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THE ROLE OF SELF-REGULATION IN ENVIRONMENTAL BEHAVIOR CHANGE

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Kristian Steensen Nielsen

THE ROLE OF SELF-REGULATION IN ENVIRONMENTAL BEHAVIOR CHANGE

Doctoral School of Organisation and Management Studies

PhD Series 24.2019

CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

The Role of Self-Regulation in Environmental Behavior Change

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Foreword

This PhD dissertation is a story of privilege. Many people spend large parts of their working careers before finding that one job they find both stimulating and intrinsically interesting—some never find it. When I landed the PhD position, my first real job, it allowed me to merge my academic interests with my personal passion: studying the psychological dynamics of changing behavior to address climate change and environmental problems. Rewinding the clock to the summer of 2011 where I had just finished the second year of my bachelor degree at what was then Aarhus School of Business, few people would have imagined that this topic would later become my deep-rooted passion. Back then I was a stereotypical and school-tired business school student, largely ignorant about the pressing environmental (and social) problems. A semester abroad at the University of Auckland, and especially the learnings acquired from taking one particular course, led me to fundamentally change my worldview, political beliefs, and academic interests. I returned to Denmark revitalized and with a new personal and academic passion.

Like many people before and after me, learning about the state of the climate system and the profoundness of environmental problems left me frustrated. But it also motivated me to act and change my own lifestyle and behavior. Fortunately, my family and friends were mostly receptive of my new life passion, and due to the interdisciplinary nature of my bachelor degree I managed to redirect my academic focus towards sustainability-related topics. The personal experiences of redefining myself and implementing behavioral changes to reduce my carbon footprint stimulated the further narrowing of my academic interest to environmental behavior change. In the years that followed I wrote my bachelor thesis and master thesis around this very topic. I also became involved in several sustainability projects outside my studies, first as a volunteer student worker in the innovative startup, WorldPerfect, and afterwards as a co-organizer of Aarhus Sustainability Festival (later renamed to SustaIN).

After graduating from Aarhus University and having moved to Copenhagen, I spent a long time searching for a job that would allow me to continue working with sustainability. Through a stroke of luck, I got in touch with Lucia Reisch who offered me a four-month internship. During this period, Wencke kindly snatched me up and proposed to convert an open call for a postdoc into a PhD position—one that was almost tailormade to my interests. The following three years as a PhD student have been a fantastic experience where I have had the privilege of immersing myself into a topic that is just as much a personal passion as it is an academic one.

Though my academic tale has been surrounded by positivity, the opposite is true of the phenomenon I am researching. Since 2011, global emissions of greenhouse gasses have continued to rise and many environmental problems have worsened. As a global community, we have monumentally failed to act appropriately on climate change and current and future generations will suffer the consequences for our inaction. This leaves me worried, yet simultaneously motivates me to continue researching a topic that only grows in importance the longer we postpone rapid action. I hope this PhD dissertation reflects the seriousness and determination required to tackle climate change because time is quickly running out.

My dissertation would not have been the same without the critical inputs from and support of many kind-hearted people to whom I sincerely thank. I want to thank my girlfriend, Maja, for her unconditional love and support, for pushing me to become a better researcher, for her wonderful feedback, and for always keeping me earthbound and motivated. I also want to thank my family for their continuous loving support throughout my PhD-life and for always being interested in my research projects and career.

A special thanks goes to my supervisor, Wencke Gwozdz, who has been an outstanding supervisor and friend. Wencke took a chance on me for which I am deeply grateful. She has also provided critical and instrumental inputs throughout the three years and made the entire process a great deal of fun. I too want to thank my second supervisor, Denise de Ridder, for her insightful comments and inputs that have significantly improved the shape of this dissertation. My close colleagues in the consumer research group—Tina, Jan, Kristian 2.0, and Lucia—also deserves my heartfelt appreciation for their close companionship and for the many fun times we shared. As does the many wonderful people at the Department of Management, Society and Communication that have made work life even more enjoyable.

I want to thank my fantastic collaborators for sharing their brilliance with me. I especially want to thank Paul Stern and Wilhelm Hofmann for their incredible interest in and inputs to our collaborations, which have greatly developed me as a researcher. I also want to thank Michael Vandenberg for being such a welcoming host during my two months in Nashville and for being a fantastic collaborator. My appreciation also goes to Ayelet Fishbach for welcoming me to Chicago and for her excellent feedback during my time there. Last, but not least I am sincerely thankful to Mistra Future Fashion and the Mistra Foundation for funding my PhD and for providing me with the opportunity to conduct interesting and high-powered research.

Abstract

A rapid and global transition is needed to prevent catastrophic climate change. This transition requires, amongst other, profound behavioral changes to reduce the emission of greenhouse gasses and other environmental impacts. Within psychology, researchers have studied the psychological constructs that predict the performance of environmentally friendly behaviors and how utilizing and manipulating these constructs can bring about behavioral changes. Limited research has, however, studied the dynamics of the behavior-change process itself to uncover the processes that determine the success or failure of environmental behavior change. To address this research gap, the dissertation investigates the role of self-regulation in behavior change that is voluntarily undertaken to limit environmental impacts. Studying self-regulation—the processes that enables humans to guide their behavior over time and builds on the capacity to influence, modify, and control their own behavior—can help identify key self-regulatory problems and strategies to overcome them.

The role of self-regulation in environmental behavior change was examined through four articles. Article I presented a theoretical account of self-regulation and theorized about how incorporating the construct of self-regulation can benefit the study of environmental behavior change. Article II focused on the moral nature of self-control, which is a central component of self-regulation, and examined the processes through which moral and environmental considerations influence decisions to purchase clothing. Article III explored the merits of goal support as a strategy for improving self-control and to increase the consistency between people's goal to purchase environmentally friendly clothing and their actual purchasing behavior. Article IV investigated the link between trait self-control and subjective well-being, and specifically the mediating role of four self-control strategies.

The articles together detail the complexity of self-regulation and environmental behavior change by highlighting the myriad self-regulatory processes involved in successfully executing a behavior change. Article I outlined, from a theoretical perspective, the central self-regulatory processes of goal setting and goal striving, and discussed how to increase the success rate of environmental behavior change. Article II found that moral and environmental self-control are unique from self-interested self-control and detailed the specific processes involved in the self-control process. Additionally, it showed how moral (and environmental) considerations influence purchasing decisions through inducing a sense of conflict, which increased the likelihood of resisting desires to purchase clothing. Article III found that goal support functions as an effective

self-control strategy across trait self-control levels. Article IV revealed how the positive relationship between trait self-control and subjective well-being is partially mediated through four self-control strategies. Moreover, it showed that trait self-control is linked with multiple strategies, and that not all strategies are equally predictive of the positive relationship between trait self-control and subjective well-being.

The dissertation contributes to the current understanding of environmental behavior change and its potential as a climate-mitigation strategy in multiple ways. First, the dissertation adds a novel theoretical perspective to the study of environmental behavior change that can help explain the frequently observed intention-behavior gap in environmental psychology. Second, it reveals the specific processes through which moral and environmental considerations may influence purchasing and behavioral decisions. This knowledge can be utilized in future interventions to improve the prospects of behavior-change success. Third, it exposes the social nature of environmental behavior change by showing how goal support from other people (or the lack thereof) can influence self-control and the performance of environmentally friendly behavior. Lastly, it contributes with further knowledge about the strategies embedded in self-control and how these relate to trait self-control's positive relationship with subjective well-being. Greater knowledge of self-control strategies is instrumental to identifying what strategies can most effectively promote environmental behavior change.

Resumé

En verdensomspændende omstilling er påkrævet for at forebygge katastrofale klimaforandringer. Denne omstilling nødvendiggør radikale tiltag, herunder omfattende adfærdsændringer der kan reducere udledningerne af drivhusgasser og andre miljøpåvirkninger. Psykologisk miljøforskning har længe afdækket de psykologiske faktorer, der påvirker menneskers udførelse af miljøvenlige handlinger og hvordan disse psykologiske faktorer kan anvendes til at frembringe miljøvenlige adfærdsændringer. De dynamiske processer involveret i miljøvenlige adfærdsændringer og deres indflydelse på, hvorvidt adfærdsændringerne er succesfulde eller ej, har dog ikke været genstand for megen forskning. Denne afhandling forsøger at adressere dette forskningsmæssige tomrum ved at undersøge hvordan menneskers evne til selvregulering påvirker miljøvenlige adfærdsændringer. Selvregulering involverer de processer, der muliggør mennesker at påvirke, modificere og kontrollere deres adfærd over tid. En bedre forståelse selvregulerings rolle i miljøvenlige adfærdsændringer kan bidrage til identificeringen af de væsentlige selvreguleringsproblemer, der kan udfordre adfærdsændringsprocessen, samt mulige og effektive strategier til at overvinde dem.

Selvregulerings rolle i miljøvenlige adfærdsændringer afdækkes i afhandlingen gennem fire videnskabelige artikler. Artikel I præsenterede en teoretisk redegørelse af selvregulering og hvordan inddragelsen heraf kan forbedre studiet af miljøvenlige adfærdsændringer. Både artikel II og III fokuserede på selvkontrol, som er en central komponent af selvregulering. Artikel II undersøgte den moralske dimension af selvkontrol og de specifikke processer hvorigennem moralske og miljømæssige hensyn påvirker beslutninger om at købe tøj. Artikel III udforskede, hvorvidt målspecifik støtte fra andre mennesker kan fungere som en effektiv selvkontrolstrategi, der kan forbedre overensstemmelsen mellem menneskers mål om at købe miljøvenligt tøj og deres egentlige købsadfærd. Artikel IV undersøgte sammenhængen mellem menneskers selvkontrol og deres lykke, og om fire selvkontrolstrategier medierer denne sammenhæng.

Artiklerne detaljerer tilsammen kompleksiteten i selvregulering og miljøvenlige adfærdsændringer ved at fremhæve de mange selvreguleringsprocesser, der er involveret i at eksekvere en succesfuld miljøvenlig adfærdsændring. Artikel I bidrogede med en teoretisk diskussion af de to centrale selvreguleringsprocesser i målsætning og målstræben. Ydermere diskuterede artiklen mulighederne for at øge miljøvenlige adfærdsændrings succesrate. Artikel II detaljerede de specifikke processer impliceret i udøvelsen af selvkontrol og demonstrerede hvordan selvkontrol motiveret af moralske og miljømæssige hensyn er unik fra selvkontrol

motiveret af egennyttige hensyn. Derudover fremviste artiklen, at moralske og miljømæssige hensyn påvirker tøjkoopsbeslutninger ved at fremprovokere en følelse af målkonflikt og øge motivationen til at udøve selvkontrol og forbigå tøjkoop. Artikel III bidrog med evidens for, at målspecifik støtte kan fungere som en effektiv selvkontrollstrategi, der endda fungerer for mennesker med både god og dårlig selvkontrol. Artikel IV demonstrerede at den positive sammenhæng mellem selvkontrol og lykke delvist kan forklares af menneskers brug af fire selvkontrollstrategier. Derudover detaljerede artiklen, hvordan brugen af disse fire selvkontrollstrategier påvirker lykke forskelligt.

Denne afhandling bidrager med ny viden om miljøvenlige adfærdsændringer og dets potentiale til at bidrage til omstillingen til et klimaneutralt verdenssamfund. Først og fremmest bidrager afhandlingen til miljøpsykologisk forskning ved at tilføje et nyt teoretisk perspektiv på miljøvenlige adfærdsændringer, der kan forfine forståelsen af, hvorfor mennesker ikke altid lykkedes med at ændre deres adfærd. Dernæst bidrager afhandlingen ved at afdække de specifikke processer, hvorigennem moralske og miljømæssige hensyn påvirker køopsbeslutninger. Denne viden kan anvendes til at forbedre adfærdsinterventioner og øge sandsynligheden for at menneskers moralske og miljømæssige hensyn faktisk afspejles i deres adfærd. Afhandlingen bidrager også ved at blotlægge den sociale side af miljøvenlige adfærdsændringer og hvordan målspecifik støtte fra andre mennesker (eller manglen på samme) kan påvirke selvkontrol og miljøvenlige handlinger. Endeligt bidrager afhandlingen med en øget forståelse af hvilke strategier, der bidrager til succesfuld selvkontrol, samt hvordan disse relaterer til menneskers lykke. Bedre kendskab til selvkontrollstrategier kan lede til identificeringen af hvilke strategier, der mest effektivt kan forbedre menneskers evne til at eksekvere miljøvenlige adfærdsændringer.

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Chapter 1: Introduction

The human species stands at a historic crossroads without precedent: our actions over the coming few decades—including our failures to act—will determine the trajectory of the Earth System, with climatic and environmental consequences potentially spanning millennia. If global emissions of greenhouse gasses (GHG) do not decline rapidly, climate change and global warming will continue and even accelerate due to the activation of ‘tipping elements’ in the climate system that amplify warming. This could potentially lead to conditions not experienced on Earth for several million years, including conditions that could make the planet inhospitable to humans and non-human species (Steffen et al., 2018).

The threat of climate change is ever-present but has been causing increasing concern amongst citizens, researchers, businesses and governments in recent decades (Poortinga, Whitmarsh, Steg, Böhm, & Fisher, 2019). The sincerity of this concern was clearly illustrated when world leaders in 2015 agreed upon and later ratified the Paris Agreement, which enshrined the necessity of keeping increases in global average temperature well below 2°C compared to pre-industrial levels. By setting this temperature target, which largely reflects scientific recommendations, it is possible to estimate the remaining ‘budget’ of CO₂ emissions (and other greenhouse gasses) if the target is to be met. While there remain scientific debates around the size of this budget, the budget represents a useful communication tool to which most people can relate: the longer the global community postpones reducing emissions the quicker we will spend the budget and subsequently need to make even more rapid and drastic reductions in emissions. If the global community is motivated to act on its concerns about climate change and restrict warming to well below 2°C, it would therefore be sensible to start ‘saving’ immediately by rapidly reducing GHG emissions. As it looks now, however, the global community is spending the budget as if there were no tomorrow.

Although the global community as a whole is currently failing to reduce overall GHG emissions, many actors are actively exploring and implementing solutions that promise or deliver emissions reductions. One broad category of climate change mitigation solutions can be labeled demand-side solutions (Creutzig et al., 2016, 2018). Embedded within such demand-side solutions are lifestyle and behavioral changes that reduce GHG emissions and support transition to a low-carbon society. Given the scale of the emissions reductions necessary to meet the Paris Agreement and the speed by which these reductions must be achieved, lifestyle and behavioral changes seem

inevitable—at least in those countries that emit the highest amounts of GHGs (van Vuuren et al., 2018).

Recent years have seen a growing research interest in lifestyle and behavioral changes as a means to deliver emissions reductions. Research on lifestyle and behavioral changes is strongly rooted in the social sciences and has much to offer climate-mitigation research (Castree et al., 2014; Victor, 2015). However, theoretical and empirical approaches to the study of behavior change vary greatly between different social science disciplines. Some disciplines have a strong emphasis on the role of structural factors and social practices in determining and shaping behavior (e.g., sociology), whereas other disciplines (e.g., psychology; see Nielsen, Clayton, Stern, Dietz, Whitmarsh, & Capstick, 2019a) focus on the individual and the individual's interactions with the social and biophysical world. This dissertation takes its point of departure in psychological research and thus the unit of analysis is the individual.

Psychologists have been studying environmentally friendly behavior¹ for decades. This research has mainly been rooted in the psychological subdiscipline of environmental psychology, although its impacts extend across other psychological subdisciplines (Stern, 1992). A major subject of research in environmental psychology has been the study of which psychological constructs can predict the performance of environmentally friendly behaviors and how these identified constructs can be used to bring about behavioral changes. Psychologists seeking to ascertain which psychological constructs have predictive value regarding the performance of environmentally friendly behaviors have developed new and applied existing psychological and conceptual models to achieve their research objectives. Historically, the most commonly applied models have been the *Theory of Planned Behavior* (Ajzen, 1991) and the *Value-Belief-Norm Theory* (Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Stern, 2000). Both models assume that either an intention or personal norm is the most proximal and predictive antecedent to the performance of environmentally friendly behavior. Mainly tested through surveys, these models have proven predictive of a number of different environmentally friendly behaviors, including using public transport (Heath & Gifford, 2002), adopting electric vehicles (Wang, Fan, Zhao, Yang, & Fu, 2016), recycling (Ramayah, Lee, & Lim, 2012), and improving household energy-efficiency (Fornara, Pattitoni, Mura, & Strazzera, 2016). More recently, attempts have been made

¹ Many terminologies have been applied to describe behavior undertaken with the aim of lessening environmental impacts. These terms include environmental behavior, proenvironmental behavior, environmentally significant behavior, environmentally friendly behavior, and climate mitigation behavior. Although I recognize there are certain distinctive conceptual features that separate these terms, the terms are used interchangeably throughout this dissertation.

to combine these models into a single comprehensive framework (Klößner, 2013). This modeling framework, which also integrates the concept of habits, has similarly proven predictive of behaviors such as the purchasing of fuel-efficient cars (Nayum & Klößner, 2017).

Psychologists have also developed behavioral interventions that make use of psychological constructs to encourage and bring about environmental behavior change. Such behavioral interventions have commonly been investigated through laboratory and field experiments (e.g., Sparkman & Walton, 2017; Tiefenbeck, Wörner, Schöb, Fleisch, & Staake, 2019) and have targeted a wide variety of psychological constructs, including social norms, goal setting, feedback, and behavioral intentions. Some of the most well-known and cited experiments have used normative approaches to motivate energy-saving behaviors (e.g., Nolan, Schultz, Cialdini, Goldstein & Griskevicius, 2008; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). For example, two field studies found that descriptive-norm appeals describing context-relevant group behavior positively promoted energy conservation—in this case in the form of hotel guests reusing hotel towels (Goldstein, Cialdini, & Griskevicius, 2008).

While prediction and experimental approaches to understanding and motivating environmentally friendly behavior have provided essential knowledge about such behaviors, limited environmental psychological research has studied the behavior-change process itself and how this process unfolds over time. Most notably, prediction research has found that the most proximal antecedents to behavior, such as intentions or personal norms, often have only modest explanatory power of behavior (Bamberg & Möser, 2007; Sheeran, 2002). In conceptual models the relationship between intentions/personal norms and behavior is largely treated as a black box. And while experimental approaches have been shown to succeed in changing behavior in an environmental direction, these experiments rarely assess whether or how behavioral changes are maintained over time and in other contexts (e.g., reusing towels at another hotel). To better understand how and when intentions influence the performance of environmentally friendly behaviors and to ascertain which processes determine whether such behaviors are continuously performed over time, it is necessary to examine the concept of self-regulation.

Self-regulation refers to those processes that enable humans to guide their behavior over time and builds on people's capacities to influence, modify and control their own behavior (Baumeister & Heatherton, 1996; Karoly, 1993). Self-regulation is a composite term that encompasses the processes by which people set, monitor, strive for, and attain goals. As argued throughout this dissertation, each of these processes is relevant for the study of environmental behavior change. Focusing on self-regulation offers a process-oriented approach to understanding

environmental behavior change, including understanding which types of environmental goals are adopted and how people monitor and strive for these goals. In environmental psychology, researchers have studied goal setting and especially how encouraging people to set goals can promote environmental behavior change (e.g., Osbaldiston & Schott, 2012). Other researchers have studied how different types of goals may relate to environmentally friendly behaviors (e.g., Lindenberg & Steg, 2007; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). While these efforts to gain a better understanding of environmental goal setting are warranted by the considerable and ongoing challenge of encouraging people to adopt environmental goals, the mere setting of environmental goals alone cannot guarantee that the associated environmentally friendly behaviors are performed. To date, however, only very limited research has been undertaken in environmental psychology on the processes that occur after an environmental goal has been set.

Self-regulation has prominently featured in research on other central life domains, such as health, academic performance, addiction, and interpersonal relationships. Though important findings have emerged from this research about the theoretical underpinnings of self-regulation and its behavioral significance, findings from other domains may not necessarily apply to environmental goals because their associated benefits are external to the self unlike most other researched goals. The purpose of this dissertation is, therefore, to incorporate self-regulation research into the environmental domain and to investigate its role in environmental behavior change.

Aim and structure of the dissertation

The present thesis examines the role of self-regulatory processes in behavior change undertaken to limit environmental impacts, aiming to provide new theoretical and empirical insights into self-regulatory processes and strategies. It is targeted especially toward researchers interested in the prospects of behavioral change as a means to mitigate climate change and other important environmental impacts. Many of these researchers are rooted in environmental psychology and disciplines outside psychology where research on self-regulation and self-control has yet to manifest itself. However, this dissertation also aims to make theoretical contributions to self-regulation research centered in social, personality, and cognitive psychology. Accordingly, the ambition of this dissertation is both to empirically investigate specific self-regulatory processes involved in behavior change and to build a case for why these theoretical concepts are relevant for researchers working on climate change mitigation and human-environment interactions, particularly in psychology. This research ambition can be summarized in the following research question:

What are the self-regulatory problems challenging environmental behavior change, and which self-regulatory strategies can enable successful change?

The answer to this research question will be sought through the introductory frame, one review article, and three empirical articles. The introductory frame positions the dissertation within the broader research agenda on demand-side solutions for climate change mitigation. The research presented throughout the introductory frame is mainly derived from disciplines outside psychology, except for the section on ‘changing individual behavior’ in Chapter 2, which incorporates findings from psychological research, including from other articles authored by myself that do not form part of this dissertation. In addition to positioning the dissertation within interdisciplinary research on demand-side mitigation solutions, I discuss how the study relates to existing research on environmental behavior change. I also reflect upon certain potentially problematic theoretical and empirical decisions often taken by (environmental) psychologists and to some extent by myself. Most importantly, I identify existing research gaps to substantiate the relevance of the present research and how it can make a significant contribution to the literature.

The first article reviews research on self-regulation and highlights its relevance for understanding environmental behavior change. This article details the processes of goal setting and goal striving and sets out the reasons why these processes might help improve our

understanding of environmental behavior change and why people sometimes fail to successfully change their behavior. In doing so it sketches some of the key self-regulatory problems that may challenge environmental behavior change, highlighting findings from research on self-regulation strategies and how these strategies can vary in their effectiveness. It is important to note that self-regulation strategies are throughout the dissertation restricted to only refer to those strategies that resolve desire-goal conflicts (e.g., whether to take the car or ride the bike to work); I thus equate self-regulation strategies with self-control strategies and will use the two terms synonymously. I acknowledge that there is a broader set of self-regulation phenomena that revolve around desire-desire conflicts (e.g., whether to sleep or have sex) and goal-goal conflicts (e.g., whether to study or attend an environmental demonstration). Whereas especially goal-goal conflicts are relevant for environmental behavior change, it is deemed beyond the scope of this dissertation (for related phenomena, such as goal balancing, see Fishbach, Zhang, & Koo, 2009; Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014).

The second article introduces the broad concept of moral self-control, which refers to the process of resisting a selfish impulse or desire in the service of a selfless long-term moral value or standard. In mapping the processes through which moral considerations influence behavioral outcomes, the article tests a four-step model of moral self-control. The same four-step model is also used to analyze whether environmental considerations, which are conceptually reminiscent of moral considerations, influence behavior through similar processes.

