention check questions that were embedded within the other surveys (these attention checks are available on the OSF website). Participants who failed to provide the correct answer were immediately thanked and dismissed. That is, they did not complete the remaining tasks and their provided data was automatically disregarded.

<sup>4</sup> Participants were dismissed after providing their utility ratings or regulatory preference ratings because Study 1 was designed to test the emotions people, particularly people higher in trait self-control, consider useful in performance situations that are high and low in self-control demand, and whether these beliefs translate into preferences to regulate emotions. Study 2 and Study 3 were, however, designed to test whether these beliefs and regulatory preferences translate into actual choice to regulate emotions and improvements in self-control performance.

<sup>5</sup> We included a personality measure in Study 1 for exploratory purposes, which is beyond the scope of the current investigation. That is, Goldberg's (1999) Big Five International Personality Item Pool scales (this measure is available on the OSF website) were used to measure Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness.

<sup>6</sup> We preregistered that we would conduct exploratory correlations to examine the relationships between trait self-control and utility ratings as well as regulatory preference ratings for pride, hope, guilt, anger, and worry, in situations that were high and low in self-control demand. These results are available online and were generally consistent with our overall findings that greater trait self-control predicted increased and decreased utility ratings for positive and negative emotions, respectively, but that trait self-control was unrelated to preferences to regulate these emotions.

<sup>7</sup> Participants who selected to write about (1) pride (27%) wrote about achievement, (2) joy (8%) wrote about laughter and having fun, (3) serenity (20%) wrote about a spa experience, natural beauty, or meditation, (4) hope (19%) wrote about exam results, future events related to having a career, and moving abroad, (5) guilt (2%) wrote about social relationships, (6) anxiety (18%) wrote about other people being in danger, financial issues, health concerns, or the possible loss of a loved one, and (7) anger (6%) wrote about being unfairly accused of things by others. Average time spent on the writing task was 8.65 minutes ( $SD = 1.91$ ). Time spent on the writing task did not differ for participants who wrote about a positive ( $M = 8.54$ ,  $SD = 1.97$ ) and a negative ( $M = 8.99$ ,  $SD = 1.74$ ) event,  $t(138) = 1.23$ ,  $p = .22$ ,  $d = .24$ , or for participants assigned to the high ( $M = 8.70$ ,  $SD = 1.89$ ) and low ( $M = 8.61$ ,  $SD = 1.95$ ) self-control demand conditions,  $t(138) = .25$ ,  $p = .80$ ,  $d = .05$ . Thus, it seems that participants actively engaged with the task.

<sup>8</sup> The supplemental study described in Footnote 2 also showed that participants judged the anagram task in Study 2 to involve more self-control demand ( $M = 4.86$ ,  $SD = 1.33$ ) than the music task ( $M = 2.07$ ,  $SD = 1.08$ ),  $t(25) = 7.99$ ,  $p < .001$ ,  $d = 1.58$ .

<sup>9</sup> Participants assigned to the low self-control demand (i.e., music) condition were told that they had been assigned to solve the remaining anagrams instead of listening to more music because this procedure allowed us to obtain comparable measures of self-control performance for participants who had regulated their emotions expecting self-control demand, compared to participants who had regulated their emotions not expecting self-control demand.

<sup>10</sup> Given the interesting finding that people higher and lower in trait self-control experienced emotions differently after the recall, we conducted non-preregistered exploratory content analyses (LIWC: Pennebaker, Booth, & Francis, 2007) to examine

whether these differences in emotions could be explained by the content people higher and lower in trait self-control wrote about. Thus, we analyzed whether trait self-control predicted the percentage of positive and negative words used in the essays. These data (available upon request) demonstrated no differences in content between people higher and lower in trait self-control, suggesting that differences in emotions after the recall cannot be explained by the content.

<sup>11</sup> We conducted non-preregistered analyses to examine whether the results obtained in Study 1 regarding people's preferences to regulate emotions replicated in Study 2. Specifically, we conducted the equivalent ANOVA as in Study 1 to examine the emotions that people prefer to regulate in performance contexts that are high and low in self-control demand, and whether this vary by trait self-control. The findings of Study 2 were identical to the findings of Study 1 (with one minor exception, which was not relevant to our key tests) and thus suggesting that trait self-control does not predict differences in preferences to regulate emotions. These results are reported on the OSF website.

<sup>12</sup> As in Study 1, we included several instructional attention checks in Study 3, that were embedded within the other surveys and/or tasks. For example, participants were instructed to "answer a 4 on this statement". Participants who failed to provide the correct answer were immediately thanked and dismissed. Thus, they did not complete the remaining tasks and their provided data was automatically disregarded.

<sup>13</sup> Participants practiced the choice task before recalling the events (and thus before regulating their emotions) in Study 3 to be consistent with our two previous studies which both used this procedure. The practice phase is an important aspect of the current framework given that it gives participants an idea about how challenging the

expected tasks will be, allowing them to regulate their emotions in ways that might be adaptive for this particular task.

## **Chapter 4: General Discussion**

As yet, little is known about the specific strategies that people higher in trait self-control might use to succeed at self-control and achieve their goals. Understanding how people can achieve self-control success has practical importance, given that this knowledge can be used to design interventions aimed at improving self-control in people who often fail at self-control, and thus help them to achieve their aspirations and goals. This thesis presented a programme of research aimed at understanding whether emotion regulation might be one strategy that people with high trait self-control use to achieve self-control success. In particular, this thesis aimed to combine research on self-control, emotions, and instrumental emotion regulation, to examine whether people higher in trait self-control regulate their emotions differently from those lower in trait self-control in the context of self-control, and whether this regulation and subsequent emotions facilitate their self-control performance.

In this chapter, I first summarize the findings obtained in Chapters 2 and 3. I then discuss my findings in the context of my overall research question, that is, whether people higher in trait self-control regulate their emotions differently from people lower in trait self-control in the context of self-control, and whether this regulation and subsequent emotions then help them to succeed at self-control. Following this, I provide a discussion of the theoretical and practical implications of this research, and I then address the limitations of this research and make suggestions for future work.

### **Summary of findings**

The studies presented in Chapter 2 demonstrated that people considered positive emotions more useful for their success in everyday self-control situations than negative emotions, but that this effect was moderated by the type of self-control required and trait self-control. Specifically, people considered positive emotions more useful for their success in situations that required them to use initiatory self-control compared to

situations that required them to use inhibitory self-control, whereas the opposite was found for negative emotions. Furthermore, people higher in trait self-control considered positive emotions more useful and negative emotions less useful for their success in everyday self-control situations that required both initiatory and inhibitory self-control, as compared to people lower in trait self-control.

Chapter 3 then showed that people considered positive emotions more useful for their performance than negative emotions in laboratory performance situations that were both high and low in self-control demand, and that these beliefs translated into greater preferences and choice to regulate positive, as compared to negative, emotions. Chapter 3 further showed that beliefs about the utility of emotions varied by trait self-control such that people higher, relative to lower, in trait self-control considered positive emotions more useful and negative emotions less useful for their performance in laboratory situations that were both high and low in self-control demand. However, these differences in beliefs did not translate into differences in preferences or choice to regulate emotions. Instead, modest evidence was found that people higher, relative to lower, in trait self-control experienced more positive and less negative emotion after a regulatory task, and that increased positive and decreased negative emotions helped them to succeed at self-control, although these findings did not replicate in a carefully controlled setting where participants were randomly assigned to regulate emotions and when using a different self-control task.

Overall, this thesis finds consistent evidence that people consider positive emotions more useful to their performance than negative emotions in various self-control situations and in one situation that does not require self-control, and that these beliefs translate into greater preferences and choice to regulate positive, as compared to negative, emotions in these situations. These beliefs and preferences did, however, not

translate into improvements in self-control performance, suggesting that these findings are more consistent with hedonic, as opposed to instrumental, views of emotion regulation, which hold that people generally regulate emotions to maximize positive and minimize negative emotions (e.g., Larsen, 2000).

Crucially, this thesis also finds consistent evidence that people higher, relative to lower, in trait self-control consider positive emotions more useful and negative emotions less useful to their performance in various self-control situations and in one situation that does not require self-control, but that these differences in beliefs do not translate into differences in preferences and choice to regulate emotions. Rather, these differences in beliefs translate into differences in emotions after a regulatory task and, consistent with the instrumental theory of emotion regulation (Tamir, 2009a), improvements in self-control performance. That is, this thesis finds that greater trait self-control predicts more positive and less negative emotion after a regulatory task, and that increased positive and decreased negative emotions facilitate the self-control performance of people with high trait self-control, although these findings seem to be very likely to depend on contextual factors.

**Did people higher in trait self-control regulate their emotions differently from people lower in trait self-control in the context of self-control?** Because beliefs about the utility of emotions have been used as an index of emotion regulation in prior work (as reviewed in Chapter 1) and that greater trait self-control consistently predicted differences in beliefs about the utility of emotions, at first glance it seems that trait self-control indeed predicts differences in emotion regulation. However, my data failed to support this as trait self-control did not predict preferences or choice to regulate emotions by recalling emotional events, which served as measures of regulatory attempts in the current research. Thus, in light of the current theoretical perspective,



people higher, relative to lower, in trait self-control differ in the emotions they consider useful in the context of self-control, but they do not seem to attempt to regulate their emotions differently in this context.

However, stepping outside the current perspective, I unexpectedly found that trait self-control predicted differences in emotions after an emotion regulation task, and that these differences in emotions were consistent with their beliefs about the utility of emotions. Thus, it seems that people higher, relative to lower, in trait self-control differ in their beliefs about the utility of emotions, and that these differences in beliefs translate into differences in emotions after a regulatory task, rather than into their preferences and choice to regulate emotions as initially proposed. These findings therefore provide tentative evidence that people higher, relative to lower, in trait self-control may indeed regulate their emotions differently in the context of self-control, as indicated by their emotional experiences following an emotion regulation task.