The third article focuses on people pursuing the goal of acquiring environmentally friendly clothing, exploring whether receiving goal support from others is an effective strategy for improving self-control. Specifically, the paper investigates whether shopping for clothes in the presence of other people who are supportive of one's environmental clothing goal influences the likelihood of acting in accordance with that goal. Furthermore, it examines whether goal support is equally effective independent of people's levels of trait self-control.

The fourth article examines the link between trait self-control and subjective well-being. The article moves beyond previous research by exploring the mediating role of four self-control strategies: situation selection, attentional deployment, reappraisal, and inhibition. While the article departs from the environmental domain, it adds two important perspectives. First, it shows that trait self-control is associated with multiple self-control strategies. Second, it shows that the tendency to employ certain self-control strategies has implications not only for goal progress but also for subjective well-being.

The following four articles comprise the body of this dissertation:

1. Nielsen, K. S. (2017). From prediction to process: A self-regulation account of environmental behavior change. *Journal of Environmental Psychology*, *51*, 189-198.
2. Nielsen, K. S., & Hofmann, W. (2019). *Moral fabrics: A daily diary study on the link between moral self-control and clothing consumption*. Manuscript under review in *Social Psychological and Personality Science*.
3. Nielsen, K. S., & Bauer, J. M. (2018). The Merits of Goal Support as a Self-Control Strategy. *Social Psychological and Personality Science*, <https://doi.org/10.1177/1948550618780729>
4. Nielsen, K. S., Gwozdz, W., & De Ridder, D. (2019). Subjective well-being and trait self-control: The mediating role of four self-control strategies. *Frontiers in Psychology*, *10*, 706.

While writing my PhD I, amongst other, co-authored the following journal articles, which have informed this dissertation and served as its backbone, though they have not been included as distinct entities:

Journal articles

- Vandenbergh, M. P., & Nielsen, K. S. (2019). From myths to action. *Nature Climate Change*, *9*, 8-9.
- Gwozdz, W., Nielsen, K. S., & Müller, T. (2017). An environmental perspective on clothing consumption: Consumer segments and their behavioral patterns. *Sustainability*, *9*, 762.
- Nielsen, K. S., Clayton, S., Stern, P. C., Dietz, T., Capstick, S., & Whitmarsh, L. (2019) *How psychology can help limit climate change*. Manuscript under review in *American Psychologist*.

Chapter 2: Background

The background section positions the dissertation within the research on demand-side solutions for climate change mitigation, and more specifically those solutions that involve individual behavior changes. In this section I will first present the current and future consequences of climate change before detailing the mitigation challenge and reviewing how research communities have studied climate change mitigation until now. Next, the section zooms in on individual and household consumption as a driver of climate change, as well as considering the sources and actors responsible for associated GHG emissions. Lastly, this section introduces individual behavior change, including three dimensions relevant for understanding the potential of behavior change as a climate-mitigation strategy, the distinction between frequently and infrequently performed behaviors, and the behavior-change process.

The challenge of climate change

The global climate system is moving towards a state unprecedented in human history. Emissions of greenhouse gasses, predominantly from burning fossil fuels and the transformations of natural land, have shifted Earth's energy balance and caused global warming. The global mean surface temperature has already increased by 0.87°C compared to pre-industrial levels (IPCC, 2018), and global warming continues at a rate of at least 0.2°C per decade due to past and ongoing GHG emissions (Smith et al., 2018; Xu, Ramanathan, & Victor, 2018). Depending on future trajectories of human societies, the global mean temperature may increase to 3.5°C above pre-industrial levels by 2100. Such a temperature increase will have detrimental effects for humans, non-human species, and vital ecosystems.

The continued emission of GHGs causes an ever-increasing concentration of CO₂ in the atmosphere. The current atmospheric CO₂ level is 410 ppm, a level not observed during the last 800,000 years, and possibly not even in the past 20 million years (IPCC, 2013; NOAA, 2019). Consequently, researchers have proposed that Earth has transitioned from the Holocene epoch of the past 10,000-12,000 years into a new epoch called the Anthropocene period (Crutzen, 2002; Steffen, Broadgate, Deutsch, Gaffney, & Ludvig, 2015). This transition into the Anthropocene—demarcating an epoch where human activity is the dominant influence on Earth's geology and ecosystems—means that we are leaving behind the climatically stable epoch that allowed the human species to develop socially and technologically complex societies. In other words, humans

are now wandering into uncharted territory with new climatic conditions that will challenge the future prospects of decent human existence (Xu & Ramanathan, 2017).

Climate change has already had significant environmental and societal consequences. Observed environmental consequences include an increase in the frequency of extreme weather events, rising sea-levels, diminishing ice sheets, loss of biodiversity, ocean acidification, the bleaching and death of coral reefs, and the thawing of permafrost (IPCC, 2013, 2018). The loss of species is current occurring at a rate of 100–1,000 times the historical rate, leading researchers to claim that the sixth mass extinction is currently underway (Ceballos et al., 2015; De Vos, Joppa, Gittleman, Stephens, & Pimms, 2015). These environmental consequences both directly and indirectly affect societies, which have to respond and adapt to more powerful storms, intensified downpours, rising sea-levels, more frequent heatwaves and wildfires, and a growing scarcity of freshwater (Mora et al., 2018). In 2017 alone, for example, 712 extreme weather events worldwide resulted in economic losses amounting to US\$326 billion, while 153 billion hours of labor were lost due to heat (Watts et al., 2018). Agricultural yields also suffer through climate change, as intensifying precipitation, drought, sea-level rise (causing saltwater intrusion, amongst other effects), changes in natural land cover, and heatwaves can cause harvest failure and exacerbate food insecurity (Mora et al., 2018; Schlenker & Roberts, 2009).

Climate change not only affects environmental and societal systems. The often-overlooked impacts of climate change include negative effects on people's physical and mental health. These effects can arise directly from extreme weather exacerbated by climate change, or may surface more progressively from increasing temperatures and rising sea levels, as well as from weakened infrastructure and food insecurity (Clayton, Manning, Krygsman, & Speiser, 2017). For example, recent evidence suggests that even small changes in temperature and precipitation can cause major changes conducive to the transmission of water-borne diseases and vector-borne diseases such as malaria and dengue fever (Watts et al., 2018). Climate change has also been linked to a rising incidence of heat strokes, kidney disease, dehydration, and respiratory problems following more frequent extreme heat waves (Glaser et al., 2016; Hurteau, Westerling, Wiedinmyer, & Bryant, 2014; McMichael, 2013; Prospero & Lamb, 2003).

Mental health impacts induced by climate change are likewise serious and wide-ranging. Extreme and changing weather patterns, crop failures and damaged water resources can produce acute and chronic mental health problems, including trauma and shock, post-traumatic stress disorder (PTSD), compound stress, anxiety, depression, and even suicide (Clayton et al., 2017; Friel, Butler, & McMichael, 2011; Norris, Friedman, & Watson, 2001; Simpson, Weissbecker, &

Sephton, 2011). Mental health problems such as stress can not only have a severe impact on physical health (Sapolsky, 1994) but may also cause short- and long-term changes in behavior, memory, executive functions, and decision-making among children (Currie & Almond, 2011; Shonkoff et al., 2012). High temperatures can likewise impact arousal, which decreases attention and self-regulation and can lead to aggressive and violent behavior (Anderson, 2001). Moreover, heat can negatively impact cognitive functioning and conflict resolution, both of which are important factors in self-regulation and self-control (Pilcher, Nadler, & Busch, 2002).

While current warming has already produced significant impacts, these will grow in scope and severity as temperatures rise. The most influential research body on climate change, the Intergovernmental Panel on Climate Change (IPCC), recently published a special report on the impacts of global warming at 1.5°C above pre-industrial levels (IPCC, 2018). The report, which was mandated as part of the Paris Agreement, also assessed the differences in impact between keeping the global average temperature increase below 1.5°C or 2°C. The report's clear conclusion is that 0.5°C of additional warming most definitely matters. Notable differences between the impacts of 1.5°C and 2°C warming include the following consequences: significantly higher risks from droughts and extreme heat days; a rise of 0.1 meters in sea level by 2100; increased depletion of terrestrial, freshwater, and coastal ecosystems; higher risks of sea-ice-free Arctic Ocean during summers; coral-reef decline of more than 99% (versus 70–90% with 1.5°C warming); and amplified risks to livelihoods, food security, water supply, human security, and economic growth (IPCC, 2018). These impacts will only worsen, while further impacts will be added if global warming continues beyond 2°C.

Restricting global warming to well below 2°C, as stated in the Paris Agreement, is critical to avoid the severe impacts of global warming. Although the Paris Agreement was ratified by nearly all the nations in the world, subsequent reductions in GHG emissions have been much slower than required. Unless the current trajectory is shifted, both the 1.5°C and 2°C marks will be exceeded. Even if all nations meet their current reduction commitments, the global mean temperature will reach 3°C above pre-industrial levels by 2100, with warming continuing thereafter (UNEP, 2018). This trend should be of grave concern, since when warming increases beyond 2°C, and perhaps even much above 1.5°C, tipping elements in the climate system may be activated (Lenton et al., 2008; Steffen et al., 2018). These tipping elements cause further warming, which in turn activates other tipping elements in a domino-like cascade. The tipping elements with the highest probability of being activated include the thawing of the Greenland Ice Sheet and

Arctic summer sea-ice, Alpine glaciers and the West Antarctic Ice Sheet, and the disappearance of coral reefs (Steffen et al., 2018). All these tipping elements may be activated within a range of global warming of 1–3°C. Recent evidence suggests that a tipping point for the Greenland Ice Sheet may already have been reached (Bevis et al., 2019). This highlights the crucial need for rapid mitigation and cuts to global GHG emissions.

Climate change mitigation

Limiting global warming to either 1.5°C or 2°C, and thus fulfilling the Paris Agreement, requires global action on an unprecedented scale. Obviously, the speed with which GHG emissions reductions will need to be achieved varies between the two temperature targets, though even meeting the 2°C target requires fundamental societal, industrial, and economic changes (Rockström et al., 2017; Rogelj et al., 2015). To sketch and quantify pathways to fulfilling the Paris Agreement, researchers build mitigation scenarios. Mitigation scenarios are most often developed using integrated assessment models, which incorporate representations of biophysical and economic systems to generate insights into strategies capable of drastically reducing GHG emissions. Building these scenarios is accomplished by identifying the cost-optimal combination of technologies under a certain set of technology and policy assumptions (van Vuuren et al., 2018). By implication, mitigation scenarios can be composed of different sets of measures depending on the specific integrated assessment model and the specified assumptions. However, such models generally have to achieve a balance between lowering energy and resource intensity, the rate of decarbonization, and the extent of reliance on negative-emission technologies (IPCC, 2018).

Many scenarios have been built to identify ways to limit warming to either 1.5°C or 2°C. But the vast majority of these scenarios rely on negative-emission technologies; that is, on removing CO₂ from the atmosphere through technical means. This in-built reliance on negative-emission technologies has been criticized for being overly optimistic, since most of these technologies are still in their infancy and may need excessive areas of land for implementation (Anderson & Peters, 2016). Only a limited number of scenarios are available for limiting warming to 1.5°C without the use of negative-emission technologies, mainly because an even steeper reduction in GHG emissions would be needed without these technologies, raising concerns about the practical feasibility of such scenarios (Grubler et al., 2018; Rogelj et al., 2018; van Vuuren et al., 2018). Despite the controversies surrounding negative-emission technologies, even the scenarios that do incorporate such technologies illustrate the necessity for radical changes. A

recent report by the IPCC (2018) reached the following conclusions from a synthesis of the scenarios literature: limiting global warming to 1.5°C requires global net anthropogenic CO₂ emissions to decline approximately 45% from 2010 levels by 2030, reaching net zero by around 2050, while restricting warming to below 2°C involves a decline in CO₂ emissions of approximately 20% by 2030, reaching net zero by 2075.

The GHG emissions reductions needed to meet the Paris Agreement are radical. Bear in mind that the IPCC report (2018) used 2010 as the reference year. Although global GHG emissions leveled out between 2014 and 2016, leading some to argue that the world had finally decoupled GHG emissions from economic growth, they increased by 1.6% in 2017, and again by a staggering 2.8% in 2018 (Figueres et al., 2018; Le Quéré et al., 2018). Given that global GHG emissions have not only continued apace but actually risen, emissions must be reduced up by more than the percentages above indicate. In other words, the window for limiting warming to 2°C is rapidly closing. But while this window is indeed closing, all hope is not lost. Solutions to mitigate climate change already exist; the main issue is that of prioritizing their implementation.

Mitigation solutions

Research has identified two broad categories of climate mitigation solutions: supply-side and demand-side solutions. The mitigation scenarios discussed above tend to focus on supply-side solutions, such as substituting fossil fuels with renewable energy production, improving energy-efficiency, and rethinking production methods (Wilson, Grübler, Gallagher, & Nemet, 2012). Supply-side solutions are undoubtedly pivotal for successful mitigation because they can have wide-reaching and cross-sectoral impacts. If a Danish municipality establishes a new wind farm, for example, it will reduce the CO₂-intensity of the entire energy supply, and by implication also reduce the CO₂ emissions generated by the energy consumption of its users.

The potentially wide-reaching impacts of supply-side solutions go some way to explain why policymakers and many other actors, including climate researchers, have for decades now advocated and hoped for technological innovations to deliver the emissions reductions needed. The great attraction of supply-side solutions is that they often preserve the status quo, allowing the global economy and modern Western lifestyles to continue to prevail with only minor modifications. But while supply-side solutions must be pursued at all costs, limiting warming to below 2°C also demands solutions that can promise rapid and radical reductions in emissions. A major limitation of many supply-side solutions, particularly technological innovations, is that their

diffusion often takes years if not decades due to scalability issues, lock-in mechanisms (e.g., sunk costs and institutional commitments), and lack of sufficient political, regulatory, and business support (Geels, Sovacool, Schwanen, & Sorrell, 2017; Sovacool, 2016). Solutions that involve changing and reducing the demand for goods and services must therefore gain a much higher priority than previously (Creutzig et al., 2016). Demand-side solutions, moreover, can also complement and support the diffusion of supply-side solutions.

Demand-side solutions for mitigating climate change encompass a heterogeneous range of solutions. According to Creutzig et al. (2018), demand-side solutions include strategies that target technology choices, consumption, behavior, lifestyle, coupled production-consumption infrastructures and systems, service provision, and associated socio-technical transitions. These strategies have been studied by social scientists for decades but are only now gaining momentum in interdisciplinary research communities on climate change. For example, although the previous IPCC report (AR5) recognized the importance of improving end-use efficiency, it offered little detail or insight on the nature, scale, and implementation of demand-side solutions (Creutzig et al., 2018). The report also largely overlooked changes in behavior and lifestyles. The reason for the IPCC's limited recognition of research on demand-side solutions may reflect the difficulties associated with integrating research from social science into the dominant methodological framework of integrated assessment modeling (McCollum et al., 2017). Although this issue of integration still exists, the IPCC will for the first time feature a chapter in its next assessment report on demand, services, and social solutions for climate mitigation, and the authors of this forthcoming chapter will primarily be social scientists, including one psychologist. It is within the domain of demand-side solutions that this dissertation is positioned, specifically focusing on demand-side solutions that target lifestyle and behavioral changes on the part of households and individuals.

Household emissions

Multiple actors demand goods and services that produce GHG emissions. These include universities that need their employees to attend conferences around the world, hospitals that need new beds for their patients, as well as individual consumers who need new pairs of jeans. These actors differ in many respects, but they all have one thing in common: the capacity to change what products and services they demand and to reduce or increase the quantity of these products and services (with certain exceptions). For example, universities may choose to limit the number of

yearly conferences they permit or advocate the use of virtual communication technologies, while consumers may opt to purchase secondhand jeans or ones made from organic cotton. Actors vary in the number of goods and services they demand—often as a function of their size and profession—and by implication this also influences the amount of GHG emissions generated in meeting that demand. For example, a company such as Walmart obviously induces much larger amounts of GHG emissions than a single household; hence if Walmart were to decide to offer only vegetarian meals in all its canteens, much greater reductions in emissions would ensue than when a single household decides to become vegetarian. However, if a significant share of the world’s households decided to become vegetarian, emissions reductions of a similar or greater magnitude may be achieved. Researchers interested in studying the emission-reduction potential of demand-side solutions may therefore choose to focus on different actors, including companies, NGOs, governmental institutions, and households. This dissertation focuses on emissions reductions achieved by individuals in their role as consumers and household members.

Households are responsible for a significant share of global GHG emissions, though the exact share attributed to households differs according to the accounting method used (Hertwich & Peters, 2009). The standard method for allocating GHG emissions, called production-based accounting, uses national statistics and production systems and treats imported goods and services as if they were produced in the same country where they are consumed (Hertwich, 2011; Ivanova et al., 2016; Tukker & Jansen, 2006). But due to the intricacy of global supply chains, the final consumption does not necessarily occur in the production country. In production-based accounting, GHG emissions are also allocated to the sector producing the emissions, not the sector (or actor) that demands the good or service. From a household perspective, this means that a smaller share of the total GHG emissions associated with goods and services is allocated to the household sector. As a result, when using production-based accounting, households are mainly responsible for the direct GHG emissions they induce and not those induced during the earlier lifecycle stages of goods and services.

An alternative allocation method is consumption-based accounting. This method differs from production-based accounting by also considering the imports and exports of goods and services that either directly or indirectly produce GHG emissions (Davis & Caldeira, 2010). For example, a recent study showed that 20-30% of GHG emissions are generated by international trade (Weidmann & Lenzen, 2018). Consumption-based studies have also shown that no absolute decoupling between GHG emissions and economic growth has been achieved, particularly due to the relocation of GHG-intensive industries to developing countries (Wood et al., 2018; Xiao et

al., 2018). Because this dissertation predominantly focuses on households in Western countries, where a significant proportion of purchased goods are produced elsewhere in the world (e.g., clothing and electronics), all presented estimates of behavior-specific GHG emissions will be based on the consumption-based accounting method or the related method of lifecycle assessment. According to this methodology, 65–72% of global GHG emissions can be attributed to household consumption (Hertwich & Peters, 2009; Ivanova et al., 2016).²

The carbon footprint of households and individuals, meaning the amount of carbon dioxide and its equivalents (i.e., greenhouse gasses) they are responsible for emitting into the atmosphere, vary significantly across nations and socioeconomic classes. Globally, the average person has a carbon footprint of 3.4 tCO₂-eq. per year, but this statistic hides remarkable variance (Chancel & Piketty, 2015; Ivanova et al., 2016). For example, the average Indian only emits 0.8 tCO₂-eq. per year, whereas the carbon footprint of the average American is 18.6 tCO₂-eq. This disparity in emissions highlights the fact that not all countries or individuals are equally responsible for driving climate change (Hubacek, Baiocchi, Feng, & Patwardhan, 2017).

Discussions as to who bears historic and current responsibility for fueling climate change mainly emphasize the differences in GHG emissions between countries. The responsibility is therefore—and for highly legitimate reasons—predominantly placed on Western countries; however, such analyses tend to ignore the considerable differences in carbon-footprint within countries. The wealthiest 10% in the world, wherever they reside, are responsible for approximately 50% of GHG emissions (Gore, 2015; see also Otto, Kim, Dubrovsky, & Lucht, 2019). Adopting this perspective on emissions thus facilitates the identification of those households and individuals most relevant for targeted intervention to reduce emissions (see Nielsen et al., 2019a, for a broader discussion). Moreover, this approach better incorporates the pressing concerns of climate justice, taking into account not only those who will suffer the most consequences from climate change but also how climate change can most effectively be mitigated. While the issue of attributing responsibility and of identifying the most relevant targets for intervention will not be explicitly dealt with in this dissertation’s empirical base, these matters are important and will be revisited in the general discussion, since income inequality also relates to and interacts with self-regulation ability.

² Although consumption-based accounting is deemed most relevant for this dissertation, it does allocate the main responsibility for GHG emissions induced from goods and services to households. Households, as end-users, can indeed directly steer demand for goods and services, but emission-reducing initiatives implemented along the supply chain (i.e., supply-side solutions) can also directly lower the share of GHG emissions attributable to households.

The main sources responsible for household emissions can vary between contexts and households, but three sources typically stand out: transport, housing, and food. A recent study that mapped the carbon footprint of EU households found that transport contributes to approximately 30% of EU households' carbon footprint, though varying between 13–44% across regions (Ivanova et al., 2017). The majority of households' transport-induced emissions arise from burning transport fuels (e.g., from cars or airplanes). The composition of transport emissions usually differs according to income levels: for low- to medium-income households, for example, transport emissions are mainly induced from the use of private vehicles, while at the top of the income ladder emissions from aviation become increasingly significant and may even be the greatest source of household emissions (e.g., Otto et al., 2019). Housing and food consumption were found to be responsible respectively for 22% and 17% of the carbon footprint of EU households (Ivanova et al., 2017). Housing-related emissions can be attributed to the construction of buildings, the heating and cooling of homes, and electricity consumption. Emissions associated with heating, cooling, and electricity consumption vary depending on the energy sources used to supply these services, weather and climatic factors, as well as other variables such as floor space (Isaac & van Vuuren, 2009; Nielsen, Birkved, Gwozdz, & Stern, 2019b; van Ruijen, de Vries, van Vuuren, & van der Sluijs, 2010). As an illustration of the significance of such differences in energy-supply sources, in 2014 the carbon-intensity per kWh of electricity was almost one hundred times greater in Kentucky than in Vermont, due exclusively to differences in energy supply (Kennedy, 2017). The main contributors to food-induced emissions, meanwhile, are animal-based products (Clark, Hill, & Tilman, 2018; Ivanova et al., 2017; Springmann et al., 2018). Food products from ruminant animals are especially carbon-intensive due to the animals' emissions of methane (a highly potent, albeit short-lived greenhouse gas). As a result, a number of recent studies have emphasized the importance of shifting dietary patterns to become increasingly plant-based. For example, one study estimates that moving from current global diets to a diet that excludes animal products could reduce GHG emissions by 49% (Poore & Nemecek, 2018).

Environmental impacts

Efforts to limit global warming to date have emphasized the importance of reducing anthropogenic GHG emissions. This emphasis is legitimate in view of the fact that anthropogenic GHG emissions are the main contributor to climate change, yet there are other highly important

environmental impact indicators that also need to be considered. For example, the Planetary Boundaries framework (Rockström et al., 2009; Steffen et al., 2015) identifies nine boundaries critical for the stability and maintenance of the Earth System. Within this framework, climate change represents only one of nine boundaries, albeit recognized as a ‘core’ boundary together with biosphere integrity (biodiversity loss and extinctions).

Another important boundary is land use change. The transformation of forests, grassland, wetlands and other vegetation types, especially their conversion to agricultural land, has major implications for biodiversity and the functionality of land-based carbon sinks (i.e., the ability to absorb and store GHG emissions; Creutzig et al., 2019; Steffen et al., 2015). In other words, the transformation of land, such as deforestation, can be—and already is—a potent contributor to GHG emissions and global warming (IPCC, 2013).