The results further showed that trait self-control only predicted differences in emotions when participants could choose how to regulate emotions and when the expected self-control task involved solving anagrams, but not when participants were randomly assigned to regulate emotions and when the expected self-control task involved delaying gratification. Thus, I initially proposed that people higher, relative to lower, in trait self-control should regulate emotions differently in the context of self-control in general, but based on these findings, I speculate that they may regulate their emotions differently in *specific* self-control contexts only. Specifically, I speculate that they may regulate their emotions differently in contexts where emotion regulation is adaptive, and that they might use alternative strategies in contexts where emotion regulation is less adaptive. Put differently, I propose that emotion regulation and emotions may not facilitate performance in all self-control situations (e.g., when

delaying gratification) and that people higher, compared to lower, in trait self-control may be better able to recognize this, and use emotion regulation accordingly.

One possible explanation for why emotion regulation (and subsequent emotions) might be adaptive in some self-control situations (e.g., when persisting on an anagram task) but not in others (e.g., when delaying immediate gratification), is that the beneficial effects of emotion regulation on self-control may depend on the situation. For example, because solving anagrams requires initiation whereas delaying rewards requires inhibition (Imhoff et al., 2014; Tuk et al., 2015) and because this thesis showed that people believe that positive emotions are more useful for initiatory than inhibitory self-control, it is possible that upregulating positive emotions might be adaptive in situations that require initiation (e.g., when solving anagrams), but less adaptive in situations that require inhibition (e.g., when delaying gratification), in which other strategies might be more adaptive.

This would not be surprising given that prior work has suggested that there is no “gold standard” regulatory strategy to achieve desired outcomes, but that it is most adaptive to choose a regulatory strategy depending on the demands required by the situation (Kashdan & Rottenberg, 2010). Research into emotion regulation has similarly argued that there is not one emotion regulation strategy that fits all situations and that adaptive emotion regulation involves choosing an emotion regulation strategy that best fits that situation (see Aldao, 2013, for a review). To illustrate, a recent ESM study showed that the use of suppression, which is a common emotion regulation strategy, improved mood in students when they experienced exam-related anxiety, but not when they experienced non-exam-related anxiety. In contrast, the use of distraction, another common emotion regulation strategy, improved mood in students when they experienced non-exam-related anxiety, but not when they experienced exam-

related anxiety (Rottweiler, Taxer, & Nett, 2018). These findings, along with my findings, illustrate the context dependency of emotion regulation, and could help explain why emotion regulation may have been adaptive in the anagram situation but not in the delay discounting situation.

Moreover, I further speculate that people higher in trait self-control might use emotion regulation differently from those lower in trait self-control to succeed in other performance contexts, not just in contexts specific to self-control. I base this on the results showing that, as compared to people lower in trait self-control, people higher in trait self-control considered positive emotions more useful and negative emotions less useful to their performance in situations that were both high and low in self-control demand, that they experienced increased positive emotions across these situations after completing the regulatory task, and that they experienced decreased negative emotions in the high (but not low) self-control demand situation. Thus, it is possible that people with high trait self-control may use emotion regulation to increase positive emotions in performance situations that are both high and low in self-control demand, but that they might focus on using emotion regulation to decrease negative emotions in contexts that are specific to self-control, although these speculations need to be confirmed in future studies.

One potential reason why people with high trait self-control might regulate their emotions in these ways might be because positive emotions may be beneficial in performance situations in general (as implied by the broaden-and-build theory: Fredrickson, 2001), whereas there might be more variability in how negative emotions influence performance. That is, it is possible that negative emotions might be detrimental in self-control situations (as reviewed in Chapter 1) but might be beneficial in certain performance situations that does not require self-control *per se* (e.g., anger

improves negotiation performance; Tamir & Ford, 2012), although this possibility remains speculative.

As such, the answer to the question whether people higher in trait self-control regulate their emotions differently from people lower in trait self-control in the context of self-control is far more complex than initially proposed. That is, the findings reported within this thesis can only provide suggestive evidence that people higher, relative to lower, in trait self-control might be more likely to upregulate positive and downregulate negative emotions in a self-control situation that requires persistence (but not in a situation that requires delaying gratification), although the upregulation of positive emotions may also generalize to a performance situation that is lower in self-control demand.

**Did emotion regulation and subsequent emotions help people higher in trait self-control to succeed at self-control?** I initially suggested that positive emotions would help people with high trait self-control to succeed at self-control, as compared to people with low trait self-control. I found partial support for this hypothesis. That is, consistent with their beliefs that positive emotions would help them to succeed at self-control, I found that increased experiences of positive emotions enhanced the self-control performance of people higher in trait self-control on an anagram task that involved persistence, but not on a delay discounting task that involved choosing between immediate and delayed rewards. Based on these findings, it seems reasonable to argue that whether positive emotions help people with high trait self-control to succeed at self-control might depend on the specific self-control task, although other moderators are, of course, plausible.

I also initially argued that lower levels of negative emotions might help people higher, relative to lower, in trait self-control to succeed at self-control, although I

acknowledged that evidence in support of this claim is currently scarce, given that prior work has concentrated on examining how increased (rather than decreased) levels of various emotions enhance performance. As such, consistent with the beliefs of people higher, relative to lower, in trait self-control that negative emotions would be unhelpful to their self-control success, I found that lower levels of negative emotions improved the self-control performance of people higher, relative to lower, in trait self-control on an anagram task that involved persistence, but not on a delay discounting task that involved choosing between immediate and delayed rewards. Thus, as with positive emotions, these findings suggest that lower levels of negative emotions may help people with high trait self-control to succeed in certain (but not all) self-control situations, as compared to people with low trait self-control.

These findings were, however, not observed when using regulatory choice or emotion-eliciting condition as predictors of self-control performance. That is, I initially expected that greater trait self-control would predict increased self-control performance after choosing or being assigned to recall a positive, as compared to a negative, event. I did not find support for these hypotheses (instead, I found modest evidence that people high in trait self-control performed badly on the delay task after being assigned to recall a positive event). Thus, it seems that increased positive and decreased negative emotions help people higher, relative to lower, in trait self-control to succeed on a self-control task such as the anagram task, but only when analyzing their actual emotions and not when analyzing their regulatory choice or emotion-eliciting condition assigned to (the implications of these discrepancies are discussed in the next section).

In sum, this thesis found tentative answers to the question whether emotion regulation and subsequent emotions help people higher in trait self-control to succeed at self-control, suggesting that more positive and less negative emotions facilitate the self-

control performance of people higher, relative to lower, in trait self-control on an anagram task that involves persistence, but not on a delay discounting task that involves choosing between immediate and delayed rewards. However, this thesis did not find support for the notion that greater trait self-control would predict increased self-control performance after choosing or being assigned to recall a positive event, compared to after choosing or being assigned to recall a negative event, suggesting that it is the actual emotions of people with high trait self-control, rather than the event they choose or are assigned to recall, that matters for their self-control performance.

### **Implications of findings**

The research presented in this thesis demonstrates a first attempt to combine theories and research from self-control, emotion, and emotion regulation research to further our understanding of how people can achieve self-control success. The findings of this thesis therefore have theoretical and practical implications for these three areas of research, and in particular, for self-control success, which are discussed below.

**Theoretical implications.** First, this investigation has implications for self-control research. In particular, this investigation is one of the first that attempts to test how people with high trait self-control succeed at behavioral measures of self-control, providing some tentative evidence that they might use emotion regulation and emotions as tools to achieve this. Researchers have generally assumed that people with high trait self-control achieve positive life outcomes through their superior ability to override impulses and to persist in disliked activity, although only a few studies have actually tested this assumption. In contrast, others have suggested that people with high trait self-control succeed at achieving their goals because they actively avoid tempting situations, suggesting that they rarely need to use self-control (Ent, Baumeister, & Tice, 2010). However, given that it is impossible to *always* avoid tempting situations, this prior work does not reveal whether people with high trait self-control *do* succeed when

they are faced with a situation that require them to use self-control, and which strategies they might use to achieve this self-control success. This thesis contributes to our understanding of these issues.

Consider, for example, a situation where a person with high trait self-control is offered delicious cake for dessert at a dinner party. Avoidance would be impossible in this scenario and a strategy must therefore be employed if he or she would like to stick to their health goals and say no to the dessert (i.e., succeed at self-control). The work presented within this thesis provides tentative evidence that greater trait self-control predicts self-control success, and that they might use emotion regulation and their emotions as tools to achieve self-control success. These findings are consistent with prior work that has shown that people with high trait self-control regulate their emotions more effectively in laboratory settings, as compared to people low trait self-control (Paschke et al., 2016), although the current investigation also extends this prior work by showing that the emotions they experience following an emotion regulation task also translate into improvements in self-control on a task that requires persistence.

Nevertheless, given that greater trait self-control only predicted self-control success on the anagram task but not on the delay discounting task, this thesis further suggests that trait self-control only predicts self-control success in situations that require persistence, and not in situations that require overriding impulses. Thus, I cannot be sure that greater trait self-control would predict self-control success in the dinner party example provided above. These findings are therefore consistent with the idea postulated by Imhoff et al. (2014) that people higher in trait self-control might be good at tasks that require them to initiate short-term efforts, but that they might be bad at tasks that require them to resist temptations. Thus, the research presented within this thesis adds to the self-control literature as it may suggest that people with high trait self-

control might achieve positive life outcomes through their superior ability to persist in disliked (but desired) activities, rather than through their ability to override impulses.

Furthermore, this investigation adds to the growing body of self-control research that has advocated for a conceptual distinction between inhibitory and initiatory self-control, generally suggesting that people can achieve their goals by inhibiting *and* initiating behaviors (e.g., de Ridder et al., 2011). Specifically, this thesis showed that people believed that positive emotions would be more useful for initiatory than inhibitory self-control, whereas negative emotions would be more useful for inhibitory than initiatory self-control, suggesting that people distinguish between situations that require them to enact or prevent behaviors in their everyday lives. Thus, this thesis demonstrates differential findings across situations that require initiation and inhibition and therefore provides further supporting evidence for a distinction between initiatory and inhibitory self-control.

Specifically, these findings disagree with prior work that has emphasized that self-control is mostly an inhibitory mechanism and agree with the line of work that has suggested that self-control is both an inhibitory and initiatory mechanism (Davisson, 2013; de Ridder et al., 2011; de Boer et al., 2011), and suggests that people with high trait self-control might be particularly good at the latter. This emphasizes the importance of including an initiatory component of self-control in current definitions of self-control as suggested by de Ridder and colleagues (2011). This further highlights the importance of distinguishing between measures of initiatory and inhibitory self-control when measuring self-control outcomes in the laboratory and in real-life, and the importance of adding more items to existing self-control scales that tap initiation (given that most items currently tap inhibition: de Ridder et al., 2011), in order to capture the full spectrum of the self-control construct. Finally, in parallel to distinguishing between



initiatory and inhibitory self-control, it seems equally important to also furthering our understanding of the interplay between these two mechanisms, and to also consider other forms of self-control, in order to fully understand how self-control operates.

Moreover, given these differences in beliefs in initiatory and inhibitory self-control situations, and that the instrumental theory of emotion regulation suggests positive links between beliefs, emotion regulation, and successful performance (e.g., Tamir et al., 2015), these findings might further suggest that positive emotions (and the upregulation of these emotions) might best function to successfully initiate (vs. inhibit) self-control behaviors and that negative emotions (and the upregulation of these emotions) might best function to successfully inhibit (vs. initiate) self-control behaviors, although future studies need to confirm whether these beliefs translate into actual emotion regulation and successful performance in these situations.

Second, this investigation has implications for emotion research. Many definitions of emotion suggest that emotions are automatic responses to emotional events (e.g., Ekman & Cordaro, 2011) and there is a long-standing notion that emotions are something that just happen to people rather than something that people do voluntarily. However, this thesis provides further evidence to prior emotion research that has proposed that people *can* voluntarily influence their emotions by choosing to engage in various emotion-eliciting activities, suggesting that emotions do not always arise as automatic responses to emotional events (e.g., Tamir et al., 2015; Tamir & Ford, 2012). This thesis also adds to this prior work by showing that people can also voluntarily influence their emotions in the context of self-control. For instance, I found that, when presented with various recall options that were positive and negative in valence, some participants chose to recall a negative event, and that these participants then experienced more negative emotions after recalling the event as compared to

before. This replicates previous work (e.g., Tamir & Ford, 2012) and extends this work by showing that people can voluntarily choose how to influence their emotions in the context of self-control, and that they can make themselves experience these emotions by engaging in emotional activities in this context.

Furthermore, it is also commonly argued, particularly among laypeople, that emotions are irrational, disruptive, and that they make people lose control, but this thesis agrees with other research that has argued that emotions are functional and adaptive (see Karnaze & Levine, 2017, for an overview), which was reflected in people's favorable utility beliefs about positive emotions and in the beneficial influence that positive emotions had on the self-control performance of people with high trait self-control. Nonetheless, people, and particularly those with high trait self-control, generally had unfavorable beliefs about negative emotions, suggesting that the view of emotions as being irrational and disruptive might be specific to negative emotions (though people who expect to confront another person have favorable beliefs about anger: Tamir & Ford, 2012) and that this view might be particularly evident in certain people (e.g., in those with high trait self-control). Thus, it seems that certain people view certain emotions as functional whereas they view other emotions as disruptive and that this might depend on the situation.

Third, this investigation has implications for emotion regulation research. That is, the research presented within this thesis is the first to test key predictions made by the instrumental theory of emotion regulation in the context of self-control, and thus the first to combine the instrumental theory of emotion regulation with self-control research. My findings provide modest evidence that people with high trait self-control might regulate their emotions instrumentally to achieve self-control success, suggesting

that the instrumental emotion regulation framework may also be used in performance contexts that require self-control exertion.

However, one may argue that prior work into instrumental emotion regulation has used performance tasks that may require some degree on self-control. For example, Tamir (2005) assessed how anxiety influenced anagram performance for people high in neuroticism. Even though that study also used an anagram task, the task in that study differed from mine in that the anagrams were solvable and thus measured the number of anagrams solved, whereas my anagrams were unsolvable and thus measured persistence (i.e., time spent on the task). These differences are of great importance because the ability to persist in aversive activities is a key feature of self-control (Carver, 2010), making my anagram task a more clear-cut example of a measure of self-control. However, regardless of whether one judge prior performance tasks used in instrumental emotion regulation research to be similar to tasks aimed at measuring self-control performance specifically, the studies included in this thesis are still novel and still contribute to the literature given that they are the first to test the moderating role of trait self-control on the relations between instrumental emotion regulation, emotions, and performance.

Moreover, even though the instrumental theory of emotion regulation mostly emphasizes the emotions people consider useful and upregulate in performance contexts, and how this regulation influence subsequent performance, a few studies have also suggested that people sometimes attempt to decrease emotions in themselves and in others if this can help them to achieve their goals (e.g., Netzer et al., 2015; Tamir & Ford, 2012). This thesis provides further evidence that the emotions people consider unhelpful to their performance in a particular situation may also predict their regulatory attempts and success in this situation. Specifically, in several studies I found that people

higher, relative to lower, in trait self-control judged negative emotions to be less useful to their performance, and in one study I found that they experienced less negative emotions immediately after completing a regulatory task and when expecting to perform a self-control task, and that lower levels of negative emotions then helped them to succeed at this task. Hence, these findings suggest that it might be important to also incorporate clear predictions into the model of instrumental emotion regulation regarding people's attempts to downregulate unhelpful emotions in performance contexts and how this might influence subsequent performance.

In addition, even though I generally found that people believed that positive emotions could help them to succeed in performance situations as compared to negative emotions, and that these beliefs translated into greater preferences and choice to regulate positive, as compared to negative, emotions, these patterns of results were not evident in people higher and lower in trait self-control. That is, I did not find that differences in beliefs about the utility of emotions among people higher and lower in trait self-control translated into differences in preferences and choice to regulate emotions. These findings suggest that beliefs about the utility of emotions does not translate into attempts to regulate emotions for everybody and therefore underscore the importance of investigating under exactly which circumstances people's beliefs about the utility of emotions predict preferences and choice to regulate emotions.

One potential explanation for why trait self-control did not predict preferences and choice to regulate emotions might be that people higher in trait self-control are more likely than others to rely on automatic behaviors to achieve their goals (de Ridder et al., 2012; Gillebaart & de Ridder, 2015). Specifically, it is possible that people with high trait self-control may be particularly inclined to regulate their emotions implicitly and may therefore not be consciously aware of the most adaptive way to regulate

emotions in the context of self-control, resulting in null findings when asked to make a deliberate choice about how to regulate their emotions. Another possibility that might explain these null findings is that people with high trait self-control may refrain from choosing how to regulate emotions because making deliberate choices such as these can be taxing and thus detrimental to subsequent self-control performance (as predicted by the ego depletion model: Baumeister et al., 1998; Vohs et al., 2008). To protect against both of these possibilities, researchers taking an instrumental approach to emotion regulation might benefit from including implicit measures of emotion regulation, which tend to be more effortless.

A third potential explanation might be that people high in trait self-control (and people in general) do not typically regulate their emotions to succeed at self-control, resulting in null findings when asked to choose how to regulate emotions in a self-control situation. To date, only one study has demonstrated that people regulate their emotions in daily self-control situations, and that the use of emotion regulation predicts people's success in these situations. Specifically, in one study Hennecke et al. (2018) instructed participants to imagine themselves carrying out different self-control behaviors (e.g., vigorously exercising on a treadmill, studying boring exam material), and to write down strategies that they typically use to succeed at performing these behaviors. One frequent strategy that participants reported using was emotion regulation, providing initial evidence that people use emotion regulation in self-control situations in real-life. More convincingly, in an ambulatory assessment study, the researchers found that people reported using emotion regulation in daily self-control situations, and that the use of emotion regulation predicted their success in these situations, providing evidence that people can regulate emotions to achieve self-control success in real-life. However, given that only a few studies have found support for the

hypothesis that people regulate emotions to succeed at self-control, and given that my studies only found modest support for this hypothesis, more research is needed to confirm whether people, and particularly people high in trait self-control, use emotion regulation to achieve self-control success.

**Practical implications.** The research presented in this thesis contributes to our understanding of how emotions and emotion regulation might shape self-control success for people with high trait self-control and has the potential to inform the design of interventions to improve people's self-control and help them to attain positive life outcomes.

For example, if increased positive emotions indeed help people higher (but not lower) in trait self-control to succeed at self-control as the results within this thesis suggest, one way to help people who are less good at self-control to better self-control might be to teach them easy-to-use positive-inducing regulatory strategies, which could, in turn, enhance their self-control. For example, research shows that music can alter people's emotions (for a review, see Västfjäll, 2002), and that people listen to music in their everyday lives to regulate their emotions (Thoma, Ryf, Mohiyeddini, Ehlert, & Nater, 2012). Thus, if people would employ music in their everyday lives for the purpose of upregulating their positive emotions, it is possible that these emotions would help them to succeed at self-control and to achieve desirable goals.

Another way to help people to better self-control through the upregulation of positive emotions might be through priming. Indeed, prior work has suggested that situated interventions such as goal priming can be effective in helping people to achieve their long-term goals (Papies, 2016). Thus, given that primes can be used to elicit emotions (Lench et al., 2011) and because the findings presented in this thesis suggest that positive emotions might be particularly beneficial to initiate self-control behaviors,

it seems plausible that a prime intervention aimed at increasing positive emotions might help people to succeed at initiating self-control behaviors. For example, integrating positive prime words (e.g., happy, joyful, and proud) into a poster displayed outside the campus gym that describes the exercise classes offered that day might increase positive emotions in students who are deciding between taking an exercise class or going home and thus help them to choose the former, indicating self-control success (though this prime may only be effective in people who have an exercise goal; see Papies & Hamstra, 2010; Stöckli, Stämpfli, Messner, & Brunner, 2016, for similar methods).

In a related vein, based on the finding that lower levels of negative emotions helped people higher in trait self-control to succeed at self-control in one of my studies, it also seems important to teach people methods aimed at downregulating negative emotions in order to improve their ability to self-control. For example, one of the most adaptive emotion regulation strategy to decrease negative feelings is cognitive reappraisal (Gross, 1998) such as distancing oneself from the negative situation or reinterpreting the negative situation as positive. Thus, teaching people who often fail at self-control how to use reappraisal to downregulate negative emotions in the context of self-control (e.g., reappraising studying as an opportunity for growth rather than boring) may have great potential to improve their self-control.