A number of other important environmental impacts also exist, including ozone depletion, ocean acidification, freshwater use, metal depletion, and marine and terrestrial toxicity (e.g., Kalbar, Birkved, Kabins, & Nygaard, 2016; Rockström et al., 2009; Steinmann et al., 2017). As an illustration of the scope of environmental impacts, when environmental engineers perform a lifecycle assessment of a given behavior they measure the impact on up to 18 different impact categories (Kalbar et al., 2016). Such quantification specificity facilitates the identification of those behaviors most relevant to target for researchers, policymakers, and organizations seeking to limit GHG emissions or other environmental impacts induced by households and individuals.

The purpose of this brief section has been to highlight the existence of a multitude of environmental impacts, all of which vary in their interconnectedness and in their significance for climate change. Although the significance of environmental impacts depends on the objective in mind (e.g., to mitigate climate change), it is critical that (behavioral) researchers are mindful of the different ways in which the behaviors they study impact the environment in order to target and develop interventions effectively. If the plurality of environmental impacts is ignored, doubts must arise as to the actual effectiveness of interventions in reducing environmental pressures and meeting their objectives (Nielsen et al., 2019a). This point will be revisited in Chapter 4, which includes a discussion of the context of main focus in this dissertation. In line with the emphasis until now, however, the main focus of the dissertation will be on climate change mitigation through changes in individual behavior intended to limit GHG emissions.

Changing individual behavior

‘Individual behavior’ is a broad term that encompasses everything from simple behaviors with minor consequences (e.g., drinking a cup of coffee) to complex behaviors with potentially life-long consequences (e.g., purchasing an expensive new house). This in turn means that the characteristics and predictors of behaviors vary accordingly. Recognizing this heterogeneity is critical when seeking to intervene against and change individual behavior with the ambition of reducing GHG emissions. Before unfolding these behavioral distinctions in greater detail, however, it is important to consider the higher-order dimensions that encapsulate the potential of individual behavior change to help mitigate climate change. For this purpose, three dimensions are identified: (i) time frames; (ii) individuals’ roles; and (iii) factors affecting the effectiveness of potential behavioral interventions (Nielsen et al., 2019a).

Time frames. Individual behavior can affect emissions over multiple time frames. For example, Stern et al. (2016) distinguish between three time frames: short (from moments to days, e.g., the time frame for changing household-equipment use); intermediate (weeks to decades, e.g., the time frame for acquiring new equipment that can reduce emissions over time); and long (the roughly generational time frame for societal and technological transformations). Behaviors in one time frame can influence the potential for behavioral performance in other time frames. For example, rebound effects imply that behavioral changes that both reduce emissions and costs may result in the money saved being re-spent on other GHG-emitting activities that either partially or fully offset the initial reductions achieved in emissions (Greening, Greene, & Difiglio, 2000). Conversely, research on behavioral spillover has shown that the performance of one emissions-reducing behavior may motivate the performance of other emissions-reducing behaviors (Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014).

Roles. Individuals, the primary actor studied when using psychological concepts, can act in many roles to impact emissions in any time frame. The following five roles of individuals can be distinguished on the basis of previous research (Clayton et al., 2015; Stern, 2014, 2018; Whitmarsh, O’Neill, & Lorenzoni, 2010): (a) *consumers*, who meet their objectives by choosing and using fuels, equipment, foods and other consumer goods and services that emit GHGs either directly through their use (e.g., cars and air travel) or indirectly through their production-use-disposal life cycles; (b) *investors/producers*, who can reduce GHG emissions by installing renewable energy production systems for internal use (e.g., solar or wind power, or electric

vehicles that run on renewable energy supplies) or by investing in entities that reduce their own direct and indirect GHG emissions or facilitate others in doing so (e.g., green investing and carbon offsetting); (c) *participants in organizations* that produce or can affect emissions and which may be influenced by their members or employees (e.g., corporations, universities and government agencies); (d) *members of communities* (e.g., social, cultural and religious groups) who may deliberate, organize, and disseminate information about climate mitigation options and act collectively to reduce GHG emissions directly and/or indirectly (e.g., community tree planting, giving internal and external talks, and lobbying policy-makers); and (e) *citizens*, who can influence policies at various levels in order to reduce emissions generated by the activities of public and private institutions and facilitate lower-emissions choices by the organizations and households within the jurisdictions of such institutions. Some actions may fall into multiple categories, or into different categories for different people. For example, food choices may be purely a consumer decision for some people, while others make food choices as citizens and as consumers by considering the consequences of their choices for animal welfare, the environment, and/or social justice.

Factors affecting effectiveness. There are three factors that influence the effectiveness of behavioral interventions in reducing GHG emissions (Dietz et al., 2009; Vandenberg & Gilligan, 2017). The first factor, *behavioral plasticity*, i.e., the degree to which a target behavior can be changed by an intervention over the time period studied, is the aspect of effectiveness most commonly studied in psychology. The second factor, a common focus among physical scientists and engineers, is the *technical potential* of the targeted behaviors, i.e., the effect a target behavior can have on aggregate GHG emissions (or other environmental impacts) if universally adopted. The emissions-reductions potential of a proposed behavioral change can be estimated as the product of behavioral plasticity and technical potential. The third factor, a common focus among policy analysts, is *initiative feasibility*, which is the extent to which an intervention being considered for changing behavior, such as a financial incentive, regulation, or educational program, can actually be implemented. Analyses that consider all three dimensions of effectiveness are currently rare, primarily because such analysis requires integrating theories and methods across disciplines that are not always easily integrable. However, a heightened sensitivity towards these factors can facilitate the process of identifying the most promising behavioral interventions for mitigating climate change.

Reflecting upon the three dimensions helps position the contributions of individual studies within the larger body of demand-side solutions for climate change mitigation. In this context, the present focus is primarily confined to behavioral changes occurring in a short time frame (but with accumulating GHG implications), concentrating on individuals in their capacity as consumers and household members, and analyzing the psychological processes influence behavioral plasticity. As will be discussed below, this delimitation follows most psychological research related to climate change mitigation and environmental behavior. Importantly, however, this dissertation focuses on theoretical aspects of individual behavior (change) not widely studied within this research tradition and whose principles should apply to the entire space covered by the three higher-order dimensions.

Frequently-performed behavior

Frequently-performed behaviors, such as using electricity-consuming equipment or recycling, have been the main subject of psychological research in the environmental domain. Consequently, researchers have identified numerous psychological concepts relevant to predicting and manipulating the performance of frequently-performed behaviors (Stern, 2011). This knowledge has informed behavioral interventions that have successfully showcased the potential to manipulate individual behavior to reduce GHG emissions. For example, studies have shown that giving injunctive normative messages (i.e., messages targeting perceptions of what is approved or disapproved of in the culture) can manipulate people's household energy consumption and produce short-term reductions in GHG emissions (Schultz et al., 2007). Other studies have further shown how inducing goal-setting and providing feedback can lower household electricity consumption (Abrahamse, Steg, Vlek, & Rothegetter, 2007; Karlin, Zinger, & Ford, 2015).

The prevailing focus on frequently-performed behaviors in psychological studies is understandable, since these behaviors are easier to study in greater numbers than infrequently-performed behaviors such as acquiring a new house or vehicle. Moreover, psychological concepts are more likely to have greater predictive power for frequently-performed behaviors (Bamberg & Moser, 2007; Wolske & Stern, 2018). The predominant focus on frequently-performed behaviors does not constitute a problem in its own right; however, the relative neglect of infrequently-performed behaviors has led to certain highly GHG-intensive behaviors being understudied. For example, choices of where to live and in what sort of home can directly influence future GHG emissions by locking people into certain lifestyles, energy-consuming equipment, and carbon-

intensive modes of transport. Despite these impacts, such decisions have received limited attention in psychological research (Kastner & Stern, 2015; Stern et al., 2016).

While the behaviors with the greatest implications for GHG emissions are oftentimes rare events, such as those listed above, frequently-performed behaviors can also make up a significant share of an individual's carbon footprint. This primarily refers to food and transport choices, which, as noted earlier, are among the major sources of emissions in households (Ivanova et al., 2017; Kalbar et al., 2016; Nielsen et al., 2019b). However, certain consumer goods (e.g., clothing and electronic equipment) can also significantly impact one's carbon footprint (Ivanova et al., 2016). These frequently-performed behaviors have not been center stage in psychological research; rather, other behaviors with limited capability to reduce GHG emissions have received the most attention (Nielsen et al., 2019a). The most popular of these behaviors include shutting off lights in unoccupied rooms, recycling bottles, taking shorter showers and, most recently, foregoing plastic products. Obviously, not all infrequently-performed behaviors have a high technical potential to reduce emissions either. What is important in selecting the behavior to be studied, whether studying frequently- or infrequently-performed behaviors, is that the choice must be influenced not only by practical matters like the relative ease of collecting data but also by the technical potential of change in that behavior to reduce GHG emissions and/or other environmental impacts.

How does the focus of this dissertation on behavior change and self-regulation relate to the dichotomy between frequently- and infrequently-performed behaviors? Studying the dynamics of behavior change and the significance of self-regulation pertaining to this process is not only easier in the case of frequently-performed behaviors (e.g., in terms of data collection), but arguably also more informative and theoretically rewarding. As a result, the empirical papers of this dissertation will mainly focus on frequently-performed behaviors. The reason for this focus is that behavior change is typically undertaken when the performance of one or multiple behaviors fails to achieve important goals or moral values (e.g., protecting the environment). The realization of the need for change may occur in the case of both frequently- and infrequently-performed behaviors; however, with frequently-performed behaviors people have more opportunities to implement the change. For example, dissatisfaction with a recently purchased water heater for one's house may cause one to reexamine the decision-making process, yet opportunities to undertake this process again are rare due to the financial costs incurred in the initial investment. By contrast, realizing the environmental impacts of meat consumption may convince a person to become a vegetarian and this decision to change—unlike the case of buying a water heater—may be implemented as soon

as their next meal. The greater frequency of opportunities to implement a behavioral change also presents researchers with a greater opening for investigating the precise factors that predict the outcome of behavior-change attempts, such as individual differences in self-regulatory ability. While this serves as a justification for studying frequently-performed behaviors, as is the case in this dissertation, it does not detract from the importance of considering which frequently-performed behaviors are to be studied and their technical potential to lessen environmental impacts.

The behavior-change process

A behavioral change is typically initiated by forming a goal intention or behavioral intention. Goal intentions are internal self-instructions to achieve desired outcomes or avoid undesired outcomes (e.g., ‘I intend to become a vegetarian’). Behavioral intentions are self-instructions to perform particular behaviors aimed at achieving these outcomes, e.g., ‘I intend to eat tofu for lunch’ (Sheeran & Webb, 2016; Triandis, 1980). The extensiveness, timescale, and effort involved in a behavioral change may vary depending on whether a goal intention or behavioral intention is formed. A goal intention typically has a longer time horizon than a behavioral intention, though the two types of intentions are interconnected, since performing one or multiple behaviors is instrumental to achieving a goal (see the discussion in Article I). Because the present emphasis is on frequently-performed and environmentally harmful behaviors, a behavioral intention refers here to self-instructions to perform a particular behavior and to maintain this performance over time whenever an opportunity presents itself. As a consequence, one-off behavioral changes (e.g., ‘I intend to eat tofu next Monday’) will not be discussed. It should also be noted that behavioral changes may also occur without a clear goal (e.g., when it is externally nudged or due to compliance with social norms), or with the behavior change occurring first and the formation of an intention occurring afterwards. However, because the present focus is on comprehensive lifestyle or behavioral changes, it is presumed that the behavioral change is initiated by the formation of an intention.

Forming an intention initiates behavior change, though this does not guarantee the intention is actually realized. Subsequent challenges include determining criteria for evaluating progress towards achieving the (goal) intention and performing the necessary and appropriate behaviors (Mann, De Ridder, & Fujita, 2013). As a result, behavior change is difficult. Anecdotal evidence for this can be found in the notorious difficulties people experience in sticking to their New Year’s

resolutions (for empirical evidence, see Norcross, Ratzin, & Payne, 1989). Failure may occur at several stages in the process. For example, people may fail to act when an opportunity presents itself, or fail to maintain and/or monitor behavioral performance and goal pursuit, or fail to achieve the desired goal outcome (Carver & Scheier, 1998; Locke & Latham, 2002; Sheeran & Webb, 2016).

Extensive evidence has accumulated regarding the discrepancy between people's intentions and their behavior—also called the intention-behavior gap. A meta-analysis of experiments manipulating intentions found that a medium-to-large change in intentions only resulted in a medium-to-small change in behavior (Webb & Sheeran, 2006). Much of this evidence has emerged from studies focusing on behaviors outside the environmental domain; however, the intention-behavior gap is found to be equally prevalent with environment-related behaviors (Kollmuss & Agyeman, 2002; Vermeir & Verbeke, 2006). There may even be reasons to expect a greater intention-behavior gap in the case of environmental behaviors, since they mostly promise benefits largely external to oneself (at least in the short term), and thus their performance may be more frequently challenged by self-interested impulses and desires.

The challenges and struggles involved in converting intentions into actions and overcoming selfish desires are encapsulated in the concept of self-regulation. Broadly speaking, self-regulation refers to the processes by which people set, strive for, and attain goals (Mann et al., 2013). Examining these processes can help demystify the intention-behavior gap by identifying and studying the procedural steps taken toward goal attainment and maintenance, as well as investigating the psychological, social, and environmental factors that can facilitate or undermine self-regulation and the prospects of successful behavior change (e.g., Diamond, 2013; Friese, Hofmann, & Schmitt, 2008). Studying self-regulation can also lead to the development of interventions to improve people's ability to self-regulate, such as interventions targeting cognitive development or smarter use of self-regulatory strategies. In the theoretical framework that follows, I offer a detailed description of critical self-regulation processes, including the narrower self-regulation process of self-control, which is particularly relevant for environmental behavior change.

Chapter 3: Theoretical framework

The theoretical framework of this dissertation focuses on two psychological concepts essential for understanding behavior change: self-regulation and self-control. Self-regulation is a central function in adaptive and goal-directed behavior, and is a concept that has mainly been studied in social, personality, and cognitive psychology, although the research base spans across a wider range of disciplines. Self-regulation is a unifying concept that encompasses a number of different sub-concepts, including self-control, effortful control, emotion regulation, delay of gratification, and willpower (Blair, Ursache, Greenberg, Vernon-Feagans, & the Family Life Project Investigators, 2015; Nigg, 2017). Self-control demarcates a narrower subset of self-regulation processes that are called upon when needing to overcome short-term interests to ensure progress on long-term goals (Hofmann, Schmeichel, & Baddeley, 2012b; Milyavskaya, Berkman, & De Ridder, 2019). Understanding the dynamics of self-regulation and self-control can yield important insights into which factors determine success or failure in behavior change, and this especially applies when attempting to bring about a change in frequently-performed behaviors for benefits that largely transcend one's own interests.

The theoretical framework first provides a general introduction to self-regulation. In doing so, the introduction will only scratch the surface of self-regulation research in order to avoid overlaps with Article I, which provides a detailed theoretical account of self-regulation and how it relates to environmental behavior change. This general introduction to self-regulation is followed by a section that identifies the key problem spots in self-regulation. The theoretical framework then zooms in on processes relevant to goal striving, i.e., the processes occurring after the formation of a goal intention to change behavior. These processes include self-control and moralization of behavior. Self-control is a prominent focus in this dissertation, warranting a thorough depiction, including detailing the difference between state and trait self-control and the components of (state) self-control. Lastly, the role of morality and moralization of behavior in goal striving is presented.

Self-regulation

Self-regulation refers to the broad set of processes by which people adopt and manage different goals and standards of thoughts, feelings and behaviors in order to ensure these goals are met (Baumeister & Heatherton, 1996; Carver & Scheier, 1990). These processes can be initiated

consciously and deliberately, though they can also operate without conscious intent or monitoring (Mann et al., 2013). In broad terms, self-regulation can be conceived as a cybernetic control process consisting of three components (see Figure 1): goal setting; monitoring for discrepancies between current behavior and goals; and implementing goal-consistent behavior to reduce the behavior-goal discrepancy (Carver & Scheier, 1998; Inzlicht, Legault, & Teper, 2014; Powers, 1973). The implementation of goal-consistent behavior is here equated with the concept of goal striving, which is defined as the processes of planning and implementing goal-consistent behavior and of altering responses in the face of distractions and temptations (Carver & Scheier, 1998; de Ridder & de Wit, 2006; Sheeran & Webb, 2012).

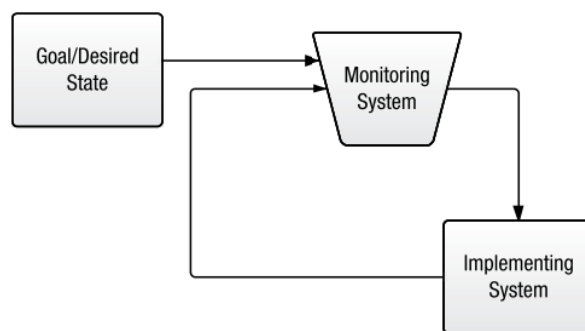


Figure 1. The cybernetic model of self-regulation (Inzlicht et al., 2014)

The three self-regulation components are connected to each other via a feedback loop that involves sensing a present state and comparing it to a reference value (i.e., a goal state or behavioral standard). If a discrepancy is detected, action is undertaken either to reduce or increase the distance to the reference value. This process continues until the behavior-goal discrepancy is brought to an acceptable level (Carver & Scheier, 1998; Inzlicht et al., 2014).

To illustrate the cybernetic control process, consider a woman who is concerned about the amount of pesticides used in the production of conventional food products and therefore wants to switch to organic food products. First, she sets a specific goal about what kind of organically produced foods she wants to purchase (e.g., ‘Purchase only organically produced fruit and vegetables’). Second, she monitors her consumption behavior in supermarkets and restaurants to identify instances where her behavior deviates from her goal (e.g., ‘I have put conventionally produced apples in my shopping basket’). Third, when a discrepancy is detected between her behavior and goal she adjusts her behavior accordingly (e.g., ‘Put the conventional apples back and take the organic apples instead’). This example illustrates the dynamic nature of self-regulation and indicates how problems may emerge with each of the three components. Before

identifying the problems spots in behavior change and self-regulation, however, the three self-regulation components are first presented in greater detail.

Goal setting

The first component of self-regulation, *goal setting*, involves determining which goals to pursue and the criteria for evaluating success (Mann et al., 2013). Goals, defined as internal representations of desired states, where states are construed as outcomes, events, or processes (Austin & Vancouver, 1996), guide the monitoring and implementation systems and therefore have a critical function in self-regulation. The process of goal setting may occur relatively effortlessly or involve extensive deliberation, depending on the context and the person. For example, research on goal contagion shows that people sometimes adopt and pursue goals that are inferred from observing the behavior of others—a process that occurs automatically under certain circumstances (Aarts, Gollwitzer, & Hassin, 2004). A related aspect is whether goal setting precedes goal striving. Goal striving sometimes occurs before goal setting. This can happen in two ways: (i) when behaviors change without conscious awareness (e.g., as a result of external nudging interventions); or (ii) when people experience significant setbacks that bring the feasibility of goal attainment into question, prompting a reexamination of whether goal disengagement is the best solution or whether the criteria for goal success should be reevaluated (Mann et al., 2013). However, despite the existence of automatic pathways to goal setting and the fact that goal setting may precede goal striving, most decisions to make life-altering behavioral changes result from extensive deliberation and with goal setting preceding goal striving.

The characteristics of goals significantly influence the likelihood of their attainment. These characteristics include the goal's motivational orientation and its interconnectedness with existing goals. A goal's motivational orientation refers to whether it is directed towards reaching a desirable state or whether it is directed towards avoiding an undesirable state (Elliot, 1999). The motivational orientation of a goal directly informs the monitoring system as to which discrepancies to monitor. In the case of pursuing an approach-oriented goal, the objective is to reduce the distance between behavior and the specified goal state (e.g., to cycle to work every day). Conversely, when pursuing an avoidance-oriented goal the objective is to increase the distance between behavior and the specified undesirable goal state (e.g., to avoid eating beef). Research on the motivational orientation of goals shows that approach-oriented goals generally have a greater success rate than avoidance-oriented goals, since approach-oriented goals offer

clearer criteria for determining success and a greater range of behavioral-implementation strategies (Elliot, McGregor, & Gable, 1999; Mann et al., 2013).

People pursue multiple goals at any point in time and a new goal's interconnectedness with existing goals can influence later stages of self-regulation. Ensuring goal interconnectedness is important for two reasons. First, a goal that connects with one or multiple existing goals increases the chance of identifying behaviors whose performance can serve multiple goals simultaneously (also called 'multifinality'; see Kruglanski et al., 2002). Such interconnectedness not only increases the probability that these behaviors will be performed but also decreases the probability of experiencing conflicts between goals (e.g., whether to fly on holiday with your family or stay at home to avoid emitting GHGs). Second, interconnected goals are more likely to be aligned with personal values—an aspect found to be positively related to goal attainment (Deci & Ryan, 2000). Both of these reasons are further elaborated in Article I.

Research on goal setting has identified a number of additional factors that facilitate goal attainment. Specifically, goal attainment is more likely when people set specific goals rather than “do your best” goals (Locke & Latham, 2013; Wallace & Etkin, 2017), when they hold high self-efficacy beliefs about goal attainment (Bandura, 2013), set challenging goals (Locke & Latham, 1990) and break long-term goals into smaller, more proximal subgoals (Amabile & Kramer, 2011; Carver & Scheier, 1998; Nunes & Drèze, 2006; Stock & Cervone, 1990).

Monitoring

The second self-regulation component is *monitoring goal progress*. The function of the monitoring system³ is to monitor the current rate of goal progress relative to a specified reference value such as a desired progress rate or a behavioral standard. Monitoring progress has an important role in ensuring goal attainment as it provides feedback on discrepancies between current behavior and desired goal states. Unacceptable discrepancies, when detected, signal to the implementation system that extra motivational and/or cognitive effort is required to ensure goal progress (Myrseth & Fishbach, 2009).

Monitoring one's current behavior can be done in two ways: monitoring behavior and

³ The monitoring system is used metaphorically to describe the process of monitoring behavior, emotions, desires, and thoughts. It is not per se a unique system found in the brain, although there are differences between which brain parts and neural pathways are activated in monitoring and those activated during the implementation of behavior. However, such discussions are outside the scope of this dissertation; instead, I refer to other resources for further details (e.g., Hofmann et al., 2012b; van Veen & Carter, 2002).

monitoring the outcomes of behavior (Michie, van Stralen, & West, 2011). For instance, people striving to reduce their energy bill at home have multiple behavioral means to choose from, including taking shorter showers, replacing appliances with energy-efficient alternatives, or lowering the temperature of their dwellings. As a result, they can monitor the length of their showers (behavior) or monitor their total energy consumption (outcome). A recent meta-analysis has found that the significance of monitoring is greatest when the focus of monitoring and the dependent variable correspond (Harkin et al., 2015); thus, when people monitor their behavior this monitoring has significant impacts on their behavioral performance but not on outcomes. In contrast, when people monitor outcomes this significantly influence the outcomes but not their behavior. These observed patterns reflect the fact that behavioral discrepancies provide information about the necessity of adjusting one particular behavior but not the outcomes, which are typically determined by multiple behaviors (Harkin et al., 2015; Sheeran & Webb, 2012). Outcome discrepancies, on the other hand, highlight the need to increase efforts to reach the goal but give no feedback on the goal instrumentality of a particular behavior (assuming multiple behaviors are performed to advance the same goal). This illustrates that adept self-regulation requires monitoring both behavioral performance and the outcome of these behaviors in terms of ensuring goal progress.