For instance, one study found that participants who were trained to use distancing and reinterpretation while watching negative images demonstrated reductions in negative emotions over time, which was particularly evident in participants who were trained to use distancing (Denny & Ochsner, 2014). Likewise, in another recent study (Giles et al., 2018), endurance runners were trained how to regulate their emotions to feel less negative emotions through reappraisal, distraction, and no training, before completing a 90 min run on three different occasions. Broadly, the results showed that

participants felt lower emotional arousal and physical exertion after learning how to use reappraisal (vs. no emotion regulation training), suggesting that reappraisal benefited their running experience. Together, these findings suggest that training participants to use cognitive reappraisal might be successful in reducing negative emotions, and also seems to have beneficial influences on a self-control behavior such as exercising. Thus, it might indeed be fruitful to teach these strategies to people who often fail at self-control in order to reduce their negative emotions and improve their self-control as a consequence.

Another (and simpler) way to help people to better self-control might be to merely educate them and thus change their beliefs about which emotions that are adaptive for various self-control behaviors, which is likely to then guide their regulatory attempts to increase these emotions and facilitate their success at performing these behaviors. For example, if positive emotions are more useful for enacting behaviors than for preventing behaviors as my results indicate, educating people about how positive emotions influence these two types of self-control behaviors might change their beliefs about these emotions and lead to greater regulatory attempts to increase positive emotions in situations that require initiatory self-control (e.g., when trying to initiate studying behaviors) but not in situations that require inhibitory self-control (e.g., when trying to resist ordering junk food) and thus help them succeed in these situations. Put differently, I am suggesting that an intervention aimed at changing people's beliefs about the utility of emotions might result in adaptive emotion regulation and self-control success.

Consistent with this idea, Tamir et al. (2015) found that participants who were led to believe that anxiety or anger would be useful to their performance on an upcoming task were more likely to attempt to increase their anxiety or anger before



performing the task, as compared to those who did not receive such instructions. Thus, given that these beliefs were manipulated in a relatively simple manner (e.g., by having participants read tips or information that implied that a particular emotion would be useful for performance, or implicitly through a prime task), it suggests that people's beliefs about the utility of emotions can be changed, which should then guide their regulatory attempts and facilitate their performance. Furthermore, given that this thesis showed that a personality trait such as trait self-control predicts the degree to which people believe that emotions can help them to succeed at self-control, it might be particularly beneficial to design interventions aimed at changing beliefs in people who do not consider emotions to be useful to their performance such as people with low trait self-control. These changes in beliefs may then guide their regulatory attempts and facilitate their self-control.

From a more general point of view, theory and intervention development would further benefit from an increased understanding of the specific self-control situations in which increased positive and decreased negative emotions benefit self-control, as the findings herein suggest that these emotional experiences only benefit self-control performance in certain self-control contexts, and that positive emotions might be more useful for initiation than inhibition whereas the opposite might be true for negative emotions. As such, it might be beneficial to combine interventions that target people's regulatory attempts with interventions that target people's beliefs about the utility of emotions. For example, it might be beneficial to develop an intervention aimed at teaching people how to increase positive emotions in situations that require persistence in aversive activities (i.e., initiate behaviors such as studying, cleaning, exercising) and to also try to change their beliefs by educating them that these techniques may not be useful in situations that require them to make trade-off decisions between immediate

pleasures and long-term rewards (i.e., inhibit behaviors such as choosing between ordering pizza or salad), in which other strategies might be more adaptive.

**Methodological implications.** The findings presented in this thesis also have methodological implications that are worth discussing separately. First, I suggest that my findings have implications for experimental research that wish to employ an emotion induction to test how emotions influence a particular outcome. Specifically, this thesis showed that trait self-control predicted differences in emotional experiences following an emotion induction, suggesting that people higher and lower in trait self-control may regulate emotions or respond differently to emotion inductions. These findings are on a par with prior studies that have similarly demonstrated that emotional experiences after an emotion induction depends on personality. For example, Larsen and Ketelaar (1991) demonstrated that high extraversion predicted increased positive emotions after a positive-eliciting induction, and that high neuroticism predicted increased negative emotions after a negative-eliciting induction. Together, these findings suggest that emotion inductions influence emotions differently for different people. Hence, experimental research that wish to employ an emotion induction might want to include (and perhaps control for) personality measures of self-control, neuroticism, and extraversion, if they wish to isolate the effects of an emotion on a particular outcome.

In a related vein, this thesis showed that using emotion induction as a categorical variable vs. actual emotions as continuous variables to predict self-control performance produced different results, perhaps because people regulated or responded differently to the emotion inductions. Thus, from a methodological standpoint, rather than doing a manipulation check after an emotion induction and then use emotion-eliciting condition as a categorical variable to predict an outcome, this investigation suggests that it might

be important to distinguish between emotion-eliciting condition and actual emotions when analyzing the data, in order to fully understand whether and how emotions influence an outcome.

Second, I further suggest that the research presented herein has implications for experimental self-control research that intends to use tasks and real-life behavioral outcomes as dependent measures (or manipulations) of self-control. Specifically, even though the self-control tasks and self-control behaviors included in this thesis are common measures of self-control in the literature, I conducted numerous supplemental studies to ensure that I included tasks and behaviors that were relatively high in self-control demand (as described in Chapter 1). This procedure was not employed because I believe that the tasks and behaviors that have been used in prior self-control research are invalid measures of self-control, but rather to complement this prior work given that some researchers have disputed whether certain self-control tasks actually require self-control (e.g., Barber et al., 2012; Shenhav, 2017). I also argued that it was particularly important to ensure that participants generally agreed that the tasks and behaviors required self-control, given that they were then asked questions about their own beliefs and behaviors in these self-control situations, suggesting they needed to be able to relate to these situations.

I believe that this approach (i.e., ensuring that the self-control tasks require self-control) will continue to be valuable moving forward, and that it will encourage the development of new better approaches that does not only rely on participants' ratings, ensuring that the tasks and behaviors used to measure self-control actually require a person to use self-control. I also hope that this approach will shed light on the importance of testing one's hypotheses in settings that are situated in the laboratory *and*

in settings that better approximates real-life situations, and thus increasing the generalizability of the findings.

Lastly, the studies reported in this thesis employed preregistration procedures. One strength of this procedure is that it increases the confidence in my findings, as it prevents HARKing (i.e., hypothesizing after the results are known; Kerr, 1998) and other practices that are generally considered bad science (e.g., p-hacking; Simmons, Nelson, & Simonsohn, 2012), and fosters reproducibility and transparency given that the method and obtained data are shared with other researchers and the general population.

### **Limitations and future directions**

In this section, I discuss the potential limitations to this thesis, and I discuss interesting ideas for future research. When discussing potential limitations, I focus on the thesis as a whole rather than discussing the specific limitations for each of the five key studies presented in this thesis, which can be found in the General Discussion in each empirical chapter.

One potential limitation is that trait self-control and emotions were measured through self-reports, which can be vulnerable to social desirability. Even though these self-reports are valid measures of trait self-control and emotions, respectively (de Ridder et al., 2012; Mauss & Robinson, 2009), future research would benefit from combining these self-reports with behavioral measures when measuring trait self-control (Duckworth & Kern, 2011), and with physiological measures when measuring emotions (Mauss & Robinson, 2009). In the case of trait self-control, this approach might be beneficial because prior work has shown that a combined measure of self-control better predicts objective measures of performance (e.g., academic performance) than a single measure of self-control (Duckworth & Seligman, 2005). Thus, using a combined measure of self-control might help clarify the inconsistent findings regarding the link

between trait self-control and self-control performance obtained herein. Moreover, using multiple measures of emotions might be beneficial because some people are unwilling to report on their emotional states (Mauss & Robinson, 2009). This suggests that assessing emotions through self-reports *and* physiological measures may increase our confidence that people actually experience the emotions they report experiencing, and thus contribute even more to our understanding of how emotions influence self-control performance among people higher and lower in trait self-control.

Another potential limitation of this thesis might be that autobiographical recall was used to measure regulatory attempts and to induce emotions across studies. Even though autobiographical recall is effective in inducing emotions (Lench et al., 2011) and has been widely used in prior studies on instrumental emotion regulation as reviewed in Chapter 1, there might also be some disadvantages associated with this task. For example, research has shown that writing about a past negative event in an expressive writing paradigm reduces negative emotions in the long-term (see Baikié & Wilhelm, 2005, for an overview of how expressive writing influence health outcomes). It is therefore possible that participants in my studies chose to write about a negative event as a coping mechanism aimed at lessening negative emotions in the long-term, instead of an emotion regulation mechanism aimed at increasing these emotions in the short-term, which was of interest in this thesis. Future studies that adapt an instrumental approach to emotion regulation in the context of self-control could use other types of tasks to measure regulatory attempts and to induce emotions such as music and video inductions. Such approach would allow researchers to test whether the findings obtained in this thesis replicate when using another task to measure regulatory attempts and to induce emotions.

Moreover, given that emotions can be classified in many different ways, not just according to their valence (as reviewed in Chapter 1), a further potential critique of this thesis might be that I limited my investigation to broadly comparing states of positive with states of negative emotions (although some analyses of specific emotions were conducted). For example, there are many subtypes of positive and negative emotions that could be examined separately, and positive and negative emotions can also vary in arousal and whether they are basic or self-conscious. However, I initially chose to limit my analyses to positive vs. negative emotions because much less is known about how other specific emotions (e.g., serenity, hate) and emotional arousal (high, low) influence self-control, and I therefore argued that I did not have enough theoretical or experimental evidence to state any a priori hypotheses regarding these emotional dimensions.

Considering this gap in the literature, I encourage researchers to unravel how specific emotions that vary in arousal influence self-control performance, and to examine how people with high trait self-control might regulate these emotions in the context of self-control and whether this regulation leads to improvements in self-control. For example, perhaps people with high trait self-control upregulate positive emotions that are high in arousal (e.g., excitement) when getting ready to go to the gym or when exercising but upregulate positive emotions that are low in arousal (e.g., serenity) when trying to resist dessert, and perhaps these emotions help them to succeed in these situations. This idea is somewhat consistent with prior work that has found that participants who are instructed to state “I am excited” rather than “I am calm” report feeling more excited and perform better on performance tasks such as karaoke singing and public speaking (Brooks, 2014), indicating that positive emotions that are high (but not low) in arousal might indeed be beneficial in various performance situations

(including exercising). These questions and others provide interesting avenues for future research.

A further potential limitation of this research is that, even though thorough attempts were made at ensuring that all self-control tasks included in this thesis were high in self-control demand, these tasks could have been even higher in self-control demand. That is, as reviewed in Chapter 1, the instrumental theory of emotion regulation holds that beliefs about the utility of emotions and regulatory attempts should be particularly evident in highly demanding situations, but I did not find support for this claim in this thesis, perhaps because the self-control tasks were not “high enough” in self-control demand. One challenge for future self-control researchers therefore involves identifying tasks that are even higher in self-control demand than the self-control tasks used herein (the self-control demand means ranged from 4.50 to 5.00 on 7-point scales), and then test whether the self-control demands of the situation moderate the findings obtained in this thesis.

Another possible critique of this thesis is that I only found modest and suggestive evidence that people with high trait self-control use emotion regulation as a strategy to succeed at self-control (i.e., Study 2 in Chapter 3 found indirect support for this whereas Study 3 in the same chapter did not), and research is therefore needed to confirm whether people higher, relative to lower, in trait self-control regulate their emotions differently in the context of self-control, and whether this facilitates self-control. For instance, rather than using regulatory preferences, regulatory choice, and emotions after an emotion regulation task as indicators of emotion regulation, future studies could use an implicit measure of emotion regulation (for reasons described previously), and test whether this predicts self-control performance and how this is moderated by trait self-control. Relatedly, future studies could assess emotion

regulation by having participants choose among various well-established emotion regulation strategies (such as those put forward in the process model of emotion regulation: Gross, 1998) in the context of self-control, and test which strategies that predict self-control performance and how this is moderated by trait self-control. Furthermore, based on the findings obtained in this thesis, it also seems crucial to examine the specific self-control circumstances under which trait self-control predicts emotion regulation, as it seems likely that this relationship depends on multiple moderators such as the self-control task (e.g., the extent to which the task is high in self-control demand, whether the task requires initiation or inhibition), whether emotion regulation is useful in that particular situation, and whether people choose or are instructed how to regulate, and others.

In a related vein, future research should examine alternative strategies that people with high trait self-control might use in self-control situations, particularly in situations where emotion regulation might be unhelpful. For example, given that making plans that link an opportunity with a suitable goal-directed response (i.e., implementation intentions; Gollwitzer, 1999; see also Gollwitzer & Sheeran, 2006) have proven to facilitate many types of behaviors that are related to self-control, one interesting avenue for future research would be to investigate whether people with high trait self-control make adaptive plans that are similar to implementation intentions to succeed at self-control and to achieve their goals. Moreover, research has shown that trait self-control is positively linked with trait mindfulness (i.e., the tendency to be mindful in daily life; Bowlin & Baer, 2012), that mindfulness meditation can be helpful in overcoming ego depletion (Friesen et al., 2012; Yusainy & Lawrence, 2015), and that mindfulness interventions are effective in improving self-control behaviors such as smoking cessation (Brewer et al., 2011) and unhealthy food consumption (see Keesman,



Aarts, Häfner & Papies, 2017, for a review). Hence, another interesting avenue for future research would be to investigate whether people with high trait self-control employ mindfulness strategies to succeed at self-control and to achieve their goals.

Furthermore, Hennecke et al. (2018) recently found that people higher, relative to lower, in trait self-control were not only more likely to use emotion regulation strategies in aversive self-regulatory activities, but they were also more likely to focus on the positive consequences of performing these activities and to set goals. There was also some evidence that their tendency to focus on the positive consequences could, to some extent, explain their self-reported success at persisting in these activities. Thus, future work would benefit from further examining how focusing on the positive consequences of performing a self-control behavior influence objective measures of self-control performance in people with high trait self-control. For example, given the link between *anticipated* positive emotions and enhanced self-control (e.g., Winterich & Haws, 2011), it might be particularly fruitful to examine whether focusing on the *future positive emotions* one might feel if he or she succeed at a self-control behavior might function as a strategy to achieve self-control success in people with high trait self-control.

Another potential limitation of this thesis is that I only found tentative evidence that emotions helped people with high trait self-control to succeed at self-control. Specifically, I found that increased positive and decreased negative emotions boosted the performance of people higher in trait self-control on an anagram task that involved persistence, but not on a delay discounting task that involved choosing between immediate and delayed rewards. Prior research has similarly found mixed evidence regarding the effects of emotions on self-control. Using a self-control behavior such as food consumption as an example, studies have found that people who experience

positive, compared to negative, emotions consume less unhealthy and more healthy food (Garg et al., 2007). They have similarly found that positive emotions increase the salience of long-term goals (e.g., health), leading to greater preferences for healthy compared to unhealthy food, whereas negative emotions have the opposite effect (Gardner et al., 2014). In contrast, research has found that people who experience positive emotions consume more unhealthy food compared to controls, and that they consume similar amounts as those who experience negative emotions (Evers et al., 2013), suggesting that positive emotions are not always good for self-control behaviors. Thus, these data underscore the importance for future studies to examine exactly when and how positive emotions facilitate self-control (several potential moderators have been discussed in this section), and how this is moderated by trait self-control.

Although not a limitation *per se*, due to time constraints I did not test my hypotheses regarding the links between trait self-control, emotion regulation, subsequent emotions, and self-control performance in *real-life*. Thus, I cannot draw conclusions about whether people higher, relative to lower, in trait self-control regulate their emotions consistent with their beliefs about the utility of emotions and whether this leads to improvements in *everyday* situations that require initiatory and inhibitory self-control. This is therefore an area of research I would like to investigate next. For example, an interesting starting point would be to conduct a study that employs the experience sampling method (ESM) to assess the emotions that people with high trait self-control report experiencing in conjunction with initiating and inhibiting various everyday self-control behaviors, and test which emotions that predict their success in these situations. Another possibility would be to ask them whether they used various emotion regulation strategies in conjunction with initiating and inhibiting various self-control behaviors, and test which strategies that predict self-control success.

## **Conclusions**

By integrating research into self-control, emotions, and instrumental emotion regulation, the current research has shed some new light on how people with high trait self-control might achieve self-control success: through the use of emotion regulation and their emotions, although it is crucial for future studies to confirm these initial findings and to further examine plausible moderators in the links between trait self-control, emotion regulation, and emotions, on self-control success. This research has significant practical implications as it has the potential to inform the design of emotion regulation interventions to improve people's self-control and to help them to attain positive outcomes.

## References

- Adriaanse, M. A., Kroese, F. M., Gillebaart, M., & de Ridder, D. D. (2014). Effortless inhibition: Habit mediates the relation between self-control and unhealthy snack consumption. *Frontiers in Psychology, 5*, 6.
- Albarracin, D., & Hart, W. (2011). Positive mood + action = negative mood + inaction: Effects of general action and inaction concepts on decisions and performance as a function of affect. *Emotion, 11*(4), 951-957.
- Aldao, A. (2013). The future of emotion regulation research: Capturing context. *Perspectives on Psychological Science, 8*, 155-172.
- Andrade, E. B. (2005). Behavioral consequences of affect: Combining evaluative and regulatory mechanisms. *Journal of Consumer Research, 32*(3), 355–362.
- Aspinwall, L. G. (1998). Rethinking the role of positive affect in self- regulation. *Motivation and Emotion, 22*, 1–32.
- Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64*, 359–372.
- Baikie, K., & Wilhelm, K. (2005). Emotional and physical health benefits of expressive writing. *Advances in Psychiatric Treatment, 11*(5), 338-346.
- Barber, L.K., Grawitch, M.J., & Munz, D.C. (2012). Disengaging from a task: Lower self-control or adaptive self-regulation? *Journal of Individual Differences, 33*, 76-82.
- Baumeister, R. F., & Alquist, J. L. (2009). Is there a downside to good self-control? *Self and Identity, 8*, 115–130.
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74*(5), 1252-1265.

- Beedie, C. J., Terry, P. C., & Lane, A. M. (2005). Distinctions between emotion and mood. *Cognition and Emotion*, 19(6), 847-878.
- Blackburn, I. M., Cameron, C. M., & Deary, I. J. (1990). Individual differences and response to the Velten Mood induction Procedure. *Personality and Individual Differences*, 11(7), 725-731.
- Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science*, 8, 591-612.
- Bowlin, S. L., & Baer, R. A. (2012). Relationships between mindfulness, self-control, and psychological functioning. *Personality and Individual Differences*, 52(3), 411-415.
- Brewer, J. A., Mallik, S., Babuscio, T. A., Nich, C., Johnson, H. E., Deleone, C. M., ... & Carroll, K. M. (2011). Mindfulness training for smoking cessation: results from a randomized controlled trial. *Drug and alcohol dependence*, 119(1), 72-80.
- Brooks, A. W. (2014). Get excited: Reappraising pre-performance anxiety as excitement. *Journal of Experimental Psychology: General*, 143(3), 1144-1158.
- Calef, R. S., Choban, M. C., Calef, R. A., Brand, R. L., & al, e. (1992). Effects of unsolvable anagrams on retention. *Bulletin of the Psychonomic Society*, 30(2), 164-166.
- Carter, E. C., Kofler, L. M., Forster, D. E., & McCullough, M. E. (2015). A series of meta-analytic tests of the depletion effect: Self-control does not seem to rely on a limited resource. *Journal of Experimental Psychology: General*, 144(4), 796-815.

- Carver, C. S. (2010). Personality. In R. F. Baumeister & E. J. Finkel (Eds.), *Advanced social psychology: The state of the science*. (pp. 757-794). New York: Oxford.
- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.
- Carver, C. S., & Scheier, M. F. (2011). Self-regulation of action and affect. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory, and applications* (2nd ed, pp. 3-21.). New York, NY: Guilford Press.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, 67, 319–333.
- Cheung, T. T. L., Gillebaart, M., Kroese, F., & De Ridder, D. (2014). Why are people with high self-control happier? the effect of trait self-control on happiness as mediated by regulatory focus. *Frontiers in Psychology*, 5, 6.
- Clark, M. S., & Isen, A. M. (1982). Toward understanding the relationship between feeling states and social behavior. In A. Hastorf & A. M. Isen (Eds.), *Cognitive social psychology* (pp. 73–108). New York: Elsevier North Holland.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Crescioni, A. W., Ehrlinger, J., Alquist, J. L., Conlon, K. E., Baumeister, R. F., Schatschneider, C., & Dutton, G. R. (2011). High trait self-control predicts positive health behaviors and success in weight loss. *Journal of Health Psychology*, 16, 750-759.
- Cunningham, M. R. (1998). What do you do when you're happy or blue? Mood, expectancies, and behavioral interest. *Motivation and Emotion*, 12, 309–331.