Another important aspect of monitoring progress is observing how social and physical settings interact with goal progress (Carver, 2015). Certain social settings can strongly promote goal-directed behavior, though sometimes people also find themselves in social settings with other people who either do not support their goals or even lure them into acting against these goals. (The importance of social and goal support is further discussed in Article III.) Physical settings can exert similar influence, either promoting or counteracting goal progress. Certain physical environments facilitate the performance of goal-directed behavior—and thus goal progress—by not presenting distractions or temptations, though again the opposite may also occur. For example, a person who has recently decided to become vegetarian but who still has a liking for meat products may be tempted to act against his or her vegetarian goal when in restaurants that mostly serve meat dishes and are less skilled in preparing tasty vegetarian dishes. Mindfully monitoring social and physical settings for their instrumentality in promoting goal progress thus provides critical information that presents people with the opportunity to avoid settings that hinder their goals.

Goal striving

The third component of self-regulation, *goal striving*, involves planning and implementing behavior as well as altering responses when facing distractions and temptations. The first task of goal striving is to identify which behaviors can be performed to achieve the goal and then decide which of these are most likely to yield success. For example, consider a fashion-conscious man who has recently become aware of the significant environmental problems associated with clothing production and consumption. He sets himself the goal of reducing the amount of GHG emissions generated by his frequent consumption of clothing and ascertains that this goal can be achieved through multiple means, such as cutting down on his clothing consumption, purchasing clothes that are produced in more environmentally friendly ways, or buying second-hand clothes instead of new. To initiate his goal pursuit, he must decide on one or more of these behavioral means that he deems most instrumental for achieving his goal.

Once the appropriate goal-directed behaviors have been identified, the next task is to start implementing these behaviors. Doing so requires foresight of when the behaviors can be implemented and making sure they are implemented once an opportunity presents itself. One line of self-regulation research has studied how ‘implementation intentions’ may help facilitate this initiation process. Implementation intentions are ‘if-then’ plans that create a mental link between a certain cue or situation and a goal-directed behavior: “If situation X arises, I will do Y” (Gollwitzer, 1993, 1999). In our case of the man with the clothing goal this might involve the following implementation intention: “If I want a new jacket, I’ll purchase one at the secondhand store around the corner.” Implementation intentions have been found effective in promoting goal striving and goal attainment. For example, a meta-analysis has shown that formulating implementation intentions has a medium-to-large effect on goal attainment compared to merely forming goal and behavioral intentions (Gollwitzer & Sheeran, 2006). The logic underlying implementation intentions is that the mental link created between a situation and a behavior increases the cognitive accessibility of the goal-directed behavior, thus increasing the likelihood that it is activated when the real situation is encountered (Achtziger, Bayer, & Gollwitzer, 2008; Gollwitzer, 1999; Webb & Sheeran, 2004).

While initiating goal striving presents its own set of challenges, routinely performing goal-directed behaviors may be even more challenging. Daily life is complex and people frequently face obstacles that challenge goal progress (Hofmann, Baumeister, Förster, & Vohs, 2012a, Milyavskaya, Inzlicht, Hope, & Koestner, 2015). A strong determinant of goal-striving success is

how obstacles are dealt with whenever they are experienced. Obstacles, defined as interfering forces that prevent people from reaching their goals along their initially-intended paths (Marguc, Förster, & Van Kleef, 2011), can take many forms and may be physical, psychological, or social in nature. For example, a broken bicycle wheel can pose an obstacle for a woman who cycles to work every day. To continue cycling she must either borrow a bicycle from someone else, get the bicycle fixed, or purchase a new one. Surprisingly perhaps, small obstacles like this can actually add personal value and increase goal-striving motivation when they are effectively overcome (Fishbach, 2009; Marguc et al., 2011; Zhang & Fishbach, 2010).

The general function of self-regulation is to ensure that goal striving persists even when confronted with obstacles. However, some obstacles may be too large to overcome. For example, a local government may decide to cancel bus routes, which would severely challenge the prospects of more people using public transportation instead of private vehicles. In situations where an insurmountable obstacle is encountered, the most adaptive decision may be to disengage from the goal and focus one's attention on other important goals (Wrosch, Scheier, Miller, Schulz, & Carver, 2003).

Problem spots in behavior change

The three self-regulation components—goal setting, monitoring, and goal striving—are useful for identifying problem spots in the behavior change process. Each component comprises numerous complexities that can threaten the prospects of successful behavior change. This section identifies some of the key problems related to each component. Some of these are general problems, while others are particularly relevant for environmental behavior change. Equal focus is given to all three components in order to demarcate the space around self-regulation and behavior change; however, the remainder of this dissertation will concentrate primarily, as indicated in the introduction, on problems associated with goal striving.

Problems associated with goal setting

Goal setting is essential for voluntary behavior change because it is the starting point of the self-regulation process. Incompetent goal setting can thus have adverse effects on the later self-regulation processes of monitoring and goal striving, and therefore on the likelihood of goal attainment itself. One problem spot of goal setting relates to the potential incompatibility of a new

goal with pre-existing goals, since if a new goal is incompatible with existing goals, progress on that new goal will undermine progress on other goals (Kopetz, Kruglanski, Arens, Etkin, & Johnson, 2012; Kruglanski et al., 2002). For example, setting a goal to complete a triathlon may be expected to elicit feelings of happiness and satisfaction if achieved; however, the intense training required to complete a triathlon may also undermine other goals such as spending time with family and friends. Because time, financial, and cognitive resources are limited, goal setting involves making value judgments about how best to allocate these resources. Such value judgments directly inform the goal-striving process by indicating which goals deserve the most attention and resources.

Another complexity and potential problem spot of goal setting is that it necessitates making predictions about the future, which is inherently shrouded in uncertainty (Gilbert & Wilson, 2007). This especially applies to setting long-term goals, which require significant time and commitment. Given that predictions about the future and the associated affective, cognitive, social, and physical implications of achieving a goal involve a considerable level of uncertainty, the risk is thus increased of striving for goals that ultimately fail to deliver the expected outcome(s). For example, a person might set themselves a materialistic goal such as earning enough money to purchase a sports car on the assumption that this will improve their subjective well-being; however, they may subsequently come to realize that their materialistic goals have not been effective in improving their subjective well-being (see Dittmar, Bond, Hurst, & Kasser, 2014 for meta-analysis on the link between materialism and well-being). Such inadequately informed or frivolous goal setting can set one up for failure.

Goal setting is not only about setting long-term goals but also about setting proximal goals that are instrumental to the attainment of an existing long-term goal such as living a low-carbon lifestyle. This task presumes knowledge about the instrumentality of sub-goals, since a lack of such knowledge can result in striving for sub-goals that do little to bring one closer to the attainment of the long-term goal. Knowledge about goal instrumentality is of special relevance in the environmental domain. Research has shown that people generally have a poor understanding of which particular goals and associated behaviors are effective in reducing GHG emissions and other environmental impacts (Attari, DeKay, Davidson, & De Bruin, 2010; Camilleri, Larrick, Hossain, Patino-Echeverri, 2019; Nielsen et al., 2019a; Vandenbergh & Nielsen, 2019). For example, Attari et al. (2010) found that people widely overestimated the energy consumption of activities that actually use only limited energy, while they underestimated the energy consumption of activities that use large amounts of energy. Such misperceptions about which activities have

the greatest environmental impacts lead to an ‘intent-impact’ gap, with people’s well-meant intentions not achieving their expected environmental impact (Moser & Kleinhüchelkotten, 2018; Stern, 2000). One problem spot of goal setting, then, is the setting of ineffective sub-goals that do not result in progress towards attaining the long-term goal, even with effective monitoring and goal striving.

Problems associated with monitoring

The major problem spot with regard to monitoring goal progress occurs when there is an absence of feedback. As outlined earlier, feedback plays a pivotal role in self-regulation by flagging up goal-behavior discrepancies. Absence of feedback, whether voluntary or involuntary, not only limits the overall assessment of goal progress, but also reduces the effectiveness of specific assessments of the instrumentality of individual behaviors in achieving the desired progress. This relates to the instrumentality of sub-goals, since when feedback is available it provides the information needed to abandon, adapt, or substitute ineffective sub-goals and associated behavioral means of achieving these goals. In this way feedback can facilitate the correction of initial goal-setting mistakes. However, while feedback is available for most goals (as will be discussed below), it is not always available for environmental goals. Before elaborating on and qualifying this statement, it is first necessary to discuss the voluntary avoidance of feedback.

Monitoring behavior and the outcome of behavior is a prerequisite for assessing goal progress, yet sometimes people deliberately do not monitor their progress. This seemingly peculiar phenomenon, called ‘The Ostrich Problem’, refers to instances where people are motivated to avoid or reject information about goal progress (Webb, Chang, & Benn, 2013). Monitoring goal progress can occur either as a result of actively seeking feedback (e.g., checking your savings account) or when feedback becomes available and is received passively without any effort on the part of the receiver. Feedback avoidance relates to the active monitoring, whereas feedback rejection refers to passive monitoring. While feedback avoidance and rejection relate to different aspects of monitoring, their motivational unpinning(s) is often similar. For example, people may not want to receive feedback on goal progress for a range of reasons, including apprehension that such feedback might (i) elicit negative emotions or diminish positive emotions, (ii) negatively impact their self-image or self-esteem, (iii) showcase that their progress is slower than anticipated, or (iv) demand undesired action (Karlsson, Loevenstein, & Seppi, 2009; Sweeney, Melnyk, Miller, & Shepperd, 2010; Tuckey, Brewer, & Williamson, 2002). Although

avoiding or rejecting feedback may be perceived as affectively beneficial in the short term, it undermines self-regulation and the prospects of behavior change in the long term (Webb et al., 2013).

The ostrich problem applies only to goals whose associated behaviors and outcomes can actually be monitored; but a different problem applies when feedback on goal progress is not available or is very difficult to obtain (Webb et al., 2013). This is especially relevant for environmental goals. For example, people who want to reduce their GHG emissions may find it difficult to assess their progress, since personalized feedback on emissions is not readily available. While there are general estimates of the impacts of certain behaviors, such as the expected reductions in emissions associated with switching from a meat-based to a vegetarian diet, it is nearly impossible to estimate the precise effect of this dietary change. The same is true of many environmentally related domains (and environmental impacts), including energy and electricity consumption, manufactured goods, and transport. Due to the difficulty of monitoring the outcome of sub-goals and behaviors, people are forced instead to monitor only their own behavior, and the main task then becomes to ensure that goal-directed behaviors are performed. The limited feasibility of effective outcome monitoring may contribute to the prevalence of the intent-impact gap, since it counteracts assessment of the instrumentality of sub-goals and behavioral means, thus preventing the abandonment, adaption, or substitution of those that are ineffective. The point here is not that outcome monitoring is impossible for environmental goals, since even general information about GHG emissions and environmental impacts is useful; however, the evident variation in the availability and accuracy of people's knowledge about environmental impacts may be a strong predictor of the prevalence of an intent-impact gap.

Problems associated with goal striving

Goal striving is physically and mentally the most challenging aspect of self-regulation. As a consequence, many problems can arise throughout the goal striving process. These problems include but are by no means limited to: improper goal balancing, persisting with unattainable goals, and succumbing to temptations. These three problems are discussed below.

Behavior change is rarely pursued in isolation but rather occurs alongside many other important goals. Consequently, it is seldom prudent to dedicate all one's attention to the pursuit of a single goal, since this may undermine progress on other essential life goals such as sustaining strong social relations or physical health. Adept self-regulation within multiple-goal contexts

entails balancing goal striving, especially when goals are long-term (Fishbach & Dhar, 2005; Fitzsimons & Fishbach, 2010). Given the constraints of finite resources, self-regulatory success requires that these resources be distributed in a manner that maximizes positive outcomes. Resources are typically allocated on the basis of inferences drawn from one's monitoring system with regard to goal progress. When progress on one goal is consistent with expectations, resources can accordingly be reallocated from attaining that goal to other goals whose progress is below expectations (Fishbach & Dhar, 2005). Problems emerge when this fluid shift of resources does not occur and one's focus remains fixated on a single goal. For example, an aspiring triathlete may allocate most of their resources to the goal of completing a triathlon but later come to learn that this decision has had negative consequences for their family and work performance.

A related problem is that of persisting with goals that are either unproductive, unattainable, or incompatible with other important goals. Deciding to disengage from a goal is sometimes the most adaptive decision (Wrosch et al., 2003). For example, goal disengagement may be the best option when goals fail to deliver the expected positive outcomes, when unforeseen and insurmountable obstacles block the road to goal attainment, or when the discrepancy between the current and desired state is simply too great. From an environmental-goals perspective, it may be necessary to disengage from existing goals before the environmental goals can feasibly be attained in order to avoid goal conflicts and/or cognitive dissonance. For example, most materialistic goals can be expected to counteract environmental goals, hence making progress with one's environmental goals implies making less progress in one's materialistic goals. To avoid frequent goal conflicts that often fuel negative emotions (Becker, Jostman, Hofmann, & Holland, 2018), the most adaptive decision is to abandon one of the two goals. In this case the mission is to ensure that people do not disengage from the environmental goal.

The goal-striving problem spot that has probably received the most attention in research is the confrontation with temptations to perform goal-conflicting behaviors. Temptations can derail goal striving and behavior change by reinforcing past and undesirable behavioral tendencies. Successfully handling confrontations with temptations requires the exertion of self-control, which involves regulating behavioral responses away from temptations and toward behaviors that advance long-term goals (Baumeister & Heatherton, 1996; Mischel, Shoda, & Rodriguez, 1989). As a result, self-control plays an important function in self-regulation and in the behavior change process. Individual differences in self-control, including the ability to regulate behavior and to forego temptations, have proven predictive of a plethora of life outcomes (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Hofmann, Gschwendner, Friese, Wiers, &

Schmitt, 2008). The following section outlines self-control in greater detail, as self-control features prominently in this dissertation.

Self-control

An unfortunate yet inevitable aspect of changing behavior is the confrontation with past behavioral tendencies. This may apply especially in the case of environmentally friendly behaviors, since these typically involve a degree of personal sacrifice in order to promote the well-being of other people in both present and future generations, other species, and the biosphere as a whole. For example, travelling by public transport rather than by car is often more time-consuming, expensive, and offers less flexibility. Foregoing temptations (e.g., the temptation to jump into your car) to promote long-term goal strivings (e.g., living a low-carbon lifestyle) thus involves exerting self-control. Self-control is a sub-concept of self-regulation that focuses solely on challenges involving a conflict between proximal and distal motives (Fujita, 2011; Kotabe & Hofmann, 2015). As a result, self-control excludes other self-regulatory challenges like deciding between two different proximal motives (e.g., eating rib-eye beef versus Angus beef) or between two different behaviors serving distal motives (e.g., studying versus running).

The definition of self-control has undergone extensive scrutiny in recent years. This has been prompted by the emergence of new findings that are incompatible with the previously dominant definition. Traditionally, self-control has been defined as the self's capacity to override or inhibit undesired inner responses and behavioral tendencies and to refrain from acting on them (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Tangney, Baumeister, & Boone, 2004). The traditional definition strongly emphasized the role of effortful inhibition in self-control. However, recent studies show that a high level of self-control is also characteristically associated with other capabilities, including goal-congruent habit formation, the initiation of goal-directed behavior, and less frequent experiences of temptations (Adriaanse, Kroese, Gillebaart, & de Ridder, 2014; de Gillebaart & Ridder, 2015; Galla & Duckworth, 2015; Hofmann et al., 2012a; Hoyle & Davisson, 2016). Efforts have subsequently been made to revise the definition of self-control to better encapsulate the plurality of capabilities that characterize self-control (e.g., de Ridder, Kroese, & Gillebaart, 2018; Fujita, 2011; Milyavskaya et al., 2019). Articles III and IV will further engage with this ongoing negotiation around the definition of self-control, but for now I adopt a broad working definition of self-control as “the process or behavior of overcoming a temptation or prepotent response in favor of a competing goal (either concurrent or longer-term)”

(Milyavskaya et al., 2019; Tangney et al., 2004).

Although the definition of self-control is still being negotiated, most researchers agree on the key feature of self-control, which is that the domain of self-control is only present when people are confronted with two conflicting and mutually exclusive motives: one motive promising immediate gratification and another motive expected to advance an important long-term goal (Fujita, 2011; Myrseth & Fishbach, 2009). Critically, the valuation of the two motives is asymmetric, where the more potent motive is expected to produce only proximal reward and the less potent motive is expected to produce a greater long-term reward (Duckworth, Gendler, & Gross, 2016). Self-control thus involves an intertemporal conflict, where the long-term is the goal-directed response. Some scholars have described this intertemporal conflict as a self-control dilemma (e.g., de Ridder et al., 2018). Whereas self-control, in the majority of instances, is characterized by an intertemporal dilemma with the long-term response being the goal-directed one, I do recognize that sometimes self-control is exerted to regulate thoughts and behavior towards the present and away from the future (see Loewenstein, 2019). For example, sometimes being overly future-focused is not adaptive and may elicit stressful and unhappy thoughts (Killingsworth & Gilbert, 2010). But in the case of implementing an environmental behavior change, the goal-directed response will usually be future-oriented and thus aligned with the common conceptualization of self-control and self-control dilemmas.

State versus trait self-control

Research distinguishes between state control and trait self-control (de Ridder et al., 2012; Tangney et al., 2004). State self-control is the situational capacity to exert self-control and regulate thoughts, emotions, and behavior. State self-control fluctuates across situations and over time, and may be influenced by situational factors, including mood (Fishbach & Labroo, 2007), cognitive capacity (Hofmann et al., 2008; Kaplan & Berman, 2010), social surroundings (Dzhogleva & Lamberton, 2014; Hofmann et al., 2012a), and motivation (Muraven, 2007). For example, people are less capable of controlling impulses and resisting temptations when their cognitive capacity is temporarily impaired, such as when they have slept poorly or are stressed or intoxicated (Fillmore & Vogel-Sprott, 1999; Hisler, Krizan, DeHart, 2018; Maier, Makwana, & Hare, 2015).

Trait self-control is the dispositional ability and chronic tendency to exert self-control. Because trait self-control refers to a dispositional capability it is expected to be stable across situations and over time. Trait self-control is largely responsible for the ‘success story’ of self-

control (de Ridder et al., 2017). Namely, high trait self-control has been linked to a wealth of positive life outcomes and the avoidance of negative life outcomes. For example, high trait self-control is associated with better academic and occupational performance, better mental and physical health, and better social relationships (Mischel et al., 1989; Moffitt et al., 2011; Tangney, et al., 2004), while low trait self-control is negatively associated with addiction, obesity, and criminality (Baumeister & Heatherton, 1996; Gottfredson & Hirschi, 1990; Patton, Stanford, & Barratt, 1995).

The accumulating evidence of linkages between high trait self-control and desirable life outcomes has sparked a growing interest in research on self-control. Specifically, researchers are seeking to dissect the aspects of trait self-control that are particularly predictive of positive life outcomes. The two capacities traditionally thought to embody trait self-control are inhibitory control and delay of gratification (Ainslie, 1975; Baumeister et al., 1998; Mischel et al., 1989). Although these two capacities are prevalent in people with high trait self-control, there is more to the picture (Duckworth & Kern, 2011). A meta-analysis has revealed, for example, that the effects of high trait self-control are greater for behaviors performed automatically without conscious effort (de Ridder et al., 2012). In fact, effect sizes were twice as high for automatic behaviors than for deliberate and intentional behaviors. The results of this meta-analysis suggest that the ability to automatize and habitualize goal-directed responses is a central component of trait self-control. Later studies have since corroborated this finding (Adriansee et al., 2014; Galla & Duckworth, 2015; Gillebaart & Adriaanse, 2017). Other important studies have also shown that high trait self-control is associated with autonomous motivation to pursue goals (Converse, Juarez, & Hennecke, 2018), being positioned in more supportive social environments (vanDellen, Shah, Leander, Delose, & Bronstein, 2015), pursuing goals that reflect one's true self (Stavrova, Pronk, & Kokkoris, 2018), and less frequent experiences of temptation (Bernecker, Job, & Hofmann, 2018; Hofmann et al., 2012a). Combined, these recent findings suggest a greater complexity in the workings of trait self-control than is suggested by traditional research on self-control.

Components of (state) self-control

The account above has highlighted some of the recently recognized capacities of trait self-control. Recent findings generally indicate that the positive effects of high trait self-control are especially evident in reducing the need for effortful exertion of self-control and to a lesser extent individual differences in the capacity for effortful self-control. The relationship between trait and state self-

control is currently unclear and remains the subject of ongoing research (further discussion of this relationship is beyond the scope of this dissertation). Although high trait self-control may reduce the need for effortful self-control, all people—independent of their levels of trait self-control—will find themselves in situations where self-control is needed. Indeed, this is nearly impossible to avoid when deliberately changing behavior, and even more so when the benefits of self-control transcend the self. To better understand state self-control, this section zooms in on the key processes of self-control exertion.

According to the four-step model of motivated behavior (Hofmann et al., 2012a; see Figure 2), self-control and resistance to temptations can be divided into the following four steps: *desire experience*, *conflict*, *resistance* (use of self-control), and *behavior enactment* (in the case of self-control failure). Desire is defined as an “affectively charged cognitive event in which an object or activity that is associated with pleasure or relief of discomfort is in focal attention” (Kavanagh, Andrade, May, 2005, p. 447). A desire, therefore, depicts a subjective feeling of wanting to have or do something (Berridge, Robinson, & Aldridge, 2009). According to this model, the desire experience is the first part of motivated behavior (Bernecker et al., 2018). The second step is the subjective experience of conflict between the desire and a personal standard, value, or long-term goal. This step is critical because it is what transforms a desire into a temptation and demarcates a self-control dilemma (Botvinick, Braver, Carter, Barch, & Cohen, 2001; Fishbach & Converse, 2011; Hofmann & Van Dillen, 2012). Whereas enacting a non-conflicting desire is unproblematic, enacting a conflicting desire (i.e., a temptation) undermines progress towards a long-term goal. If there is a conflict, the person decides whether to invest effort in the third step of the process: resisting the desire. In the fourth step, the person either foregoes the desire, representing successful self-control, or enacts the desired behavior, representing a failure of self-control (Hofmann et al., 2012a).