- Cyders, M. A., & Smith, G. T. (2007). Mood-based rash action and its components: Positive and negative urgency. *Personality and Individual Differences*, 43(4), 839-850.
- Davisson, E. K. (2014). *Strengthening self-control by practicing inhibition and initiation*. (Doctoral Dissertation). Available from PsycINFO. (Order No. AAI3558026).
- de Boer, B. J., van Hooft, E.A., & Bakker, A. B. (2011). Stop and start control: A distinction within self-control. *European Journal of Personality*, 25, 349–362.
- Denny, B. T., & Ochsner, K. N. (2014). Behavioral effects of longitudinal training in cognitive reappraisal. *Emotion*, 14(2), 425-433.
- de Ridder, D. T., De Boer, B. J., Lugtig, P., Bakker, A. B., & van Hooft, E. A. (2011). Not doing bad things is not equivalent to doing the right thing: Distinguishing between inhibitory and initiatory self-control. *Personality and Individual Differences*, 50, 1006–1011.
- de Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, 16(1), 76-99.
- DeSteno, D. (2018). *Emotional Success*. Boston: Houghton Mifflin Harcourt.
- Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality*, 45, 259-268.
- Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, 16(12), 939-944.

- Duckworth, A. L., & Seligman, M. E. P. (2017). The science and practice of self-control. *Perspectives on Psychological Science*, 12(5), 715-718.
- Eigsti, I., Zayas, V., Mischel, W., Shoda, Y., Ayduk, O., Dadlani, M. B., . . . Casey, B. J. (2006). Predicting cognitive control from preschool to late adolescence and young adulthood. *Psychological Science*, 17(6), 478-484.
- Ekman, P., & Cordaro, D. (2011). What is meant by calling emotions basic. *Emotion Review*, 3(4), 364-370.
- Elliot, A.J., & Thrash, T.M. (2002). Approach-avoidance motivation in personality: Approach and avoidance temperaments and goals. *Journal of Personality and Social Psychology*, 82, 804–818.
- English, T., Lee, I. A., John, O. P., & Gross, J. J. (2017). Emotion regulation strategy selection in daily life: The role of social context and goals. *Motivation and Emotion*, 41, 230-242.
- Ent, M. R., Baumeister, R. F., & Tice, D. M. (2015). Trait self-control and the avoidance of temptation. *Personality and Individual Differences*, 74, 12-15.
- Evers, C., Adriaanse, M., de Ridder, D. T. D., & de Witt Huberts, J.C. (2013). Good mood food. positive emotion as a neglected trigger for food intake. *Appetite*, 68, 1-7.
- Evers, C., Marijn Stok, F., & de Ridder, D. D. (2010). Feeding your feelings: Emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin*, 36(6), 792-804.
- Falk, A., & Heckman, J. J. (2009). Lab experiments are a major source of knowledge in the social sciences. *Science*, 325(5949), 535-537.



- Faul, F., Erdfelder, E., Buchner, A., and Lang, A.G. (2009). Statistical power analyses using G\*Power 3.1: tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149–1160.
- Feather, N. T. (1982). Expectancy-value approaches: Present status and future directions. In N. T. Feather (Ed.), *Expectations and actions: Expectancy-value models in psychology* (pp. 395–420). Hillsdale, NJ: Erlbaum.
- Feldner, M. T., Hekmat, H., Zvolensky, M. J., Vowles, K. E., Secrist, Z., & Leen-Feldner, E. (2006). The role of experiential avoidance in acute pain tolerance: A laboratory test. *Journal of Behavior Therapy and Experimental Psychiatry*, 37(2), 146-158.
- Finkel, E. J., & Campbell, W. (2001). Self-control and accommodation in close relationships: An interdependence analysis. *Journal of Personality and Social Psychology*, 81, 263-277.
- Forgas, J. P. (1999). On feeling good and being rude: Affective influences on language use and request formulations. *Journal of Personality and Social Psychology*, 76(6), 928-939.
- Forgas, J. P. (2011). Affective influences on self-disclosure: Mood effects on the intimacy and reciprocity of disclosing personal information. *Journal of Personality and Social Psychology*, 100(3), 449-461.
- Ford, B. Q., & Gross, J. J. (2018). Emotion regulation: Why beliefs matter. *Canadian Psychology/Psychologie canadienne*, 59(1), 1-14.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56, 218–226.

- Fredrickson, B. L. (2013). Positive emotions broaden and build. In E. A. Plant & P. G. Devine (Eds.), *Advances in experimental social psychology* (vol. 47, pp. 1–53). Burlington, MA: Academic Press.
- Fredrickson, B. L., Tugade, M. M., Waugh, C. E., & Larkin, G. R. (2003). What good are positive emotions in crisis? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *Journal of personality and social psychology*, 84(2), 365-376.
- Friese, M., & Hofmann, W. (2009). Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality*, 43, 795–805.
- Friese, M., Messner, C., & Schaffner, Y. (2012). Mindfulness meditation counteracts self-control depletion. *Consciousness and cognition*, 21(2), 1016-1022.
- Frijda, N.H. (1986). *The emotions*. New York: Cambridge University Press.
- Fujita, K. (2011). On conceptualizing self-control as more than the effortful inhibition of impulses. *Personality and Social Psychology Review*, 15(4), 352-366.
- Galanakis, M., Stalikas, A., Pezirkianidis, C., & Karakasidou, I. (2016). Reliability and Validity of the Modified Differential Emotions Scale (mDES) in a Greek Sample. *Psychology*, 7, 101-113.
- Galla, B. M., & Duckworth, A. L. (2015). More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *Journal of Personality and Social Psychology*, 109(3), 508-525.
- Galla, B. M., & Wood, J. J. (2015). Trait self-control predicts adolescents' exposure and reactivity to daily stressful events. *Journal of Personality*, 83(1), 69-83.

- Gardner, M. P., Wansink, B., Kim, J., & Park, S. (2014). Better moods for better eating?: How mood influences food choice. *Journal of Consumer Psychology, 24*(3), 320-335.
- Garg, N., Wansink, B., & Inman, J. J. (2007). The influence of incidental affect on consumers' food intake. *Journal of Marketing, 71*(1), 194–206.
- Gerrards-Hesse, A., & Spies, K. (1994). Experimental inductions of emotional states and their effectiveness: A review. *British Journal of Psychology, 85*(1), 55.
- Gilead, M., Katzir, M., Eyal, T., & Liberman, N. (2016). Neural correlates of processing “self-conscious” vs. “basic” emotions. *Neuropsychologia, 81*, 207-218.
- Giles, G. E., Cantelon, J. A., Eddy, M. D., Brunyé, T. T., Urry, H. L., Taylor, H. A., . . . Kanarek, R. B. (2018). Cognitive reappraisal reduces perceived exertion during endurance exercise. *Motivation and Emotion*.
- Gillebaart, M., & de Ridder, D. T. D. (2015). Effortless self-control: A novel perspective on response conflict strategies in trait self-control. *Social and Personality Psychology Compass, 9*(2), 88-99.
- Giner-Sorolla, R. (2001). Guilty pleasures and grim necessities: Affective attitudes in dilemmas of self-control. *Journal of Personality and Social Psychology, 80*, 206–221.
- Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In V. I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist, 54*(7), 493-503.

- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, 38, 69-119.
- Grasmick, H. G., Tittle, C. R., Bursik, R. J. J., & Arneklev, B. J. (1993). Testing the core empirical implications of Gottfredson and Hirschi's general theory of crime. *Journal of Research in Crime and Delinquency*, 30, 5-29.
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2(3), 271-299.
- Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 26, 1-26.
- Gross, J. J., Richards, J. M., & John, O. P. (2006). Emotion regulation in everyday life. In D. K. Snyder, J. A. Simpson, & J. N. Hughes (Eds.), *Emotion regulation in couples and families: Pathways to dysfunction and health* (pp. 13-35). Washington, DC: American Psychological Association.
- Gyurak, A., Gross, J. J., & Etkin, A. (2011). Explicit and implicit emotion regulation: A dual-process framework. *Cognition and Emotion*, 25(3), 400-412.
- Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, 136, 495.
- Harmon-Jones, C., Bastian, B., & Harmon-Jones, E. (2016). Detecting transient emotional responses with improved self-report measures and instructions. *Emotion*, 16(7), 1086-1096.
- Haynes, A., Kemps, E., & Moffitt, R. (2016). Does trait self-control predict weaker desire for unhealthy stimuli? A lab-based study of unhealthy snack intake. *Personality and Individual Differences*, 89, 69-74.

- Hennecke, M., Czikmanti, T., & Brandstätter, V. (2018). Doing Despite Disliking: Self-Regulatory Strategies in Everyday Aversive Activities. Manuscript under review.
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, 44, 513-524.
- Hofmann, W., Baumeister, R. F., Förster, G., & Vohs, K. D. (2012). Everyday temptations: An experience sampling study of desire, conflict, and self-control. *Journal of Personality and Social Psychology*, 102(6), 1318-1335.
- Hofmann, W., & Fisher, R. R. (2012). How guilt and pride shape subsequent self-control. *Social Psychological and Personality Science*, 3, 682–690.
- Hofmann, W., Luhmann, M., Fisher, R. R., Vohs, K. D., & Baumeister, R. F. (2014). Yes, but are they happy? effects of trait self-control on affective well-being and life satisfaction. *Journal of Personality*, 82(4), 265-277.
- Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science*, 23(6), 582-588.
- Imhoff, R., Schmidt, A. F., & Gerstenberg, F. (2014). Exploring the interplay of trait self-control and ego depletion: Empirical evidence for ironic effects. *European Journal of Personality*, 28, 413–424.
- Inzlicht, M., Schmeiche, B.J., & Macrae, C.N. (2014). Why self-control seems (but may not be) limited. *Trends in Cognitive Sciences*, 18(3), 127–133.
- Juergensen, J., & Demaree, H. A. (2015). Approach-motivated positive affect and emotion regulation alter global–local focus and food choice. *Motivation and Emotion*, 39(4), 580-588.