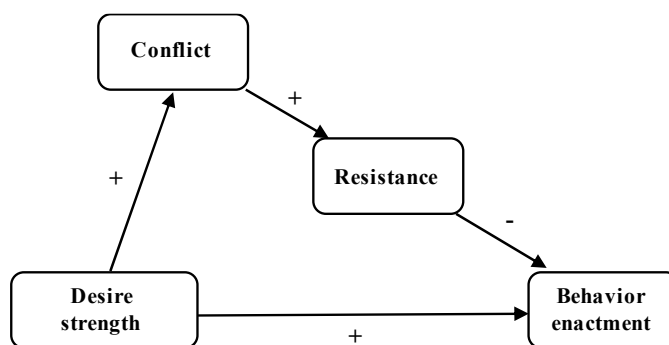


Figure 2. Four-step model of motivated behavior (Hofmann et al., 2012a)

The model framework postulates that the likelihood of self-control failure in any given situation is influenced by the preceding three steps (Bernecker et al., 2018). For example, a potent desire can reach a state at which it crowds out conflicting mental representations, including long-term goals and values (Hofmann & Van Dillen, 2012; Kavanagh et al., 2005). In such situations, people may not be aware of the need to exert self-control, or the desire may be too powerful to forego. Studies have confirmed a positive correlation between desire strength and behavior enactment (Casey et al., 2011; Friese & Hofmann, 2016; but see Fishbach, Zhang, & Trope, 2010). Another and interrelated route to self-control failure is through lack of conflict identification. At the outset of a self-control episode, people may be overly consumed by low-level situational details that crowd out considerations of long-term goals (Fujita, Carnevale, & Trope, 2016; Kotabe & Hofmann, 2015). As such, self-control failure does not always occur because the desire experience is too overpowering but rather because the long-term goals are not cognitively salient at the moment of decision-making. Conflict identification thus has an important function in self-control, and one that is embedded within the larger functioning of the monitoring system.

Self-control failure can also result from a lack of motivation and/or capacity to resist the desire. Recent accounts of state self-control postulate that motivation to resist plays a highly significant role in decisions to exert self-control and in the outcome of self-control exertions (Inzlicht & Schmeichel, 2012; Kaplan & Berman, 2010; Locke & Braver, 2008). For example, an experience-sampling study found that 85–90% of the variance in personal goal attainment was at the within-person level (Milyavskaya et al., 2015). This finding challenges the proposition that self-control success is determined only by trait- and state-variations in cognitive control; rather it suggests that people exert self-control in certain life domains more effectively than in other domains (Milyavskaya et al., 2019). Motivation to resist, or lack thereof, is undoubtedly a strong predictor of self-control success; however, limitations in trait- and state-level capacity are also predictive of self-control outcomes (Casey, 2015; Diamond, 2013; Eisenberg, Smith, Sadovsky, & Spinrad, 2016). It has been suggested, for example, that executive functions, i.e., the set of general-purpose control processes that regulate one's thoughts and behaviors (Miyake & Friedman, 2012), subserve self-control (Hofmann et al., 2012b). State-level capacity can also impact self-control outcomes when this capacity is temporarily impaired (Hofmann et al., 2008). Such temporary impairment may occur due to a range of situational factors, such as stress, sleep deprivation, or resource scarcity (Hisler et al., 2018; Maier et al., 2015; Shah, Mullainathan, & Shafir, 2012).

Morality and the moralization of self-control

Morality can be characterized as a culturally transmitted set of normative values and rules that enable people to live in (more or less) harmony. Two key functions of morality are to constrain action and provide identity (Haidt, 2007). Morality can constrain action by defining and identifying what constitutes morally “right” or “wrong” behavior, which often motivates selfless behaviors (Hofmann, Meindl, Mooijman, & Graham, 2018; Janoff-Bulman, Sheikh, & Hepp, 2009). Morality binds people who share moral values in a collective identity and facilitates collective action and social order (Ellemers & van den Bos, 2012; Graham & Haidt, 2010). Moral values frequently motivate people to resist short-term impulses and desires in order to ensure long-term interpersonal and collective prosperity over personal gain (Janoff-Bulman et al., 2009). The constraining function of morality thus overlaps significantly with self-control (this conceptual overlap is explored in Article II).

At the behavioral level, the disposition to perform one behavior over another may sometimes be determined by merely preferential differences; at other times, this disposition may be morally laden and encompass serious moral and self-relevant implications (Rozin, 1997). For example, whether someone smoked or not was once a question of mere preference, but over the last few decades smoking has become a moralized behavior that is widely condemned (Rozin, 1999). Moralized behaviors are internalized preferences that obtain a unique moral status and whose performance may be condemned (if morally dubious) or praised (if morally approved). Research shows that moralized behaviors are more durable, demand less attention to maintain, and are more resistant to temptation (Rozin, Markwith, & Stoess, 1997). For example, people who become vegetarians for moral and environmental reasons generally find it easier to resist eating meat than people who become vegetarians for health reasons (Rozin et al., 1997).

It is not only behaviors that can become moralized; self-control decisions may also become moralized (Hofmann et al., 2018). The moralization of self-control refers to the process by which, over time, self-control preferences are converted into moral values (Rozin, 1999). When moralized, decisions to exert self-control become an issue of right and wrong, where self-control is perceived as a morally important trait and self-control failures are morally condemned (Mooijman et al., 2017). Transforming personal self-control preferences into moral values thus adds a powerful motivational component to decisions of whether to exert self-control (Janoff-Bulman et al., 2009). The greater motivation linked to moralized self-control preferences as

compared to non-moralized preferences corresponds strongly with observations that moralized behaviors are more resistant to temptations because of the prominent role of motivation in determining self-control success.

How does the moralization of behavior occur? Rozin (1997) proposed that a behavior or object can attain moral status through moral expansion and/or moral “piggybacking”. Moral expansion may result from cognitive-rational considerations, such as deciding that eating meat is immoral after reading about its contribution to anthropogenic climate change, or from an intense affective experience (or experiences), such as watching a documentary about modern animal agriculture and its treatment of animals (Rozin, 1999). Moral piggybacking, meanwhile, can occur when new experiences or knowledge cause a previously neutral activity or object to become embedded within an already functioning moral principle. For example, a recent study found that moral piggybacking played a critical role, together with moral emotions such as disgust, guilt and shame, in the moralization of eating meat (Feinberg, Kovacheff, Teper, & Inbar, 2019). Another study has shown how binding moral values (i.e., the group-oriented values: purity, loyalty, and authority) act as an antecedent to the moralization of self-control (Mooijman et al., 2017). The same study further found that self-control was emphasized more strongly when binding morality concerns were salient.

Morality and moralization are highly relevant for environmental behavior, since performing environmentally friendly behaviors typically requires setting aside self-interested motives to advance biospheric prosperity and thus involves the same self-restraining element as moral behavior. People who endorse biospheric values often act on these values because they believe it is their moral responsibility to protect the environment (Bolderdijk, Steg, Geller, Lehman, & Postmes, 2013; Thøgersen & Ölander, 2006). Moral and biospheric values are therefore theorized to share considerable conceptual overlap. (This overlap will be further explored in Article II with evidence to substantiate this theorizing.)

Chapter 4: Methodology

This section outlines the methodological approach applied in addressing the research question of this dissertation—an approach that uses methods commonly applied in social and environmental psychology. I first provide a brief overview of psychological methods before considering some recent methodological developments and debates that are transforming psychological science. I then outline the methods used in the four articles before presenting the context in which the empirical studies were conducted.

Psychological research methods

Psychology encompasses many subdisciplines and the methods applied within these subdisciplines vary considerably. Even within the subdisciplines that comprise the main focus of this dissertation—environmental, personality, and social psychology—the methodological approaches vary widely. In environmental psychology, research on behavior and behavior change has predominantly been studied through survey research, though it should be noted that the methodological toolbox of this subdiscipline is being developed and expanded (see a recent editorial in *Journal of Environmental Psychology* by van der Linden, 2019). In social psychology, experimental approaches have long prevailed, though other methods are also common, including experience-sampling methods (e.g., diary studies, event-based sampling, and experience sampling). Research methods in personality psychology include surveys, cohort studies, observer reports, and experience-sampling methods. The purpose of this section is not to provide a cumbersome review of all psychological methods, however; rather, the intent in what follows is to highlight some key methodological discussions and trends that have recently emerged within psychology as a whole. The section will especially discuss three issues central to the ongoing methodological reformation of psychological science (p-hacking, publication bias, and low statistical power), the sampling population from which most psychological findings are drawn, and the important distinction between exploratory and confirmatory research. These matters are then revisited in the subsequent section that outlines the dissertation’s research approach to explicate how they have informed the present empirical work.

The renaissance of psychology

Psychology has undergone a renaissance over the past decade (Nelson, Simmons, & Simonsohn, 2018) as psychological scholars have undertaken a wide-reaching methodological reconstruction to improve the research and statistical methods employed in psychological science. This renaissance of psychology was sparked by a series of events that served to highlight the prevalence of what are now referred to as “questionable research practices” (John, Loewenstein, & Prelec, 2012; Simmons, Nelson, & Simonsohn, 2011; see Nelson et al., 2018 for substantial details about these events). These events included a failure to replicate a famous psychological finding (Bargh, Chen, & Burrows, 1996; Doyen, Klein, Pichon, & Cleeremans, 2012), with a number of subsequent replication failures leading to a “replication crisis” in psychology. Amongst the theories that appear unable to withstand replication, or at least that have a much smaller effect size, is the self-control theory of ego depletion (Baumeister et al., 1998; Friese, Loschelder, Gieseler, Frankenbach, & Inzlicht, 2018; Hagger et al., 2016). In response to these replication failures and questionable research practices, extensive measures have been adopted to improve the methodological foundation of psychological science. Leading psychology journals now frequently publish replication attempts, regardless of their success or failure, as well as preregistered reports (Lindsay, 2015). International multi-lab replication projects have been formed, such as the Many Labs project (Klein et al., 2018), and there has been an immense increase in sample sizes in psychological studies.

While covering the full extent of psychology’s renaissance is beyond the scope of this dissertation, it is worth highlighting three center-stage issues that motivated this renaissance: ‘p-hacking’, publication bias, and low statistical power. P-hacking refers to conducting multiple analyses on the same data set and exclusively reporting those analyses that obtain statistical significance (Nelson et al., 2018). In a groundbreaking study by Simmons et al. (2011), p-hacking was shown to dramatically increase the likelihood of obtaining false-positive results. This finding, together with a subsequent study detailing the prevalence of p-hacking (John et al., 2012), raised concerns that many published psychological findings might in fact be false positives. A related issue is publication bias, referring to the tendency of journals to give preferential treatment to statistically significant and novel findings. The preference for significant results, together with p-hacking and the ‘file-drawer explanation’ (i.e., that null-results are rarely submitted or accepted for publication), led to inflated effect sizes in the literature that have proven hard to control for in meta-analyses (Mellor, Vazire, & Lindsay, 2018). Finally, on the third issue, publishing studies

with small sample sizes was once common practice in psychology despite the fact that overly small sample sizes pose significant problems. Small sample sizes not only reduce the probability of identifying the effects of interest, for example, but more importantly increases the probability of false-positive results and decreases the probability of replication (Anderson, Kelley, & Maxwell, 2017).

The issues of p-hacking, publication bias, and small sample sizes, amongst other concerns, provoked debates within and outside psychology about what constitutes robust science and highlighted the need for a sharper line to be drawn between exploratory and confirmatory research, and how to interpret the results of these different types of research. The latter debate has led to calls for preregistering analytical plans before collecting data in order to combat post-hoc analyzing and p-hacking. Below there follows a discussion of the difference between exploratory and confirmatory research and the recent trend towards preregistration.

Exploratory versus confirmatory research

Exploratory and confirmatory research are both critical aspects of scientific inquiry and discovery. In exploratory research, which can be defined as empirical and theoretical discovery, results are assessed on the basis of detailed models of experimental variation that cannot be pre-defined (Shiffrin, Börner, & Stigler, 2018). Exploratory research is a significant component of most research programs and can lead to the discovery of novel associations and rare but important occurrences (Ledgerwood, Soderberg, & Sparks, 2017). And while novel discoveries are often met with initial skepticism, this skepticism itself spurs subsequent pursuits to validate, reproduce, and assess the importance of such discoveries. The results of these pursuits will, over time, ultimately determine the legitimacy of the discovery. This self-correcting process in science, albeit prevalent, does not always function optimally. Problems occur, for example, when exploratory analyses are reported as confirmatory ones. Specifically, since p-values obtained in exploratory analyses cannot be easily interpreted and the likelihood of false-positive results is higher, it is critical that the results be labeled as exploratory so as to indicate the degree of confidence with which they should be interpreted (Mellor et al., 2018). Thus, although exploratory research is critical for scientific progress, it is important to label it as such. Framing post-hoc explanations of the findings of a study in a way that signals the theoretical prediction was made prior to seeing those results, often referred to as “HARKing” (Hypothesizing After Results are Known), mistakenly leads readers to infer that an actual test of a theory has been performed when no such

test has occurred (Ledgerwood, 2018; Rubin, 2007). This counteracts the self-correction process of science and hinders scientific progress.

Contrary to exploration, confirmatory research involves testing pre-specified hypotheses with the ambition of confirming or disconfirming one or multiple predictions. Pre-specified hypotheses are commonly derived from theory and thus confirmatory research is a more deductive approach than exploration. Performing a confirmatory analysis of a prediction demands that full details of a study be provided in advance of seeing any results. Such details include the procedure, choice of participants, sample size, measures, and the statistical analyses that will be performed to test the prediction (Cumming, 2014). The outcomes of confirmatory analyses, when properly conducted, allow for stronger claims to be made about the validity of a given prediction.

A helpful tool for clearly labeling and legitimizing a confirmatory analysis is preregistration. Preregistration is a time-stamped record of a research project that is created prior to data collection (Lindsay, Simons, & Lilienfeld, 2016; van't Veer & Giner-Sorolla, 2016). Preregistration should specify essential details about the project—including the procedure, choice of participants, sample size, measures, and planned statistical analyses—for each study to be conducted. The primary goal of preregistration is to separate traditional hypothesis testing from exploratory results (Mellor et al., 2018). Moreover, preregistration can diminish the influence of p-hacking (van 't Veer & Giner-Sorolla, 2016). In recent years, preregistration has rapidly grown in popularity and is gradually becoming a common practice in psychology; in fact, many psychology journals specifically inquire about a manuscript's use of preregistration upon submission.

Researchers have several options for preregistration, but the two most commonly used platforms are AsPredicted (aspredicted.org) and the Open Science Framework (OSF) (osf.io). AsPredicted offers preregistration through the completion of a standardized form, including eight questions about the research project. OSF allows researchers to collaborate, share and archive files, including uploading self-generated preregistration reports. OSF also offers the possibility of sharing datasets that can be used during the review process and/or to allow other researchers either to scrutinize statistical analyses or to use the dataset for other (exploratory) studies.

Although preregistration is especially desirable for confirmatory research, it can also be used advantageously for exploratory research. Preregistering the general details of an exploratory study signals a commitment to present the final results as exploratory and thereby helps to create a clearer line between exploratory and confirmatory results (Mellor et al., 2018; Nelson et al., 2018). Furthermore, it signals that readers should be less worried about the use of questionable research practices since the results are not confirmatory and should be interpreted with care.

Sampling population

Psychology is the study of human behavior and the human mind, yet most psychological research has been conducted with samples from one particular demographic group: people from Western, Educated, Industrialized, Rich, and Democratic societies (WEIRD; Henrich, Heine, Norenzayan, 2010). Such intensive study of one demographic group raises doubts about the generalizability of psychological findings and leaves many non-WEIRD psychological phenomena unexplored. While the WEIRD bias is similarly widespread in other social and behavioral disciplines, it seems especially prevalent in psychology. For example, an analysis of the top journals in six of psychology's subdisciplines from 2003–2007 showed that 68% of studies relied on samples from the United States, while an astounding 96% relied on samples drawn from Western industrialized countries (Europe, North America, Australia and Israel; Arnett, 2008). This means that theory development has been built on empirical observations from only 12% of the global population. Moreover, the studies' samples largely matched the authors' countries of residence, with 73% of first authors working at American universities and 99% working at universities in Western countries (Arnett, 2008; Henrich et al., 2010).

A recent analysis has corroborated that the WEIRD bias remains a problem for psychological research (Rad, Martingano, & Ginges, 2018). In a review of articles published in three issues of the leading journal *Psychological Science* in 2017, the authors found that half of the articles drew samples from North America and that 70% of the samples were drawn from North America, Europe (United Kingdom, Germany, France, and Spain), and Australia. Only 7% of samples were from Asia (China, South Korea, and Japan), and not even one study sampled people from Africa, the Middle East, or Latin America (Rad et al., 2018). This overwhelming dominance of WEIRD samples counteracts the aspiration of psychology to be the study of all human minds and behavior.

The problem of biased samples is not new to psychology. In fact, the problem not only involves the prevalence of WEIRD samples but extends even further to the predominance of specific segments within WEIRD countries. Historically, the most sampled segment in psychology has been undergraduate students despite its associated theoretical and generalizability problems (Henry, 2008; McGuire, 1967; Sears, 1986). Although undergraduate students still make up a significant share of samples today, there has been a transition towards online convenience samples in recent years. Crowd-sourced platforms such as Amazon Mechanical Turk (MTurk) and Prolific are now widely used in psychological studies (Zhou & Fishbach, 2016). These newly

emerged convenience-sampling platforms have resulted in a broadened sampling focus and larger sample sizes. Moreover, they have allowed for easier access to hard-to-reach samples. Despite making a positive contribution to psychological research, however, the participant pools on MTurk and other similar platforms have their own problems. For example, their participant pool mainly comprises North Americans or Europeans but is not representative of these populations (Buhrmester, Talaifar, & Gosling, 2018; Paolacci & Chandler, 2014). These data sources thus still fail to provide a respite from WEIRDness sampling (Giner-Sorolla, 2019).

Whereas the WEIRD bias is problematic for the general study of human behavior and the human mind, such a focus may sometimes be justified. For example, some problem-oriented or cultural research may primarily be interested in addressing research questions that particularly relate to people within WEIRD populations. In some regards this dissertation itself represents such a case, since its overall objective is to study environmental behavior change and the role of self-regulation therein, and thus the populations of greatest interest are WEIRD. From an environmental perspective, WEIRD populations are of particular interest since they are the primary drivers of global warming and global environmental problems. At per capita level, WEIRD populations have much higher carbon footprints than the global average, as well as those of low-income households within Western countries (Chancel & Piketty, 2015; Ivanova et al., 2016). While this provides some justification for the empirical focus of this dissertation, as will be detailed below, the study nevertheless succumbs to some extent to the same WEIRDness bias as much other psychological research. In building on large and socioeconomically diverse samples, however, including one cross-cultural survey comprising four culturally distinct countries, the empirical foundation of this dissertation does differ from most WEIRD research in being more representative of the full populations of the assessed countries.

Research approach

The dissertation's research question is addressed through four articles. These four articles employ three different methodologies: a literature review, a diary study, and a cross-cultural survey. Article I uses a literature review of self-regulation research in cognitive, health, personality, and social psychology to build a case for why environmental psychologists ought to consider self-regulatory processes when studying environmentally friendly behavior and behavior change. Article II employs a diary study to explore the processes through which moral (and environmental) considerations influence behavioral decisions, while Articles III and IV draw on the same data

source, a four-country survey, to explore the merits of goal support as a self-control strategy and the mediating role of four self-control strategies in the relationship between trait self-control and subjective well-being.

Before presenting each method in greater detail, a few general remarks are warranted about the studies. First, all three empirical articles are exploratory in nature and thus do not explicitly attempt to empirically confirm a theoretical prediction. Although the articles are exploratory, however, their research questions were logically deduced from theory; in other words, the theorizing and narratives were not the product of HARKing (Hypothesizing After Results are Known). Second, only the design of the diary study was preregistered prior to data collection (osf.io/ut6kp). The four-country survey was developed and carried out before preregistration became common practice in psychology journals and before I had become sufficiently aware of its validity.

Article I: Literature review

The objective of Article I is to showcase the significance of self-regulation processes for research on environmentally friendly behavior and behavior change. Targeted towards environmental psychologists, the article reviews and synthesizes the research on self-regulation, mainly centered in other psychological subdisciplines, to detail how self-regulation processes may afford a better understanding of environmental behavior change. The chosen method was a literature review, which is a more qualitative and subjective review of literature than a systematic review. With a literature review, the ambition is to provide a summary or overview of a given topic. The literature review method was prioritized for this article due to the objective of presenting self-regulation as a theoretical concept, as well as of showcasing and theorizing on how self-regulation processes may apply to and benefit the study of environmental behavior change. Moreover, this method was deemed an effective means to present and apply—rather than systematize or map—self-regulation research to an audience presumably unfamiliar with its associated theoretical concepts.

The articles selected to comprise the literature review's empirical and theoretical foundation were identified through a snowballing method proceeding from the reference lists of key articles. These key articles included Mann et al. (2013) and Fujita (2011), which also inspired the structure of Article I. The review centers around the central self-regulation processes of goal setting and goal striving, and potential articles were screened based on their focus on either of these two processes. The majority of the articles discussed have been published in cognitive, health, or social

psychology. The foci and results of these articles were then synthesized in order to provide a comprehensive overview of self-regulation as a concept. A number of examples from environmental domains are also incorporated in the review in order to highlight the relevance and facilitate an easier understanding of self-regulation, goal setting and goal striving.

Article II: Diary study

Article II investigates the concept of moral self-control and explores how moral (and environmental) considerations influence purchasing decisions in the context of clothing consumption. A diary study was identified as the appropriate method to capture the dynamic nature of moral self-control and purchasing decisions. The diary method offers a means to assess experiences and processes that occur during the day with limited intrusion from retrospective bias (Reis & Gable, 2000). In addition, the diary method is especially useful to capture and analyze short-term dynamics within and between individuals (Ohly, Sonnentag, Niessen, & Zapf, 2010). The diary method, together with related methods of experience sampling and event sampling, has been employed with increasing frequency in psychological research (Bolger, Davis, & Rafaeli, 2003; Hofmann & Patel, 2015). Despite its growing popularity, however, the diary method has not yet been widely adopted in environmental psychology.

A diary study involves collecting repeated responses from individuals. The responses are usually collected once a day, typically at the end of the day. Because responses are given only once a day, participant responses are slightly lagged. However, the briefness of this lag makes the diary method a more attractive method for research questions relating to transient processes, experiences, and behavior than surveys, which are generally more prone to retrospective bias (Ohly et al., 2010). Another benefit of a diary study is the opportunity to assess within-person variability. This opportunity is especially relevant when investigating state self-control, where daily fluctuations are to be expected both in the motivation and capacity to exert self-control (e.g., Hisler et al., 2018; Wenzel, Kubiak, & Conner, 2016). Similar fluctuations may also be expected with regard to purchasing desires, moral considerations, and experiences of conflict—variables of central focus in Article II. A two-week diary study was conducted to assess these and other variables.

The diary study was conducted in the United Kingdom in December 2017. The study was programmed in Qualtrics and participants were recruited through the Prolific online research platform. Participants were invited to the study through an intake survey. One or two days after

completing the intake survey, participants began the diary study and completed daily diaries over the following two weeks. The final sample, albeit a convenience sample, was large (N = 594) and included considerable variance in terms of participants' age, education, political beliefs and employment status. Since participating in a diary study involves repeated assessments and therefore demands more effort than completing a conventional survey (Hektner, Schmidt, & Csikszentmihalyi, 2007), two precautionary measures were taken to limit attrition and improve response quality, i.e., offering participants above-average monetary compensation and instituting a payment-eligibility requirement. Participants were also sent daily reminders about the release of each daily diary to maximize participation. The daily diary protocols were highly structured, with standardized questions, and the full study design was preregistered on the Open Science Framework (osf.io/ut6kp).

Articles III & IV: Cross-cultural survey

Articles III and IV build on a cross-cultural survey carried out in four countries: Germany, Poland, Sweden and the United States. The survey method is useful for assessing constructs that are more stable and for investigating the generalizability of relationships and effects (Ohly et al., 2010). A cross-cultural survey is thus a beneficial method for assessing the associations of trait self-control with goal-directed behavior and subjective well-being across countries and heterogeneous population segments. Moreover, such a survey can allow for a general assessment of the self-control strategies people employ as well as the social environments they encounter. All these aspects were analyzed through the four-country survey.

The overall purpose of the survey was to deliver a comprehensive cross-sectional assessment of clothing consumption and the environmental aspects of such consumption (see Gwozdz et al., 2017 for descriptive findings). The selection of the four countries was therefore primarily based on their heterogeneous clothing markets and expected differences in environmental knowledge, attitudes and goals. Variation in these factors facilitated stronger assessments and comparisons of the environmental friendliness of clothing consumers (see the next section for the funding and context background). While the survey's main emphasis was on clothing consumption, it was thoughtfully developed to assess general psychological constructs as well. Thus, the survey included measures of psychological constructs such as self-control, goal support, and subjective well-being, which are of particular interest in this dissertation. Moreover, the cultural, economic, and geographical differences among the four countries enabled analyses of the stability of the

psychological constructs and phenomena across countries, thereby at least partially circumventing the WEIRD bias.

The survey was conducted through Qualtrics' online panel service between October 2016 and February 2017. Due to its comprehensive scope, the survey was divided into two parts conducted with an interval of 2-4 weeks. The initial ambition was to obtain representative samples on age, sex, education and region from each country; however, the assessment interval meant that participants themselves freely decided whether or not to participate in both surveys. As a result, while the sample for Part I was representative of the four quota variables, the final sample was not. In spite of this, the sample comprised considerable cultural and socio-demographic variation.

The survey was developed in English and then translated into the respective languages by ISO17100-certified translators. In this way the English-speaking bias in psychological research was addressed through the cultural heterogeneity of the different countries surveyed. The survey was also pretested with multiple iterations by non-experts, and some of the key measures were further pretested in focus-group interviews to avoid measurement ambiguities (Hine, Kormos, & Marks, 2016). The measures included in Articles III and IV were not pre-tested prior to data collection, however, since the majority of them were adopted from existing scales with known reliabilities.

Context

The financial support for this dissertation and research has come from the Mistra Future Fashion project phase II, an interdisciplinary research program that studies how to sustainably transform the clothing system. It focuses on four stages of the clothing lifecycle: design, supply chain, users, and recycling. My PhD position was linked to the user phase, which focused on how to shift consumers toward low-impact clothing-consumption patterns. Due to the funding source, the empirical contexts were dictated for the four-country survey and the diary study. Articles II and III, which have clothing consumption as dependent variables, include brief discussions of the relevance of the clothing context for their specific research questions, hence I will here argue why clothing consumption is generally an interesting domain for both the study of self-regulation and climate change mitigation.

Clothing is a consumer good whose importance varies tremendously among different people. For some people, clothing serves strictly the physical need of protecting the body from variations in weather; for others, clothing is closely intertwined with their identity and lifestyle.

Clothing can thus serve several psychological needs that transcend the physical (Gwozdz, Nielsen, Gupta, Webb, & Gentry, 2019). People for whom clothing only satisfies a physical need will presumably rarely find themselves in situations where self-regulation is required. When clothing serves important psychological needs such as self-esteem or social acceptance, however, the demand for self-regulation is presumed to be greater. For these people, potent desires to purchase clothing may be experienced regularly because such purchases are undertaken to satisfy their psychological needs and produce (at least short-lived) positive affect. Not all clothing desires can be enacted, however, since consumers must simultaneously advance other important long-term goals such as financial stability or environmental protection. Some desires may thus be in direct conflict with long-term goals, thereby converting such desires into temptations and eliciting the need for exerting self-control. Even a single self-control failure may have considerable personal and economic ramifications; for example, a person purchasing a piece of clothing that she or he cannot afford. Nevertheless, for people with a strong interest in clothing, clothing desires can be triggered from an endless number of stimuli, including from merely observing other people's clothing or from online clothing advertisements. In fact, the clothing industry is notorious for creating and reinforcing a culture driven by short-term usage and symbolic obsolescence, all intended to induce purchasing desires. All these factors make clothing consumption an interesting test bed for psychological research, and especially for research into self-control.

The climate impacts of clothing production and consumption are also significant. When taking the full lifecycle of clothing into account, clothing represents 3% of total global GHG emissions (Hertwich & Peters, 2009) and 4–5% of household-induced GHG emissions in Europe (Ivanova et al., 2017; Steen-Olsen, Wood, & Hertwich, 2016). Whereas clothing's share of household-induced GHG emissions is lower than that of other domains such as food or transport (Girod, van Vuuren, & de Vries, 2014; Shepon, Eshel, Noor, and Milo, 2018), clothing is widely regarded as the manufactured good that generates the highest amount of accumulated GHG emissions—with an ever-increasing share (Wood et al., 2018).

Clothing production and consumption also has other environmental impacts besides GHG emissions throughout its lifecycle. Non-GHG related environmental impacts, including freshwater depletion, natural land transformation, and freshwater ecotoxicity, are incurred especially during the production and manufacturing of clothing, since the production and manufacture of clothing demands voluminous amounts of water, energy and chemicals. The production of a single pair of jeans, for example, requires 3,625 liters of water, 3 kilograms of chemicals, 400 MJ of energy and 16 m² of harvested land (Deloitte, 2013). When coupled with the sheer volume of clothing sales—

e.g., the average American consumer purchased 64 items of clothing in 2013 (American Apparel and Footwear Association, 2014)—significant environmental impacts are induced. With regard to freshwater depletion, clothing production is responsible for approximately 3% of global freshwater withdrawal, which is increasingly problematic given the growing scarcity of freshwater worldwide (Ellen MacArthur Foundation, 2017). Clothing production, and especially land-intensive cotton production, also directly competes with growing land demands for food production, urbanization, the preservation of nature and biodiversity, and much needed negative-emission technologies such as bioenergy with carbon capture or afforestation (Creutzig et al., 2019). Moreover, the hazardous chemicals used during the preparation of clothing fabrics are often returned to local freshwater streams without any process of purification, causing intense water pollution and deterioration of ecosystems (Kant, 2012; Weller, 2013). The substantial climate and environmental impacts induced from clothing production and consumption make it a highly relevant domain for research on climate change mitigation and behavior change.

Chapter 5: Article I

From prediction to process:

A self-regulation account of environmental behavior change

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Abstract

Recently, environmental researchers have been urged to widen the theoretical scope and integrate other behavioral moderators to better understand and bridge the frequently observed intention-behavior gap in the environmental domain. The present article seeks to meet this call by reviewing and highlighting the relevance of self-regulation for environmental behavior change. The article focuses on the two primary components of self-regulation: goal setting and goal striving. Self-regulation research differs from the prediction models commonly employed in environmental research (e.g., theory of planned behavior or value-belief-norm theory), as it focuses on the dynamic psychological mechanisms that result in either success or failure in acting relative to a certain standard or goal. Similar to the intention-behavior gap, self-regulation research recognizes the occasional failure of people to adhere to their own environmental standards and goals. However, unlike prediction models, self-regulation research gives directions on how to reduce the frequency by which these failures occur.

Keywords: self-regulation; environmental behavior change; goal setting; goal striving

Introduction

The wealth and magnitude of environmental problems ranging from climate change and sea level rise to mass extinction of species and plastic-filled oceans severely threaten the prospects of future societies. As a result, climate and environmental scientists are speaking with profound clarity about the immediate necessity of progressing toward a more sustainable world (IPCC, 2013). This shift demands fundamental societal changes including constructing low-carbon infrastructure, building energy-efficient housing, crowding out environmentally harmful production methods, and reducing overall consumption levels. At the heart of the change process is the individual citizen. The developed world has for decades evolved around a market economy consisting of individuals purchasing products and services at an ever-increasing rate. It is thus not surprising that many environmental problems can be traced back to the accumulated choices of individuals. Large scale attitudinal studies have found that most people acknowledge the severity of environmental problems and the responsibility of individuals to take action (e.g., European Commission, 2008). Unfortunately, the positive environmental attitudes and intentions are not always reflected in people's behavior (Carrington, Neville, & Whitwell, 2014; Kollmuss & Agyeman, 2002). This raises the interesting question of why people who are willing and have the adequate means to live environmentally friendly fail to do so. Obviously, the question is by no means novel as environmental psychology researchers have been interested in this psychological discrepancy for decades. Nonetheless, Bamberg (2013a) has recently raised criticism of the sufficiency of the prevailing theoretical frameworks within environmental psychology and their struggling effort to bridge the intention-behavior gap. The criticism is in part directed at these frameworks' inability to account for the self-regulatory aspects of behavior change.

Social psychological research has for decades underpinned the relevance and significance of self-regulation in behavior determination and behavior change. The strong attention to self-regulation has not yet spilled-over into environmental psychology, where self-regulation processes so far have been largely overlooked. In environmental psychology, the prevalent focus has been directed towards predicting the psychological mechanisms underlying the performance of environmentally friendly behaviors. A similar focus has for long been prevalent in health psychology, but more recent efforts have increasingly recognized the significance of self-regulation in the performance health behavior (e.g., de Ridder & de Wit, 2006; Mann et al., 2013; Hofmann et al., 2014).

The prediction models commonly applied in environmental (and health) psychology assume

that the immediate predecessor to behavior is either intention (e.g., theory of planned behavior) or personal norm (e.g., value-belief-norm theory). Research has repeatedly found only a modest relationship between intentions or personal norms and the performance of environmentally friendly behaviors (e.g., Bamberg & Möser, 2007). Though prediction models to some extent are capable of explaining why people perform a specific environmental behavior, they pay little or no attention to the performance of multiple environmental behaviors over time. For example, in the theory of planned behavior (Ajzen, 1991) no formal distinction is made between decisions concerning the intention to initiate a behavior and those concerning the maintenance of that behavior over time (Rothman, Baldwin, Hertel, & Fuglestad, 2011). There is a need to broaden the perspective of prediction models to gain further insight into the environmental behavior change process. The process-oriented approach of self-regulation provides some of the answers as to what is needed to successfully attain environmental goals. Self-regulation models differ from prediction models in that they seek to elucidate the dynamic psychological mechanisms that result in either success or failure in acting relative to a certain standard as opposed to predicting future behavior (Mann et al., 2013). This process-oriented approach to understanding behavior change builds on the assumption that people to a wide extent have the necessary knowledge to execute the task. The focus is instead directed towards outlining how that knowledge is transformed into behavior and why people well-knowing of how to live environmentally friendly fail to conform.

To date, the most competent effort to integrate self-regulation in environmental research has been provided by Sebastian Bamberg. Following his criticism of the prevailing theoretical frameworks, Bamberg (2013b) introduced a conceptual response to the criticism – the stage model of self-regulated behavior change. Although the model provides a strong contribution to empirical researchers, it does not elaborate on the specific processes of self-regulation nor the characteristics or structure of the environmental goals people strive to achieve. The present paper aims to fill this gap by reviewing social psychological research on self-regulation and discuss it in the context of environmental behavior change. The paper examines the antecedents to setting environmental goals, the interconnectedness with other existing goals, and the most appropriate goal characteristics. Furthermore, it discusses the self-regulation strategies commonly employed during goal striving and their impact on the likelihood of goal attainment.

Self-regulation

Self-regulation refers to the broad set of processes by which people adopt and manage different

goals and standards of thoughts, feelings, or behaviors and ensure that these are met (Baumeister & Heatherton, 1996; Carver & Scheier, 1990). Many challenges are represented in self-regulation including which goals to pursue, planning how to pursue them, shielding them from competing goals and concerns, and deciding on the brink of success or failure to continue or abandon goals (Fujita, 2011; Oettingen, Hönig, & Gollwitzer, 2000). Generally, self-regulation can be conceived as a cybernetic control process consisting of three components: (a) goal setting, (b) monitoring for discrepancies between goals and current states, and (c) implementing behavior that is consistent with goals to reduce the behavior-goal discrepancy (Carver & Scheier, 1998; Inzlicht et al., 2014). Central to the self-regulation process is the role of feedback loops, which connects the three components to each other. Feedback loops can take either a discrepancy reducing or discrepancy enlarging form. Discrepancy reducing feedback loops occur when the monitoring system senses a discrepancy between desired and current states, where after people initiate action to adjust their behavior to conform to the goal or standard they desire (Carver & Scheier, 1998). This refers to approach behaviors such as eating more fruits or increasing frequency of bike riding. In contrast, discrepancy enlarging feedback loops involve acts of avoidance, wherein deviations from the comparison point is increased through the inhibition of normal response tendencies – for example not eating high-caloric foods or avoiding excessive fashion consumption (Carver & Scheier, 2004; de Ridder & de Wit, 2006). In other words, self-regulation is the process that enables humans to guide their behavior over time and builds on the capacity to influence, modify, and control their own behavior (Baumeister & Heatherton, 1996; Karoly, 1993).

Self-regulation is important to the understanding of environmental behavior change. Inherent to behavior change is the transitional substitution of past environmentally harmful behaviors with new, more environmentally friendly ones. During the behavior change process, people will undoubtedly encounter difficulties arising from past behavioral tendencies or environmentally harmful temptations elicited internally or from the external environment. An environmentally harmful temptation refers to a problematic desire that interferes with important environmental goals (e.g., not recycling a plastic bottle, if deemed inconvenient in the situation). The encounter with past tendencies and temptations are especially true of environmental behaviors as these often involve a degree of personal sacrifice in order to promote the well-being of others (present and future generations), other species, and the environment as a whole. Thus, people sometimes have to overcome egoistic tendencies in order to adhere to their environmental goals and standards. Self-regulation is a set of processes that can assist in successfully adhering to these aspired goals and standards. Self-regulation includes setting appropriate environmental goals and

employing self-regulatory strategies to protect and shield them from past tendencies and experienced temptations.

The primary tenet in self-regulation theories is that humans are by nature goal-driven organisms (e.g., Ford, 1992). Goals are defined as internal representations of desired states, where states are construed as outcomes, events, or processes (Austin & Vancouver, 1996). Goals can span from the moment to a life span. Given the importance of the goal-construct in human behavior it is no surprise that people hold numerous goals at any point in time. To fully understand the role played by goals in self-regulation it is necessary to consider how goals are structured, prioritized, and managed in connection with each other (Shah & Kruglanski, 2008). Most self-regulation accounts assume that goals are organized in hierarchies with lower-order goals serving higher-order goals (Fujita, Trope, Liberman, & Levin-Sagi, 2006; Kruglanski et al., 2002; Vallacher & Wegner, 1987). Lower-order goals are more numerous, concrete, context specific, substitutional, and proximal. On the other hand, higher-order goals are more distal, abstract, fewer in number, and more important to the individual (Duckworth & Gross, 2014). For example, a higher-order goal of living environmentally friendly can be comprised into many different lower-order goals such as recycling materials, using public transportation, or eating vegetarian. In essence, lower-order goals help define the higher-order goal whose attainment is predicated on the attainment of its defining lower-order goals (Carver & Scheier, 2004).

Goal setting

The first component of self-regulation relates to the process of goal setting. Goal setting involves determining which goals to pursue and the criteria for evaluating progress. A goal can take many forms and vary from easy and specific lower-order goals (e.g., only buying organic carrots) to difficult and abstract higher-order goals (e.g., living an environmentally friendly lifestyle). Differences in the time-dimension (and other dimensions) of goals result in predictable variations in how the goal is pursued and its outcomes (Yang, Stamatogiannakis, & Chattopadhyay, 2015). In general, the likelihood of successful self-regulation and ultimately goal attainment is higher, when goals are considered personally meaningful and supported by positive expectations concerning the ability to perform the required actions in the present environmental settings (Locke & Latham, 2002; Mischel, Cantor, & Feldman, 1996). Whilst recognizing the importance of personal meaningfulness and self-efficacy, other facets of goal setting deserve equal consideration. The following section discusses four aspects of goal setting. First, the hierarchical

division of goals is examined followed by exploring the antecedents to setting environmental goals. Next, the significance of interconnectedness between goals is discussed before, finally, outlining different goal characteristics and their impact on expected goal success.

The hierarchical division of goals

One central issue of environmentally friendly behaviors is the difficulty associated with achieving viable environmental change. Whereas improving personal health is a challenging and demanding endeavor it largely rests upon the personal commitment to accomplish the goal. Furthermore, the resulting benefits are somewhat apparent and discernible. The same cannot be said for many environmental goals. These require the collaboration of people, communities, and nations in order to be effective and the outcomes are largely invisible and long into the future. At face value pursuing higher-order (long-term) environmental goals seems like an insignificant and unattainable undertaking. Yet many environmentalists think otherwise. One reason is that these higher-order goals are usually divided into several, more specific lower-order goals (Venhoeven, Bolderdijk, & Steg, 2013). For example, in order to attain the higher-order goal “to live environmentally friendly” people could have lower-order goals such as “reduce consumption of meat” or “lower frequency of air travels”.

The division of higher-order goals into more specific, proximate, and attainable lower-order goals contributes to stronger motivation and self-efficacy beliefs (Kirby & Guastello, 2001; Locke & Latham, 2002). In addition, formulating specific environmental lower-order goals can facilitate the formation of appropriate feedback measures on performance, which has been identified as a highly important feature of goal striving (Bandura & Cervone, 1983; Fishbach, Eyal, & Finkelstein, 2010).

The number of lower-order goals associated with one higher-order environmental goal can differ substantially depending on goal content and individual factors such as environmental knowledge. For instance, even people aware of an environmental problem might not grasp the full extent of the problem, how it relates to individual behavior, or what can be done about it (Thøgersen, 2014). Although models of self-regulation assume task knowledge to be present, it is not a fixed measure and people can improve their knowledge of environmental problems and behavioral alternatives over time. Generally, it is expected that the number of lower-order goals representing one higher-order environmental goal increases with the level of environmental knowledge.

Antecedents

There are two important antecedents to setting environmental goals. The first antecedent is the awareness of the environmental consequences of behavior. If people are unaware of these consequences, they will be less likely to adopt environmental goals. The second antecedent to setting environmental goals is linked to people's values. Values are defined as 'desirable goals, varying in importance, that serve as guiding principles in people's lives' (Schwartz, 1992). Values are relatively stable and abstract goals that transcend situations (Stern & Dietz, 1994). Based on this definition, it can reasonably be assumed that higher-order goals are, if not identical to, then strongly reflective of a person's values and thus placed at the top of the goal hierarchy. Unless people attach value to the environment and the protection thereof it is unlikely that they will adopt more specific lower-order environmental goals.

Previous environmental psychological research has identified self-enhancement values (key concern for individual interests) and self-transcendence values (key concern for collective interests) as being particularly relevant for environmental behaviors (Steg & de Groot, 2012). Unsurprisingly, people strongly endorsing self-enhancement values are less likely to adopt environmental goals, whereas people endorsing self-transcendence values are more likely to adopt and pursue environmental goals. Specifically, two self-transcendence values have been distinguished: altruistic and biospheric. Altruistic values involve a key concern for the welfare of others and biospheric values reflect a key concern with nature and the environment for its own sake (de Groot & Steg, 2007; Stern, Dietz, & Kalof, 1993). Biospheric values have been found most related to the performance of environmental behaviors (e.g., Schultz et al., 2005). Following, it seems sensible to assume that people endorsing biospheric values are more prone to adopt lower-order environmental goals such as recycling or reducing household energy consumption. It should be noted that people can of course adopt environmentally-related goals without being aware of the environmental consequences or endorsing biospheric values. Thus, some people may have an unintentionally low environmental impact (Stern, 2000). However, in these cases it is expected that the environmentally-related goal is serving another purpose. For example, one could adopt the goal of only purchasing organic food strictly out of a concern for health and not for the environment (e.g., Hughner, McDonagh, Prothero, Shultz, & Stanton, 2007).

Goal Interconnectedness

A significant facet of goal setting is to ensure compatibility between a new goal and people's preexisting goals. People are unlikely to adopt environmental goals (the new goal) if they interfere or are in conflict with existing goals that are highly valued. Furthermore, people are reluctant to adopt goals and engage in behaviors that are opposing their self-image and identity (Fishbein et al., 2001). This builds on a sound recognition of the restrictive capacity of humans to strive for and attain goals throughout life. The scarce resources of time, cognitive capabilities, and money means that any environmental goal is in a constant battle with other significant life goals for the allocation of these resources (Mann et al., 2013).

One way to circumvent goal interference and conflict is to adopt environmental goals with clearly identifiable and interconnected behaviors that serve other goals as well. Thus, any progress achieved on one goal would lead to the simultaneous progress on another goal. The process of adopting a goal that is aligned with one or multiple goals is according to goal systems theory (Kruglanski et al., 2002) referred to as the quest for multifinality. Multifinality occurs when several goals are served through the same behaviors, thereby maximizing goal striving effort (Kopetz, Faber, Fishbach, & Kruglanski, 2011). For example, the act of riding a bike can serve both an environmental goal (i.e., reducing carbon dioxide emissions from transport) and a health goal (i.e., improving physical shape). Steg et al. (2014) take an analogous theoretical approach in their 'integrated framework for encouraging pro-environmental behavior' (IFEP). The IFEP identifies three classes of goals that govern environmental behavior in a given situation: hedonic, gain, and normative. The authors classify environmental actions as mainly serving normative goals, which involve considering the appropriateness of behaviors and how one ought to behave (Lindenberg & Steg, 2007). They propose that increasing the compatibility of normative goals with hedonic and gain goals could increase pro-environmental behaviors overall. Although, Steg et al. (2014) suggest achieving the enhanced compatibility (or multifinality) through policy interventions, the same could be advocated concerning individual goal setting.

Goal Characteristics

Most people have experienced the failure of not achieving a personal goal. Commonly, the failure can in part be traced back to the characteristics of the adopted goal. The characteristics of a goal strongly determines how it is pursued and what its outcomes are (Yang et al., 2015). Research on goal setting has acknowledged several goal characteristics that influence the likelihood of success

(e.g., Austin & Vancouver, 1996; Locke & Latham, 2002). Among these is the motivational orientation of the goal, which describes the underlying purpose of adopting a goal in the sense of wanting to either avoid undesired outcomes (avoidance goals) or to obtain desired outcomes (approach goals). The motivational orientation relates to the direction of the feedback loops accounted for in cybernetic self-regulation theories, where discrepancy enlarging feedback loops (relevant for avoidance goals) increases the distance to an unwanted state and discrepancy reducing feedback loops (relevant for approach goals) shortens the distance to the wanted state (Carver & Scheier, 1998). Much environmental and climate communication has taken an avoidance strategy to stress the need for behavior change, wherein the problematic features of various behaviors are emphasized. This has resulted in many people adopting avoidance goals as a means to protect the environment – for example avoiding air travel, meat products, or excessive consumption. However, the avoidance strategy largely leaves people directionless if not accompanied by eligible behavioral alternatives. As a result, approach goals have been found more effective as they provide clearer guidance strategies in terms of which behaviors to perform. According to Mann et al. (2013), a useful measure to enhance the effectiveness of avoidance goals is therefore to convert them into approach goals (e.g., “increase vegetarian meals” rather than “avoiding meat”). In other instances, people can instead specify a substitution goal (“buy secondhand instead of new clothes”) or formulate another goal to which the avoidance goal is instrumental (“reducing carbon emissions from car driving” is instrumental to getting in better physical shape through biking; Mann et al., 2013).