- Karnaze, M. M., & Levine, L. J. (2017). Data versus Spock: Lay theories about whether emotion helps or hinders. *Cognition and Emotion*, 1-17.
- Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, 30(7), 865-878.
- Katzir, M., Eyal, T., Meiran, N., & Kessler, Y. (2010). Imagined positive emotions and inhibitory control: The differentiated effect of pride versus happiness. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 36(5), 1314–1320.
- Keesman, M., Aarts, H., Häfner, M., & Papies, E. K. (2017). Mindfulness reduces reactivity to food cues: underlying mechanisms and applications in daily life. *Current Addiction Reports*, 4(2), 151-157.
- Kerr, N. L. (1998). HARKing: Hypothesizing after the results are known. *Personality and Social Psychology Review*, 2(3), 196-217.
- Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General*, 128, 78–87.
- Koole, S., Webb, T., & Sheeran, P. (2015). Implicit emotion regulation: feeling better without knowing why. *Current Opinions in Psychology*, 3, 6-10.
- Krosnick, J.A., & Presser, S. (2010). Question and Questionnaire Design. In J.D. Wright & P.V. Marsden (Eds.), *Handbook of Survey Research* (2nd Edition). West Yorkshire, England: Emerald Group.
- Kross, E., & Guevarra, D. (2015). Self-Control. *Oxford Bibliographies in Psychology*.
- Larsen, R.J. (2000). Toward a science of mood regulation. *Psychological Inquiry*, 11, 129–141.

- Larsen, R. J., & Ketelaar, T. (1991). Personality and susceptibility to positive and negative emotional states. *Journal of Personality and Social Psychology*, 61(1), 132-140.
- Lazarus, R. S. (1991). *Emotion and adaptation*. London: Oxford University Press.
- Lench, H. C., Flores, S. A., & Bench, S. W. (2011). Discrete emotions predict changes in cognition, judgment, experience, behavior, and physiology: A meta-analysis of experimental emotion elicitation. *Psychological Bulletin*, 137(5), 834-855.
- Lench, H. C., & Levine, L. J. (2005). Effects of fear on risk and control judgments and memory: Implications for health promotion messages. *Cognition & Emotion*, 19, 1049-1069.
- Li, X. P. (2008). The effects of appetitive stimuli on out-of-domain consumption impatience. *Journal of Consumer Research*, 34, 649-656.
- Lobbestael, J., Arntz, A., & Wiers, R. W. (2008). How to push someone's buttons: A comparison of four anger-induction methods. *Cognition and Emotion*, 22(2), 353-373.
- Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review. *Cognition & Emotion*, 23(2), 209-237.
- McCarthy, P. J., Allen, M. S., & Jones, M. V. (2013). Emotions, cognitive interference, and concentration disruption in youth sport. *Journal of Sports Sciences*, 31(5), 505-515.
- McIntyre, J. C., Barlow, F. K., & Hayward, L. E. (2015). Stronger sexual desires only predict bold romantic intentions and reported infidelity when self-control is low. *Australian Journal of Psychology*, 67(3), 178-186.

Miles, E., Sheeran, P., Baird, H., Macdonald, I., Webb, T. L., & Harris, P. R. (2016).

Does self-control improve with practice? Evidence from a six-week training program. *Journal of Experimental Psychology: General*, 145(8), 1075-1091.

Milyavskaya, M., & Inzlicht, M. (2017). What's so great about self-control? examining the importance of effortful self-control and temptation in predicting real-life depletion and goal attainment. *Social Psychological and Personality Science*, 8(6), 603-611.

Mischel, W. (2014). *The Marshmallow Test: Mastering self-control*. New York, NY: Little, Brown.

Mischel, W., & Ebbesen, E. B. (1970). Attention in delay of gratification. *Journal of Personality and Social Psychology*, 16, 329-337.

Mischel, W., Zeiss, A. R., & Ebbesen, E. B. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, 21, 204-218.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., . . . Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, 108, 2693-2698.

Muhtadie, L., Johnson, S. L., Carver, C. S., Gotlib, I. H., & Ketter, T. A. (2014). A profile approach to impulsivity in bipolar disorder: The key role of strong emotions. *Acta Psychiatrica Scandinavica*, 129(2), 100-108.

Muraven, M. (2010). Practicing self-control lowers the risk of smoking lapse. *Psychology of Addictive Behaviors*, 24(3), 446-452.



- Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126, 247-259.
- Muraven, M., Shmueli, D., & Burkley, E. (2006). Conserving self-control strength. *Journal of Personality and Social Psychology*, 91, 524–537.
- Muraven, M., Tice, D., Baumeister, R. (1998). Self-control as a limited resource: regulatory depletion patterns. *Journal of Personality and Social Psychology*, 74(3), 774–89.
- Netzer, L., Van Kleef, G. A., & Tamir, M. (2015). Interpersonal instrumental emotion regulation. *Journal of Experimental Social Psychology*, 58, 124-135.
- Niermann, C. Y. N., Herrmann, C., von Haaren, B., van Kann, D., & Woll, A. (2016). Affect and subsequent physical activity: An ambulatory assessment study examining the affect-activity association in a real-life context. *Frontiers in Psychology*, 7, 10.
- Oaten, M., & Cheng, K. (2006). Longitudinal gains in self-regulation from regular physical exercise. *British Journal of Health Psychology*, 11, 717–733.
- Onwezen, M. C., Bartels, J., & Antonides, G. (2014). The self-regulatory function of anticipated pride and guilt in a sustainable and healthy consumption context. *European Journal of Social Psychology*, 44(1), 53-68.
- Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science*, 349(6251), 1-8.
- Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on amazon mechanical turk. *Judgment and Decision Making*, 5(5), 411-419.
- Papies, E. K. (2016). Goal priming as a situated intervention tool. *Current Opinion in Psychology*, 12, 12-16.

- Papies, E. K., & Hamstra, P. (2010). Goal priming and eating behavior: Enhancing self-regulation by environmental cues. *Health Psychology, 29*(4), 384-388.
- Paschke, L. M., Dörfel, D., Steimke, R., Trempler, I., Magrabi, A., Ludwig, V. U., . . . Walter, H. (2016). Individual differences in self-reported self-control predict successful emotion regulation. *Social Cognitive and Affective Neuroscience, 11*(8), 1193-1204.
- Patrick, V. M., Chun, H. H., & Macinnis, D. J. (2009). Affective forecasting and self-control: Why anticipating pride wins over anticipating shame in a self-regulation context. *Journal of Consumer Psychology, 19*(3), 537-545.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology, 51*, 768-774.
- Peer, E., Vosgerau, J., & Acquisti, A. (2014). Reputation as a sufficient condition for data quality on amazon mechanical turk. *Behavior Research Methods, 46*(4), 1023-1031.
- Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). *Linguistic inquiry and word count: LIWC [computer software]*. Austin, TX: LIWC.net.
- Pyone, J. S., & Isen, A. M. (2011). Positive affect, intertemporal choice, and levels of thinking: Increasing consumers' willingness to wait. *Journal of Marketing Research, 48*(3), 532-543.
- Quoidbach, J., Berry, E. V., Hansenne, M., & Mikolajczak, M. (2010). Positive emotion regulation and well-being: Comparing the impact of eight savoring and dampening strategies. *Personality and Individual Differences, 49*, 368-373.
- Raghunathan, R., & Trope, Y. (2002). Walking the tightrope between feeling good and being accurate: Mood as a resource in processing persuasive messages. *Journal of Personality and Social Psychology, 83*, 510-525.

- Rottweiler, A.L., Taxer, J.L., & Nett, U.E. (2018). Context Matters in the Effectiveness of Emotion Regulation Strategies. *AERA Open*, 4(2), 1-13.
- Scherrer, M. C., & Dobson, K. S. (2009). Predicting responsiveness to a depressive mood induction procedure. *Journal of Clinical Psychology*, 65(1), 20-35.
- Schmeichel, B. J., & Zell, A. (2007). Trait self-control predicts performance on behavioral tests of self-control. *Journal of Personality*, 75(4), 743–756.
- Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience sampling: Promises and pitfalls, strengths and weaknesses. *Journal of Happiness Studies*, 4(1), 5-34.
- Shenhav, A. (2017). The perils of losing control: Why self-control is not just another value-based decision. *Psychological Inquiry*, 28(2-3), 148-152.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2012). A 21 word solution. *Dialogue: The Official Newsletter of the Society for Personality and Social Psychology*, 26, 4–7.
- Stöckli, S., Stämpfli, A. E., Messner, C., & Brunner, T. A. (2016). An (un)healthy poster: When environmental cues affect consumers' food choices at vending machines. *Appetite*, 96, 368-374.
- Tamir, M. (2005). Don't worry, be happy? Neuroticism, trait-consistent affect regulation, and performance. *Journal of Personality and Social Psychology*, 89(3), 449–461.
- Tamir, M. (2009a). What do people want to feel and why? Pleasure and utility in emotion regulation. *Current Directions in Psychological Science*, 18(2), 101-105.
- Tamir, M. (2009b). Differential preferences for happiness: Extraversion and trait-consistent emotion regulation. *Journal of Personality*, 77(2), 447-470.

- Tamir, M., Bigman, Y. E., Rhodes, E., Salerno, J., & Schreier, J. (2015). An expectancy-value model of emotion regulation: Implications for motivation, emotional experience, and decision making. *Emotion, 15*, 90–103.
- Tamir, M., & Ford, B. Q. (2012). When feeling bad is expected to be good: Emotion regulation and outcome expectancies in social conflicts. *Emotion, 12*(4), 807–816.
- Tamir, M., Mitchell, C., & Gross, J.J. (2008). Hedonic and instrumental motives in anger regulation. *Psychological Science, 19*, 324–328.
- Tangney, J. P. (2003). Self-relevant emotions. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 384-400). New York: Guilford Press.
- Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72*(2), 271–324.
- Thoma, M., Ryf, S., Mohiyeddini, C., Ehlert, U., & Nater, U. M. (2012). Emotion regulation through listening to music in everyday situations. *Cognition and Emotion, 26*(3), 550-560.
- Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: Positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology, 43*(3), 379-384.
- Tong, E. M. W., Tan, K. W. T., Chor, A. A. B., Koh, E. P. S., Lee, J. S. Y., & Tan, R. W. Y. (2016). Humility facilitates higher self-control. *Journal of Experimental Social Psychology, 62*, 30-39.
- Tornquist, M., & Miles. (2018). Trait self-control and beliefs about the utility of emotions for initiatory and inhibitory self-control. Manuscript under review.

- Tsukayama, E., Duckworth, A. L., & Kim, B. (2013). Domain-specific impulsivity in school-age children. *Developmental Science*, *16*, 879–893.
- Tuk, M. A., Trampe, D., & Warlop, L. (2011). Inhibitory spillover: Increased urination urgency facilitates impulse control in unrelated domains. *Psychological Science*, *22*, 627–633.
- Tuk, M. A., Zhang, K., & Sweldens, S. (2015). The propagation of self-control: self-control in one domain simultaneously improves self-control in other domains. *Journal of Experimental Psychology: General*, *144*, 639–654.
- Vinci, C., Li, L., Wu, C., Lam, C. Y., Guo, L., Correa-Fernández, V., . . . Wetter, D. W. (2017). The association of positive emotion and first smoking lapse: An ecological momentary assessment study. *Health Psychology*, *36*(11), 1038–1046.
- Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource depletion approach. *Psychological Science*, *11*, 249–254.
- Vohs, K. D., Schmeichel, B. J., Nelson, N. M., Baumeister, R. F., Twenge, J. M., & Tice, D. M. (2008). Making choices impairs subsequent self-control: A limited-resource account of decision making, self-regulation, and active initiative. *Journal of Personality and Social Psychology*, *94*(5), 883–898.
- Västfjäll, D. (2002). Emotion induction through music: A review of the musical mood induction procedure. *Musicae Scientiae*, *6*, 173–211.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.
- Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and

- psychobiological evidence. *Journal of Personality and Social Psychology*, 76, 820–838.
- Wenzel, M., Conner, T. S., & Kubiak, T. (2013). Understanding the limits of self-control: Positive affect moderates the impact of task switching on consecutive self-control performance. *European Journal of Social Psychology*, 43(3), 175–184.
- Wertheim, E. H., & Schwarz, J. C. (1983). Depression, guilt, and self-management of pleasant and unpleasant events. *Journal of Personality and Social Psychology*, 45(4), 884–889.
- Westermann, R., Spies, K., Stahl, G., & Hesse, F. W. (1996). Relative effectiveness and validity of mood induction procedures: A meta-analysis. *European Journal of Social Psychology*, 26(4), 557–580.
- Westfall, J., Yarkoni, T. (2016). Statistically Controlling for Confounding Constructs Is Harder than You Think. *PLoS ONE*, 11(3), e0152719.
- Williams, L. A., & DeSteno, D. (2008). Pride and perseverance: The motivational role of pride. *Journal of Personality and Social Psychology*, 94(6), 1007–1017.
- Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-control constructs related to measures of dietary intake and physical activity in adolescents. *Journal of Adolescent Health*, 41(6), 551–558.
- Winterich, K. P., & Haws, K. L. (2011). Helpful Hopefulness: The Effect of Future Positive Emotions on Consumption. *Journal of Consumer Research*, 38(3), 505–524.
- Yusainy, C., & Lawrence, C. (2015). Brief mindfulness induction could reduce aggression after depletion. *Consciousness and cognition*, 33, 125–134.

- Zabelina, D. L., Robinson, M. D., & Anicha, C. L. (2007). The psychological tradeoffs of self-control: A multi-method investigation. *Personality and Individual Differences, 43*, 463–473.
- Zautra, A., Smith, B., Affleck, G., & Tennen, H. (2001). Examination of chronic pain and affect relationships: Applications of a dynamic model of affect. *Journal of Consulting and Clinical Psychology, 69*, 786–795.
- Zemack-Rugar, Y., Bettman, J. R., & Fitzsimons, G. J. (2007). The effects of nonconsciously priming emotion concepts on behavior. *Journal of Personality and Social Psychology, 93*(6), 927-939.
- Zhu, J., & Thagard, P. (2002). Emotion and action. *Philosophical Psychology, 15*(1), 19-36.

## Appendices

### Appendix 1. Self-Control Vignettes, Domains and Self-Control Type

#### **Food domain.**

*Inhibition.* I recently decided to stop eating sweets for a while. It took self-control to resist the urge because I normally eat candy at least once a day. I get physical cravings for something sweet after I've eaten "normal" food and especially in the evening. I like to eat something sweet while I'm watching TV and so I guess I've associated relaxation in the evening with candy. I also tend to eat a lot when I'm stressed and tend to eat as part of a procrastination process before starting on important school work. So, what was difficult for me was to change this behavior and not reach for the "usual" chocolate after lunch or dinner and whenever I didn't feel like doing school work.

#### **Work domain.**

*Initiation.* It was a Monday morning and I had just worked a night shift and I had a difficult university assignment to complete that was due in in 3 days. After work I went home and went to bed for about 3 hours. I told myself that after a couple of hours sleep I then had to get up and go to the university to meet some friends and work on my assignment. I knew I had to force myself out of bed to work on my assignment otherwise I would be behind and I would struggle to complete it.

#### **Relationship domain.**

*Inhibition.* I recently broke up with my boyfriend. He said some really hurtful and spiteful things to me and accused me of things that he knew not to be true. I exhibited self-control as I tried not to retaliate or indulge him in an argument.

#### **Sex domain.**

*Inhibition.* Me and my girlfriend had woken up in the morning and we had to leave her house in under an hour to get in time for a football game. We were already



only in our underwear and we started making out, and it started to turn into something more, and it took self-control to stop and get ready instead of carry on, but I knew that if we did we wouldn't make it back in time for the match. I had to be responsible because I'm the captain of the team and couldn't really be late, but I really didn't want to be responsible in that situation at all.

**Exercise domain.**

*Initiation.* I recently decided to get back into an old exercise routine. As an undergraduate student I had a good exercise routine as I had a big bedroom and a lot of free time. Soon after leaving university this routine changed and my fitness decreased. Recently, I decided that I needed to try and get back into an exercise routine to improve my level of fitness and general well-being. Getting back into this exercise routine was, however, difficult as I now have a much smaller room and I have nowhere near as much free time as I used to. Trying to find the time and space to exercise was difficult as I am now busy working and studying so I am often tired and have no motivation to exercise. It takes self-control to force myself to exercise when I am tired.

## **Appendix 2. Sample Self-Control Behaviors, Domains and Self-Control Type**

### **Food domain.**

*Initiation.* Please imagine that you are trying to get yourself to make healthy food choices when eating out at a cafe or restaurant (e.g., order a healthy side dish such as a salad or a vegetable soup).

*Inhibition.* Please imagine that you are trying to resist the temptation to eat late at night.

### **Work domain.**

*Initiation.* Please imagine that you are trying to get yourself to study for a test or quiz.

*Inhibition.* Please imagine that you are trying to resist the temptation to procrastinate.

### **Relationship domain.**

*Initiation.* Please imagine that you are trying to get yourself to tell someone how you feel (e.g., tell someone they hurt you, tell someone you love them).

*Inhibition.* Please imagine that you are trying to resist the temptation to say something you may later regret when you are angry.

### **Sleep domain.**

*Initiation.* Please imagine that you are trying to get yourself to wake up early every morning.

*Inhibition.* Please imagine that you are trying to resist the temptation to take a nap when you are tired (e.g., you try to resist napping or falling asleep in the daytime or early evenings).

### **Exercise domain.**

*Initiation.* Please imagine that you are trying to get yourself to exercise (e.g., go to the gym, go for a run).

**Appendix 3. Emotional Events**

**Pride.** Please write a short description of a personal event in which you succeeded at something that you had worked hard for (you invested long hours, physical exertion, mental effort etc.)

**Serenity.** Please write a short description of a personal event in which you experienced physical calmness (as a result of a massage, taking a bath etc.)

**Joy.** Please write a short description of a personal event in which you saw something very funny (stand-up comedian, a funny movie, a sitcom etc.)

**Hope.** Please write a short description of a personal event in which you were optimistic about the future (graduating and getting a job, getting married and starting a family etc.)

**Guilt.** Please write a short description of a personal event in which you said something that hurt someone close to you (partner, family, friend etc.)

**Anxiety.** Please write a short description of a personal event in which you experienced a stressful life situation (marriage, accident, illness, financial problems, moving house etc.)

**Anger.** Please write a short description of a personal event in which you were blamed for a mistake for which you were not responsible (at work, in school, with friends etc.)

**Appendix 4. Instructions for Regulatory Writing Task**

You will now write about your chosen event. Please begin by writing down what you remember of the situation, and continue by writing as detailed a description of the situation as is possible, and try to vividly imagine yourself in this situation while doing so. In the space below, write your description in as much detail as possible, so that someone reading this might feel as you felt when it happened to you. What is it like to be in this situation? Why does it make you feel this way?

Do not rush through this task. Take your time and describe the situation in detail. You will have 10 minutes to complete the task, but please write for at least 5 minutes (see timer above).

**Appendix 5. Instructions for Regulatory Writing Task**

Remember a specific event that has occurred in your life that has made you very pride [or guilty] . . . imagine the situation as vividly as you can. Picture the event actually happening to you. Try to experience all the details of the situation. . . think through the thoughts that occurred to you. . . feel the same feelings you felt - . . . describe the event you remembered as vividly as you can including all the important details.

**Appendix 6. Choices used in Discounting Task**

Please click on your preferred choice

**Choice 1.**

A. I prefer to get \$10 tomorrow

B. I prefer to get \$12 in 25 days

**Choice 2.**

A. I prefer to get \$67 tomorrow

B. I prefer to get \$85 in 70 days

**Choice 3.**

A. I prefer to get \$34 tomorrow

B. I prefer to get \$35 in 43 days

**Choice 4.**

A. I prefer to get \$48 tomorrow

B. I prefer to get \$55 in 45 days

**Choice 5.**

A. I prefer to get \$40 tomorrow

B. I prefer to get \$70 in 20 days

**Choice 6.**

A. I prefer to get \$16 tomorrow

B. I prefer to get \$30 in 35 days

**Choice 7.**

A. I prefer to get \$30 tomorrow

B. I prefer to get \$35 in 20 days

**Choice 8.**

A. I prefer to get \$15 tomorrow

B. I prefer to get \$35 in 10 days