Another goal characteristic that draws similarity with the approach-avoidance distinction concerns goals with an achievement orientation. Researchers studying achievement goals have identified three different types of achievement goals that function in most achievement contexts: mastery goals, performance-approach goals, and performance-avoidance goals (Elliot & Harackiewicz, 1996). Mastery goals focus on the development of a competence or skill such as learning to grow vegetables or doing household composting. Performance-approach goals concern the attainment of competence in comparison to a standard or other people (e.g., having the lowest energy bill in the neighborhood). Performance-avoidance goals focus on the avoidance of incompetence relative to others (e.g., conforming to social norms of recycling bottles). Mastery and performance-approach goals are approach goals, whereas performance-avoidance goals are avoidance goals (Elliot & Thrash, 2002). The achievement goal distinction has not been frequently applied in an environmental context. However, evidence from the academic and learning domain indicates that pursuing a mastery goal promotes self-efficacy and more effective goal striving than

performance goals even in the light of failure (Bell & Kozlowski, 2002). Furthermore, mastery goals allow for a more gradual incorporation of appropriate behaviors where competence improvements serve as indications of progress and success. This suggests that reframing performance goals into mastery goals could be beneficial. In fact, attaining environmental goals might require people to develop new competencies – for example the skill of preparing delicious vegetarian or vegan dishes, more efficient use of food ingredients to reduce food waste, or learning to redesign clothing to increase longevity.

Goal striving – mechanisms of self-regulation

While it is important to adopt environmental goals that are feasible and with the right characteristics, there is still a long route to goal attainment (at least for the majority of goals). The second and third component of self-regulation is encapsulated in the process of goal striving. Goal striving refers to planning and implementing actions that promote goal attainment and shielding the goals against distraction and disruption (Mann et al., 2013). Goal striving is a challenging endeavor that entails specifying what should be done to attain the goal and when these actions ought to be performed. This planning effort is deemed necessary as most environmental goals rarely are represented by only one behavior and with only opportunity of achievement. Rather, they can usually be achieved through multiple behaviors and involve the performance of numerous actions over a period of time across contextual settings.

Goal striving also entails shielding the environmental goal against outside intrusions. As people strive for many different goals during daily life it is inevitable that they encounter obstacles, goal conflicts, and temptations. Successfully overcoming obstacles or conflicting goals requires self-regulation through efforts of managing thoughts, feelings, and actions (Gollwitzer & Moskowitz, 1996; Kuhl, 2000). To accompany the goal striving process, there are a number of self-regulation strategies that can be undertaken to increase the likelihood of success. These self-regulation strategies represent a continuum ranging from prospective to interventive strategies (Fujita, 2011; Hofmann & Kotabe, 2012). Prospective strategies refer to the broad collection of processes and strategies people use to protect their goals from anticipated temptation or disruption (Fujita et al., 2016). These strategies help reduce the probability of self-regulation failure by circumventing potentially goal conflicting situations and through automating goal-congruent behavioral responses. In contrast, interventive strategies are called upon in situations where a goal conflict is already experienced and self-regulation is needed to ensure the adherence to the more valued goal. Generally, prospective strategies are more effective and less subject to failure than

interventive strategies (Ent, Baumeister, & Tice, 2015; Hofmann et al., 2012a). In the following, the self-regulation strategies of planning, automatization, cognitive change, and effortful inhibition are outlined (see Table 1).

Table 1

Self-regulation strategies supporting goal striving

Strategy		Description	Example
Planning	Implementation intentions	Pre-committing to a behavioral plan by specifying “if situation X arises, I will perform the goal-directed response Y”	If at a restaurant, I will choose the vegetarian option
	Avoiding temptations	Restricting the future availability of problematic elements or situations that might create conflict and undermine goal progress	Getting rid of the dryer to avoid using it
Automatization	Habitualization	Establishing beneficial habits that support one’s goal striving efforts	Taking the bicycle to work every day
	Counteractive control	Developing an asymmetric pattern of cognitive associations between higher-order goals and proximal temptations	Thinking about eating meat activates the goal of living environmentally friendly, but thinking about living environmentally friendly does not activate thoughts about meat
Cognitive change	Construal level	Changing how situations or objects are construed by applying high-level construals to highlight the long-term features	Thinking about eating a steak as being harmful for the environment rather than being a delicious meal
	Reappraisal	Changing how behaviors and objects are cognitively appraised in favor of higher-order goals	Telling yourself that eating last night’s leftovers are both economically and environmentally beneficial
Effortful inhibition	Inhibiting impulses	The process of inhibiting prepotent thoughts, feelings, or behavioral tendencies and refrain from acting on them	Inhibiting the tempting impulse of taking the car to work on a rainy day

Planning

One of the most powerful self-regulation strategies is the anticipatory planning of behavior (Hofmann & Kotabe, 2012). It requires foresight of the contextual environments in which goal-directed behaviors are performed and how to shield goals from disturbances. One way of planning

is to mentally prepare the appropriate behavioral response when a given situation arises. The use of mental pre-commitment is encapsulated in the concept of implementation intentions (Gollwitzer, 1999). Implementation intentions are distinct from goal intentions as they increase the level of structure specificity of a behavioral plan. Implementation intentions have the structure of “if situation X arises, I will perform the goal-directed response Y” (Gollwitzer & Oettingen, 2010). For instance, an implementation intention serving the goal intention of eating vegetarian could involve the link between a situational context (e.g., ordering at a restaurant) and the appropriate behavior (e.g., choosing the vegetarian option). Implementation intentions have received empirical support in numerous studies across domains (see Gollwitzer & Sheeran, 2006). Bamberg (2002) also provided evidence for the beneficial effect of implementation intentions on the performance of environmental behaviors. In two studies, Bamberg found that the formation of implementation intentions significantly increased the probability of performing two new environmentally related behaviors. Other evidence suggests that even preparing simple plans can benefit the enactment of goal intentions – for example preparing a shopping list can help reduce impulse purchases when going to the supermarket (Inman, Winer, & Ferraro, 2009).

In addition to mentally preparing future behavior, planning also includes shielding goals against potential obstacles and temptations. This involves foreseeing and choosing situations that favor goal pursuit and reduce the risks of encountering goal conflicts (Duckworth et al., 2016). In other words, planning should be used to restrict the future availability of problematic elements or situations that might create conflict and undermine goal progress. For example, consider a woman wanting to reduce her consumption of clothes to benefit the environment. One obvious way to accomplish this is to simply avoid going into fashion stores in the first place. Thereby, she will not be presented with tempting stimuli that could cue her desire to consume. Although complete avoidance is effective, other less extreme approaches could also be valuable such as avoiding certain aisles in the supermarket (Inman et al., 2009). Studies have shown that the planned avoidance of temptation is especially evident in competent self-regulators who generally report experiencing fewer goal-conflicting desires (Ent et al., 2015; Hofmann et al., 2012a). Importantly, as complete avoidance of tempting and conflicting situations is largely unrealistic in practice, planning should be complemented by other self-regulation strategies.

Automatization

Traditional accounts of self-regulation assume that the regulation of thoughts, feelings, or

behaviors occurs in a consciously controlled fashion, wherein the ‘self’ acts as an active agent (e.g., Muraven & Baumeister, 2000). However, these accounts overlook the contribution of automatic processes to self-regulation. Much evidence suggests that automatic processes play a larger role in goal striving than originally thought (Papies & Aarts, 2016). This builds on the recognition that people’s capacity to exert conscious effort and monitor their social environments is limited (Bargh et al., 1996; Fiske & Taylor, 2008). Thus, it would seem like an efficiency-driven logic to distribute part of the goal striving responsibility to the ‘automatic system’. The handover of responsibility is accomplished through an automatization of goal-directed behaviors. In other words, it involves establishing beneficial habits that support one’s goal striving efforts. The purpose of such habitualization is to free up resources and to improve the ability to monitor multiple goals simultaneously (Baumeister & Alquist, 2009; Gillebaart & de Ridder, 2015). Habits are formed through the gradual development of mental associations between a frequently performed behavior and recurring situational cues (Wood & Neal, 2007). Consider for example a woman who, when first starting to exercise, needs to use self-regulation in order to run after a long day at work. After a few weeks and continued use of self-regulation, the exercise becomes an integral part of her daily routine, thus requiring less self-regulation to go for a run. In the end, a habit of running after work is established in which the behavior is almost automatically initiated (de Ridder et al., 2012). The positive contribution of habits was illustrated in a recent study by Galla and Duckworth (2015). They found that beneficial habits mediated the relationship between self-control and positive life outcomes.⁴

In environmental research, habits have a rather negative connotation and for good reasons. Habits are difficult to change typically due to a lack of motivation to change and because they are reinforced by contextual cues (Thøgersen, 2014). Thus, from an environmental behavior change perspective habits function as a significant barrier to progress. The difficulty of breaking habits has been observed in various environmental domains such as choice of transportation mode, where strong car driving habits have impeded the transition to more environmentally friendly alternatives (e.g., Klöckner & Matthies, 2004; Thøgersen, 2012). However, as the account above illustrates, habits can also be a force for good and once formed, environmentally friendly habits are equally difficult to change. The notion of habits may also include the re-initiation of behaviors. This refers to behaviors that are not performed on a consistent basis throughout the year (e.g., due to seasonal

⁴ Galla & Duckworth (2015) used a measurement of trait self-control for their study. Whereas the habitualization of goal-directed behaviors is distinct from acts of self-control, it is included in the broader definition of self-regulation (for further clarification see Fujita, 2011).

fluctuations), but rather are conditionally performed in the same contextual context such as shopping at the farmer's market or riding a bicycle to work in the summertime. If such behaviors are repeatedly carried out over time and the contextual environments remain unchanged, they might be restarted in a similar manner as conventional habits.

A different automatization strategy involves developing automatic processes to activate higher-order goals when facing temptations. People are, if sufficiently motivated, capable of over time developing an asymmetric pattern of cognitive associations between their higher-order goals and proximal temptations. It involves expanding self-regulation to the extent that thoughts about temptations activate thoughts about higher-order goals, but not the other way around (Fishbach, Friedman, & Kruglanski, 2003). The asymmetric pattern is particularly beneficial as it biases thoughts toward higher-order goals, thereby increasing the likelihood of self-regulation success (Fujita, 2011). The strategy is based on the counteractive control theory (Trope & Fishbach, 2000), which holds that temptations, signaling a threat to a higher-order goal, automatically activate goal-directed behavior to counteract the immediate threat. In a number of studies, Fishbach et al. (2003) observed this asymmetric pattern in cognitive associations among their study participants, where temptations (e.g., cake) promoted the activation of goals (e.g., health), but not the reciprocal relationship. Other studies have found a similar pattern where facing temptations cued and boosted goal importance and intentions (Kroese, Evers, & de Ridder, 2009). Although specific boundary effects have been identified (see Kroese, Adriaanse, Evers, & de Ridder, 2011), these findings suggest that encountering temptations can in fact remind people of their higher-order goals, thereby shielding them from goal disruptions (for further discussion see Ozaki, Goto, Kobayashi, & Hofmann, 2017).

Cognitive change

The experience of situations and objects does not always reflect objective features. Instead, they oftentimes rely on subjective interpretations (e.g., Balcetis & Dunning, 2006). Subjective interpretations can fluctuate over time and are subjected to mental framing effects (Trope & Liberman, 2003). Subsequently, situations and objects can be mentally represented (or construed) in different ways. For instance, one can think about eating a steak as being a delicious meal or, alternative, as being harmful for the environment. The former construal highlights the immediate benefits of eating the steak, whereas the latter highlights the long-term costs of doing so (Duckworth et al., 2016). Whether the immediate or the long-term aspects are highlighted has

evaluative implications and can influence judgments, decisions, and behaviors (Fujita & Han, 2009).

The psychological mechanisms underlying different construals can be explained by construal level theory (Trope & Liberman, 2003). Construal level theory proposes that one distinguishing feature between mental construals is the level of abstraction (Liberman, Trope, & Stefan, 2007). High-level construals are mental representations that highlight the global, abstract and central features of situations or objects. Or in simpler words, high-level construals involve seeing the broader, long-term picture. Conversely, low-level construals are mental representations that highlight the proximal and concrete features of situations and objects. As high- and low-level construals emphasize different features of the same situation or object, they can lead to contrasting judgments and decisions (Fujita & Han, 2009). For instance, when decisions are to be implemented in the future, people are more likely to apply high-level construals, thus preferring larger and more distal rewards (e.g., environmental benefits) over smaller and immediate rewards. However, when decisions are to be implemented in the present, people more often apply low-level construals, whereby preferences are reversed rendering the smaller and immediate rewards to be preferred (Fujita et al., 2016). The different levels of construal might also explain why so many people find environmentally friendly behaviors positive and desirable in the future, yet sometimes find them unattractive and burdensome in the present (Mann et al., 2013).

A study by Fujita and Han (2009) found that adopting a high-level construal rather than a low-level construal enhanced the preferences for apples over candy bars among a group of dieters. This suggests that simply adopting a more abstract (high-level) perspective might help people to escape falling prey to immediate environmentally harmful behaviors and instead highlight the relevance and importance of one's higher-order environmental goals. Although changing the construal of specific situations benefits goal striving, it is susceptible to situational fluctuations in cognitive capacity. Thus, when cognitive resources are taxed, reconstruing a situation or object becomes a difficult task unless done so automatically (Fujita, 2008). A better way to efficiently capitalize on high-level construals is through prospective planning. When planning future goal-directed behaviors people are more likely to adopt a high-level construal as they are not confronted with immediate and tempting stimuli (Fujita & Carnevale, 2012). As a result, pre-committing to behaviors can protect people against a shift in construal, wherein temptations suddenly become tangible (Myrseth & Fishbach, 2009).

Another cognitive change strategy involves changing how behaviors and objects are cognitively appraised in favor of higher-order goals. Cognitive reappraisal involves thinking

about a behavior or object in a different manner. It is an effective tool to diminish the strength of temptations and amplify the value of goal-directed behaviors (see Quoidbach, Mikolajczak, & Gross, 2015 for review). For instance, when striving to break out of a bad habit decreasing one's evaluation of the problematic behavior can down-regulate the experienced conflict arising from performing the alternate, more sensible behavior. Similarly, the reversed pattern can also work, wherein the appraisal of the sensible behavior is enhanced (Gillebaart & de Ridder, 2015). In an environmental context, reappraisal can assist in reducing the hedonic conflict associated with performing certain environmentally friendly behaviors. For example, mentally highlighting both the economic and environmental benefits of reducing food waste could over time lessen the decision conflict of having to eat the same meal two days in a row.

Effortful inhibition

The perhaps most studied goal striving strategy in social psychology is effortful inhibition. Unlike the three other strategies, effortful inhibition does not directly enhance the attainment of higher-order goals. Rather, effortful inhibition is an intervention strategy that serves to protect higher-order goals from disruption during direct encounters with temptations. Effortful inhibition is the process of inhibiting prepotent thoughts, feelings, or behavioral tendencies and refrain from acting on them (Tangney et al., 2004; Vohs et al., 2008). The classical illustration of effortful inhibition is the dieter's confrontation with a tempting chocolate cake. The immediate allure of the tasty chocolate cake is in direct confrontation with the dieter's higher-order goal of better health and physical appearance. To successfully self-regulate, the dieter must inhibit the impulse to eat the chocolate cake and reject tasting it in favor of his or her higher-order goal. As such, effortful inhibition is a reactionary approach to protect higher-order goals and it is mainly deemed necessary when prospective strategies have been unsuccessful (Fujita, 2011). The reason underlying this dull classification lies in its inconsistent effectiveness. The ability to use effortful inhibition is predicated on an exertion of conscious effort, which is strongly dependent upon dispositional and situational factors (Frieze et al., 2009). Research has suggested that working memory capacity is an important dispositional factor of effortful inhibition. People high in working memory capacity are generally assumed more effective in enacting goal-directed processing and shield their goals from disruption (e.g., through attention control; Hofmann, Frieze, & Strack, 2009). Consequently, these individuals should be more capable than people low in working memory capacity to inhibit automatically cued behavioral tendencies such as

environmentally harmful habits.

A key situational factor is cognitive capacity. Temporary reductions in cognitive capacity can hinder the use of conscious effort to control behavior (e.g., Baddeley, 1996). Such reductions can, for example, occur due to cognitive load (e.g., deciding while trying to remember an 8-digit number; Muraven & Baumeister, 2000), being under time pressure (Frieze et al., 2009), experiencing negative moods (Fishbach & Labroo, 2007; Tice, Baumeister, Shmueli, & Muraven, 2007) or due to alcohol intoxication (Fillmore et al., 1999).

Another prerequisite for effortful inhibition is the availability of motivational resources. Decades of research on ego depletion indicates that effortful inhibition of goal-inconsistent tendencies depletes the motivational resources it is dependent upon (Baumeister et al., 1998; Hagger, Wood, Stiff, & Chatzisarantis, 2010). Ego depletion refers to a state, wherein the 'self' has reduced capacity to override or inhibit the enactment of temptations (Baumeister & Vohs, 2007). This implies that individuals have a limited resource that becomes depleted through acts of self-control. Once ego depleted, attempts of inhibiting temptations become increasingly difficult and unsuccessful. For example, in a study of impulsive buying, Vohs and Faber (2007) found that ego depleted participants spent more money on products than non-depleted participants. Although the ego depletion effect has been validated in numerous studies across various situations (de Ridder et al., 2012), more recent studies have questioned its validity and replicability (Hagger et al., 2016; Inzlicht & Schmeichel, 2012; Lurquin et al., 2016). As an alternative response, it has been proposed that ego depletion does not exhaust one's effortful inhibition ability, but rather reflects a reduction in the motivation to exert it (Inzlicht & Schmeichel, 2012). Following this hypothesis, Osgood and Muraven (2015) reported that ego depleted participants were less motivated to inhibit their selfish impulses than non-depleted participants, despite reporting an equal concern for others. Notwithstanding the true nature of ego depletion, motivation plays a critical role in effortful inhibition. If the motivation to inhibit goal-inconsistent tendencies is not present, successful inhibition is highly unlikely. The motivational component of effortful inhibition partly depends on the perceived importance of the higher-order goal and the strength of the experienced temptation or behavioral tendency (Kotabe & Hofmann, 2015). A highly important goal may alert the monitoring system that violating this goal could cause unwanted disruption, thus motivating protective action. However, in other instances an experienced temptation might be too strong to inhibit. For example, a person might have an important goal of protecting the environment, but the urge of flying to an exotic destination on an impulsive holiday might simply be too attractive to pass up. As a result, unless an environmental

goal is perceived to be particularly important or prospective strategies have been implemented, the motivation to protect it will not always be strong enough to shield it from disruption.

In sum, the evidence illustrating the cognitive and motivational limitations of effortful inhibition suggest that strictly relying on effortful inhibition to attain one's environmental goals is a journey set for failure. However, effortful inhibition can act as an important "last resort" strategy when prospective strategies have failed.

Future research

The present exploration and conceptualization is based on empirical findings mostly from other behavioral domains than the environmental domain. As a result, empirical researchers are encouraged to test and validate the reported results and especially the highlighted self-regulation strategies in studies specific to the environmental domain. Due to the limited focus on self-regulation there are many avenues yet to be explored. An important avenue for future research is understanding what creates persistence in environmental goal striving. Typically, self-regulation research assumes that attending to the delayed and long-term outcomes of higher-order goals are essential for successful goal striving. However, recent evidence suggests that attending to the immediate benefits associated with higher-order goals can increase the persistence towards attaining them (Woolley & Fishbach, 2016). Over a series of studies, Woolley and Fishbach (2016) found that the experience of immediate rewards (versus delayed rewards) increased persistence in goal-directed behaviors, despite the fact that the behaviors were performed for the positive long-term outcomes they provide. Most higher-order environmental goals involve some immediately tangible rewards such as the good taste of vegetarian food or the fun of growing vegetables with your family. Attending to these rewards can assist cognitive change strategies in down-regulating any decision conflicts that might arise from the performance of environmentally friendly behaviors. Whether the benefits of attending to the immediate rewards of higher-order goals are similarly true in relation to environmental goals should be confirmed by future research.

Another significant avenue concerns the impact of small self-regulation failures on the commitment to higher-order goals. It specifically relates to the cognitive associational links in goal hierarchies between lower-order and higher-order goals. A recent study by Devezzer et al. (2014) found that the failure of not recycling a water bottle led to a decrease in commitment towards the participants' higher-order goal of protecting the environment. The possible existence of a negative motivational spillover upwards in the goal hierarchy may have significant

implications for the understanding of environmental self-regulation failures. This is particularly relevant considering that contextual settings not always facilitate or allow for successful self-regulation or the performance of environmental behaviors. For example, individuals with a lower-order goal of purchasing organically produced food products would regularly encounter goal conflict due to the limited availability of such products in most countries. To what extent the findings of Devezer et al. (2014) can be generalized to other environmental goal-failures needs further clarification.

The pursuit of environmental goals does not always occur in seclusion, but will often take place in the presence of other people. Who these people are might have implications for self-regulation success. Other people can have both an inhibiting and facilitating effect of the enactment of goal-directed behaviors (Hofmann et al., 2012a). Specifically, the presence of people sharing similar environmental goals as oneself can function as a facilitating agent – for example through supporting the individual’s prospective planning efforts or acting as a reminder of these goals when encountering temptations. In contrast, people non-supportive of one’s environmental goals have the opposite effect, whereby they act as an inhibiting agent. These individuals might undermine the prospective self-regulation strategies leading to more frequent confrontations with goal-inconsistent tendencies and temptations. In fact, inhibiting agents can lead to the exertion of counterproductive self-regulation. This entails the use of effortful inhibition to inhibit the desire to perform goal-directed behaviors in the service of ensuring social acceptance (see Rawn & Vohs, 2011). For instance, a person with the goal of becoming a vegetarian might override the desire of ordering vegetarian food when in a social situation with only meat-eaters. The undermining effects of non-supportive people might lead one to speculate that the probability of self-regulation success and ultimately goal attainment is smaller for individuals with closely connected inhibiting agents. However, the appropriateness of this claim must be verified by future research.

Conclusion

The present article sought to draw on the social psychological tradition in self-regulation research to explore and conceptualize self-regulation processes in the study of environmental behavior change. The article carves out some of the important aspects of self-regulation particularly those centered around goal setting and goal striving. The process of changing behavior is complex and providing one solution to successfully setting and attaining environmental goals would be unbecoming. An important lesson from self-regulation research is that sometimes people do in

fact fail to conform to their own standards and goals. However, unlike prediction models, self-regulation research gives directions on how reduce the frequency by which these failures occur.

To strengthen the likelihood of success people must fully commit to the environmental goal as well as ensure that it is consistent with existing goals and appropriately framed. Preferably, the goal should be a mastery goal with an approach orientation. They need to prospectively plan and execute goal-directed behaviors in goal-supportive contexts, while being attentive to goal-disruptive temptations and behavioral tendencies. Once successfully executed, goal-directed behaviors must, if possible, be automatized to free up cognitive resources for other assisting purposes. People should be wary of low-level construals and reappraise objects and past behavioral tendencies to reduce or avoid experiencing conflict. In situations where temptations are encountered, people must consciously inhibit the impulse to transgress and direct attention away from tempting behaviors and back to goal-congruent behaviors.

Chapter 6: Article II

Moral Fabrics: A Daily Diary Study on the Link between Moral Self-Control and Clothing Consumption

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Abstract

Self-control is the process of overcoming short-term temptations in the service of a long-term goal. But does it matter whether this long-term goal is a self-interested or moral goal? The present research sought to answer this question by investigating the influence of moral considerations on self-control decisions relating to clothing consumption. To illuminate the processes through which moral considerations influence purchasing decisions, we developed a conceptual model of moral self-control composing four factors: moral considerations, conflict, resistance, and purchase. The model was assessed using data from a large diary study ($N = 594$; $n_{\text{obs}} = 7,880$) conducted with daily reporting over two weeks in the United Kingdom. A multilevel path model analysis revealed that moral considerations were associated with stronger conflict experiences, more frequent attempts to resist clothing desires, and less frequent clothing purchasing. This finding suggests that moral self-control is unique from non-moral self-control.

Keywords: Morality, Self-control, Experience Sampling, Clothing Consumption

Introduction

Morality is a critical element in the functioning of societies and human relationships. Morality can be characterized as a culturally transmitted set of normative values and rules that enable people to live in (more or less) harmony. Moral values and rules often motivate people to resist short-term impulses and desires to ensure long-term interpersonal and collective prosperity over personal gain (Janoff-Bulman et al., 2009). Much the same is true of self-control: Self-control decisions often come to benefit the collective, although not necessarily undertaken with such benefits in mind (Lieberman, 2013). Self-control can be defined as “the process or behavior of overcoming a temptation or prepotent response in favor of a competing goal (either concurrent or longer-term)” (Milyavskaya et al., 2019; Tangney et al., 2004). As such, morality and self-control have a similar behavior-constraining function by inhibiting the performance of morally- and/or goal-conflicting actions (Hofmann et al., 2018).

Despite significant conceptual overlaps, research on morality and self-control have mainly led different lives. The present work is part of a recent movement to bridge and connect the two areas of research more closely, for good reasons: Integrating self-control insights into morality research can help elucidate the processes by which moral values and standards are enacted and adhered to. Conversely, incorporating morality into self-control research may improve the understanding of the moral nature of many self-control domains and decisions. In the present research, we thus sought to shed more light on the conjunction between morality and self-control research by investigating the influence of moral considerations on the self-control process.

There are two central terms relevant for understanding the interaction between moral values and self-control: *moral self-control* and *moralization of self-control*. Moral self-control draws inspiration from traditional self-control frameworks (e.g., Fujita, 2011; Kotabe & Hofmann, 2015), but specifically centers around situations in which people need to resist a selfish impulse or desire in the service of a less selfish (e.g., prosocial or biospheric) moral value or standard. Thus, by implication, moral self-control only relates to a sub-set of self-control dilemmas by excluding non-moral self-control—the resistance of a selfish impulse or desire in the service of a long-term self-interested goal (Hofmann et al., 2018). For example, resisting the desire to purchase the newest iPhone with the aim of limiting one’s environmental impact is an instance of moral self-control, whereas resisting this desire aiming to ensure one’s financial stability is not. The translation of moral values into action is largely subjected to the same process as other (non-moral) values. Enacting moral-congruent behavior too relies on conflict identification, motivation

to exert self-control, and cognitive capabilities (e.g., executive functions). Construing morality from a self-control perspective may therefore prove diagnostic in terms of identifying why and under what conditions people fail to adhere to their moral values.

Moralization of self-control refers to the process by which, over time, self-control preferences are converted into values (Rozin, 1999). Moralizing self-control preferences adds a layer of significance by converting self-control into a matter of right and wrong with self-control failure being morally condemned (Graham et al., 2011; Horberg, Oveis, Keltner, & Cohen, 2009; Mooijman et al., 2017; Ståhl, Zaal, & Skitka, 2016). The conversion of self-control derived from a personal preference, which may fluctuate over time, into a more absolute and resilient moral value may have significant implications for self-control. Moral values carry remarkable motivational power for self-restraint and could, as a result, strengthen people's motivation to exert self-control upon realizing the moral nature of a decision (Mooijman et al., 2017). The positive link between moral values and motivation is especially important considering the increasing recognition of the imperative function of motivation in determining self-control outcomes (e.g., Berkman, Livingston, & Kahn, 2017; Inzlicht & Schmeichel, 2012; Milyavskaya et al., 2019).

The objective of this exploratory study was to investigate conceptual distinction between moral and non-moral self-control, as well as the influence of moral considerations on the self-control process. We did so in the context of clothing consumption and through a two-week diary study with daily reporting. Clothing consumption is a key consumer domain involving a range of ethical and moral issues, such as clothing factories' use of child labor, excessive pollution of ecosystems, and poor working conditions. The assumed moral nature of clothing consumption allowed us to assess both the extent to which clothing purchase decisions were moralized (moralization of self-control) as well as how moral considerations affected the self-control process (moral self-control). To elucidate the latter, we used an adapted version of Hofmann et al.'s (2012a) conceptual model of motivated behavior comprising four components of moral self-control: moral considerations, conflict, resistance, and behavioral enactment (see model and model description in Figure 1). In subsequent analyses, we also explored the emotional consequences of the exertion of self-control and the activation of moral considerations, particularly focusing on feelings of guilt, pride, and happiness—all of which have been linked to self-control (Hofmann, Kotabe, & Luhmann, 2013; Becker et al., 2018).

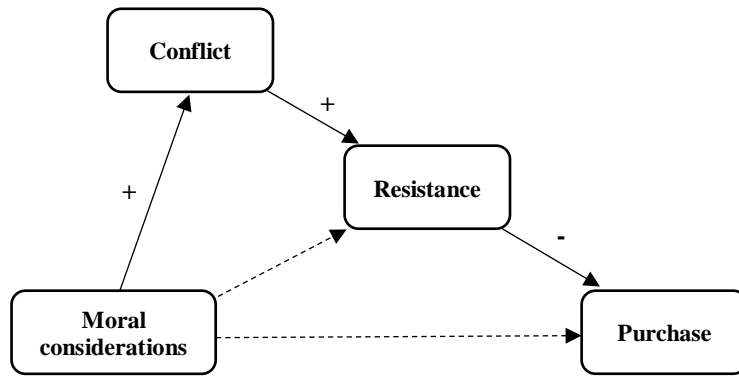


Figure 1. Four-step conceptual model of moral self-control: The model is sequential and integrates moral considerations, conflict, resistance, and purchase. The pathway from moral considerations through conflict and resistance to purchase represents the assumed indirect and inhibiting effect of moral considerations on purchasing decisions. We propose that the activation of moral considerations prompts an experience of conflict between a current desire and moral values, which in turn motivates the resistance of the purchasing desire.

Method

Participants completed a two-week diary study on clothing consumption. Statistical power in intense longitudinal data is a complex function of the number of measurement occasions as well as the number of participants sampled, among other parameters (e.g., Bolger & Laurenceau, 2013). To maximize power, we sampled as many participants as our budget allowed for—yielding a goal of 700 participants. Materials are available online (osf.io/ut6kp); unfortunately, data-protection policies specified by the funding projects hinder the publication of the dataset.

Participants

The online research platform, Prolific, was used to recruit study participants. Recruitment was terminated when an initial sample of 705 participants was reached. These participants entered the study by completing an intake survey. All participants were informed of the eligibility requirement, before completing the intake survey and again at the end of every daily diary protocol. The requirement and the diary protocol were pre-registered on OSF (osf.io/ut6kp). 105 participants failed to meet the payment eligibility requirement (completing a minimum of 11 out of 14 daily protocols) and were therefore excluded from the analysis. Six additional participants were excluded due to technical issues with the daily response reminders.

The final sample consisted of 594 adults from the United Kingdom (71% female, 29% male; age range: 18–64 years, $M = 37.44$, $SD = 11.07$). Participants were generally more educated (31%

with college/A-levels, 34% with an undergraduate degree, 15% with a graduate or doctorate degree) and had more left-leaning political beliefs than the U.K. average (37% leftwing, 24% center, 13% rightwing, and 24% reported not knowing). The majority of participants were either full-time (34%) or part-time employed (24%). The remaining participants were homemakers (15%), self-employed (11%), out of work (5%), students (5%), retired (3%), or unable to work (3%).

Procedure

People were invited to participate in the diary study on the 4-5th of December by completing an intake survey consisting, amongst other, of trait measures (e.g., trait self-control) and measures of clothing goals and clothing consumption (all measures are detailed in the pre-registration report). Participants were informed that the diary study would begin on the 6th of December with daily reporting over the following 14 days. All participants were compensated with £10 for their participation — assuming they met the payment eligibility requirement — independent of whether they completed 11 or 14 daily protocols. Throughout the diary study period, participants were sent a link to the daily protocol every day at 5 pm through Prolific's mailing system. The link was valid until 8 am the following day. The average daily completion rate was 82.93% for all participants invited to the diary study ($N = 705$) and 96.06% among the final sample ($N = 594$). The completion rate was lowest on Day 4 where a technical issue in Prolific's system delayed the publication of the survey link by two hours. The total number of diary responses was 7,880.

Measures

In each daily protocol, participants first answered five measures of well-being (e.g., happiness, stress level, satisfaction with self). Next, participants indicated whether they had experienced a desire to purchase clothing since their last protocol completion. If they answered affirmatively, they indicated the strength of the desire (1 = *very weak*, 7 = *irresistible*), the location and duration of the desire experience, the specificity of the desire (1 = *towards clothing in general*, 2 = *towards a specific product category (e.g., jeans)*, 3 = *towards a specific clothing item*), how vividly the desire was imagined (1 = *not at all*, 7 = *extremely*), and the extent to which the desire was in conflict with one or more of their personal goals (1 = *not at all*, 2 = *very little*, 8 = *very much*).

Independent of whether a desire was experienced, all participants then indicated if they had purchased any clothing items since the last protocol. When clothing was purchased, the participants reported the number of items purchased—from 1 item to 10 or more items. Next, they were asked to report the details of up to three purchases; participants who purchased more than three clothing items could themselves select which of the purchases to report. For each purchase, participants reported the type of clothing (e.g., *outerwear*), where the item was purchased (e.g., *high street* or *shopping mall*), the price (in *pounds*), whether the item was on sale, the main purpose of the purchase (e.g., *replacement*, *gift*, or *reward*), the main reason(s) for the purchase decision (e.g., *brand*, *price*, *style*, or *environmental impact*), and how the purchase made them feel (11-point bipolar scales: *unhappy-happy* and *guilty-proud*). They then reported the extent to which the purchase decision was based on deliberate thoughts/reasoning and the extent to which the decision was based on gut feelings/intuition—both indicated on a scale from 1 (*not at all*) to 7 (*very much*). They also indicated the extent to which the purchase was in conflict with one or more of their personal goals, whether the purchase decision included moral considerations, and whether the purchase decision included environmental considerations (1 = *not at all*, 2 = *very little*, 8 = *very much*).

Whenever a purchase was reported, participants then indicated whether they tried to resist the desire to purchase clothing before their purchase(s). If they tried to resist the desire, they reported how motivated they were to resist the desire (1 = *not very motivated*, 4 = *somewhat motivated*, 7 = *very motivated*), how much mental effort they invested in resisting the desire (1 = *very little*, 7 = *very much*), and how they tried to resist the desire (e.g., *by focusing my attention on something else*). If participants did not purchase any clothing items but experienced a purchasing desire, they were first asked whether they tried to resist the desire. If they answered affirmatively, they similarly indicated their motivation to resist the desire, allocation of mental effort, and the resistance strategy used. In addition, they reported how resisting the desire made them feel (11-point bipolar scales: *unhappy-happy* and *guilty-proud*), whether the resistance of the desire included moral considerations, and whether the resistance included environmental considerations (1 = *not at all*, 2 = *very little*, 8 = *very much*).

The diary protocol included a few additional measures not listed above. These measures are available at the OSF project page where full descriptions of the intake survey and the diary protocol are uploaded. Due to a misspecification of the income measure in the intake survey, participants were asked to report their income again on Day 1 and Day 14 of the diary study. An overview of the central variables is provided in Appendix A.

Data analytic strategy

The main purpose of our analysis was to investigate how moral considerations influence the self-control process. Because the diary data is nested (observations within persons), all analyses were analyzed using multilevel modeling (Raudenbush & Bryk, 2002) except descriptive raw data calculations. Our conceptual self-control framework was tested using the multilevel software Mplus (Muthén & Muthén, 2004). The analysis strictly focused on situational variables fluctuating at the within-person level (level 1), thereby excluding trait-level variables (level 2), such as trait self-control.

The two binary dependent variables, resistance and purchase, were handled differently: resistance was transformed into a continuous variable by merging the original binary variable (no resistance; resistance) with the resistance motivation variable (new resistance variable: 1 = *no resistance*, 2 = *not very motivated*, 5 = *somewhat motivated*, 8 = *very motivated*); the purchase variable was dummy-coded in order to estimate the effect of no purchase (coded 0) versus purchase (coded 1). The central variable, moral considerations, was created by taking the mean of the variables assessing the extent to which moral considerations were included in the purchase or resistance decision (i.e., one variable for each of up to three reported purchases and the variable assessing moral considerations when a purchasing desire was reported as resisted). All other responses were coded as missing values. The same procedure was repeated for the creation of the guilt/pride and happiness variables except that these variables included two non-purchase assessments—when the desire was resisted and when it was not (Appendix B contains an overview of all recoding and relabeling decisions). Moreover, we only used the desire conflict measure to assess conflict (as specified in the conceptual framework) due to the theorized temporal sequence of the self-control process. Due to the process-focus of the current study, all Level-1 continuous variables (moral considerations¹, conflict, resistance, guilt/pride, and happiness) were person-mean centered to facilitate the estimation of their unbiased relationships at level 1 (Enders & Tofighi, 2007).

The conceptual model was estimated as a multilevel path model using the WLSMV estimator in conjunction with a probit link. Mediation (indirect) effects were estimated via the delta method (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Analyses of the emotional consequences of self-control and the activation of moral considerations were performed through multilevel linear regression using the MIXED command in SPSS treating guilt/pride and

happiness as continuous Level 1 variables. Intercorrelations between key variables were estimated using the R package *rmcorr* to account for the nested data structure (Bakdash & Marusich, 2017).

Results

Descriptive and frequency data

Participants reported 1,472 desire experiences with a moderate desire strength ($M = 4.33$, $SD = 1.47$) on average, with 9% of desires indicated as being irresistible. The experienced desire duration was, on average, brief with the majority of desire experiences lasting either 0-5 minutes (31%) or 6-10 minutes (24%). The desire to purchase clothing most often emerged at home (52%), in a clothing store (28%), or at work (9%). The average level of (desire) conflict was $M = 3.57$ (measured from 1 to 8; $SD = 2.20$), with 24% of desires rated as not conflicting at all, 19% as very little conflict, and 6% as very much in conflict. On average, desires were resisted 49.7% of occasions and enacted (with or without prior resistance) 36% of occasions. The average level of resistance (motivation) was $M = 3.47$ (measured from 1 to 8; $SD = 2.70$). Moral considerations were included in the decision process – either in the purchasing decision or the decision to resist the desire – at an average level of $M = 2.96$ (measured from 1 to 8; $SD = 1.93$) suggesting that clothing-related decisions had been moralized by some participants (see distribution plot in Supplemental Material). After a purchase, participants felt a stronger sense of pride compared to guilt ($M = 7.23$, $SD = 2.80$; rated on a 11-point bipolar guilt-pride scale). Feelings of pride were also more prevalent when participants experienced a desire to purchase clothing, yet did not act upon the desire ($M = 7.25$, $SD = 2.29$; overall guilt/pride mean: $M = 7.24$; $SD = 2.47$). Larger differences between purchase and no purchase were evident with regards to experiences of happiness. Participants experienced seemingly greater levels of happiness following a clothing purchase ($M = 8.94$, $SD = 2.15$; rated on an 11-point bipolar unhappiness-happiness scale) than when they experienced a desire but did not enact it ($M = 6.46$, $SD = 2.60$; overall happiness mean: $M = 7.49$, $SD = 2.71$). Means and intercorrelations of key variables are presented in Table 1.

Table 1. Descriptive statistics and intercorrelations

	<i>M</i>	<i>SD</i>	Range	1	2	3	4	5	6
1. Moral considerations	2.96	1.93	1-8	—					
2. Conflict	3.57	2.20	1-8	.296	—				
3. Resistance	3.47	2.70	1-8	.195	.179	—			
4. Purchase	0.09	0.28	0-1	-.222	-.090	-.563	—		
5. Guilt/pride	7.24	2.47	1-11	.046	.029	.157	-.090	—	
6. Happiness	7.49	2.71	1-11	-.166	-.075	-.197	.502	.354	—

Note. Correlations significant at $p < .05$ are printed in bold.

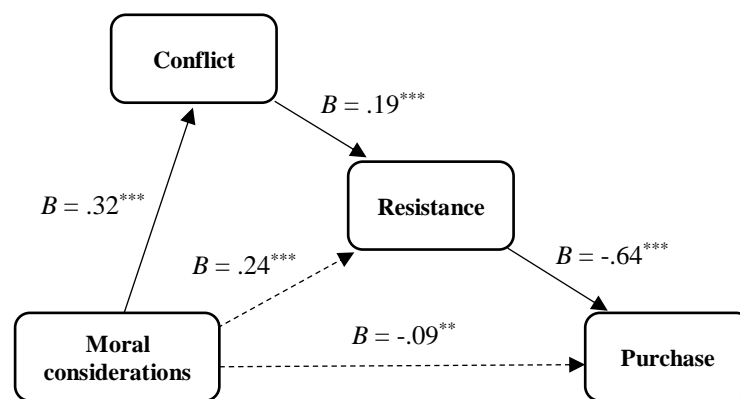
On 669 occasions, participants reported one or multiple clothing purchase(s). On the days where participants purchased clothing, they typically purchased one item (59% of occasions), whereas two and three items were purchased on 21% and 9% of occasions, respectively. As participants reported purchase details for up to three items, we received purchasing details for a total of 1,071 purchases. The most frequently reported purchasing purpose was gifting (28% of occasions) followed by replacement (26%), new style (13%), and event (10%)². A clothing item's style was indicated as the main reason for the purchase decision on 26% of occasions, closely followed by price (22%), comfort (21%), and quality (13%) (note that participants could report multiple reasons; $n = 1,813$). By contrast, environmental impact was reported as the main reason for the purchasing decision on 0.7% of occasions and ethical production 0.4% of occasions.

Morality and the self-control process

For the purpose of this study, we first estimated the variance partition coefficient (Goldstein, 2003) at the between-person and within-person levels to decompose the source of variance. The variance decomposition for continuous variables showed that the main share of variance arose from within-person variations in moral considerations (61%), conflict (53%), resistance (71%), guilt/pride (65%), and happiness (66%). These findings supported our focus on within-person variability in the self-control process.

We next tested the influence of moral considerations on the self-control process through a multilevel path model. The (probit) regression coefficients are displayed in Figure 2. Model results showed a positive relationship between moral considerations and conflict ($B = .32$, 95% CI = [.28, .36], $p < .001$), indicating that respondents experienced a stronger conflict whenever moral considerations were present. As expected, conflict predicted higher resistance. Mediation analyses showed that the effect of moral considerations on resistance were partially mediated via

conflict (indirect effect: $B = -.04$, 95% CI = $[-.05, -.02]$, $p < .001$). However, there was, at the same time, a reliable residual effect of moral considerations on resistance, indicating that moral considerations also exerted an effect on resistance that went beyond raising conflict awareness (we will get back to this interesting finding in the discussion). Resistance, in turn, had a strong inhibitory effect on purchase behavior, as expected. Mediation analyses revealed that the entire indirect pathway from moral considerations on purchase, mediated via conflict and resistance, was reliable. In addition, the indirect effect of moral considerations on purchase via resistance was reliable, as was the residual direct effect of moral considerations on purchasing decisions (see Figure 2). The latter finding suggests that, next to conflict and resistance, there may be residual pathways or mechanisms via which moral considerations exert their effect. In sum, this analysis shows that moral considerations exerted a strong inhibitory influence on purchasing decisions (overall total effect: $B = -.07$, 95% CI = $[-.09, -.05]$, $p < .001$), the major part of which is mediated via conflict and resistance as entry points.³



Indirect (Mediation) Effects:
 Moral considerations → Conflict → Resistance → Purchase: $B = -.04$, 95% CI = $[-.05; -.02]$, $p < .001$
 Moral considerations → Conflict → Resistance: $B = .06$, 95% CI = $[.04; .08]$, $p < .001$
 Moral considerations → Resistance → Purchase: $B = -.15$, 95% CI = $[-.20; -.11]$, $p < .001$
 Conflict → Resistance → Purchase: $B = -.12$, 95% CI = $[-.16; -.09]$, $p < .001$

Figure 2. Multilevel mediation model of moral self-control. Parameters are unstandardized (probit) regression coefficients. The box summarizes the estimated mediation effects.
 $*p < .05$, $**p < .01$, $***p < .001$.

Emotional consequences of self-control in clothing consumption

Self-control is called upon when an experienced desire is conflicting with a higher-order (moral or non-moral) goal (Myrseth & Fishbach, 2009). Deciding whether to resist or enact a conflicting desire has emotional consequences and can elicit feelings of pride, guilt, and happiness (Hofmann et al., 2013; Tracy & Robins, 2004). For example, studies have shown that people may feel guilty after enacting a conflicting desire, whereas successful resistance may elicit feelings of pride (e.g., Hofmann & Fisher, 2012). Recent research has, however, illustrated that the emotional consequences of self-control are not clear cut to predict (Becker et al., 2018). Building on this stream of research, we explored the emotional consequences of exerting self-control in supplementary analyses. Specifically, we focused on feelings of guilt/pride (rated on an 11-point bipolar guilt-pride scale) and happiness.⁴

We first performed multilevel regression analyses using the MIXED command in SPSS to estimate the effect of resistance (no resistance = 0, resistance = 1), purchase (no purchase = 0, purchase = 1), and their interaction on guilt/pride and happiness, respectively. We expected that participants felt proudest and happiest when successfully resisting a desire (i.e., not purchasing clothing) and the least proud and happy when purchasing clothing despite trying to resist the desire to do so. With regards to guilt/pride (intercept: $B = 6.57$, 95% CI = [6.28, 6.85], $p < .001$), an interaction effect was observed between resistance and purchase ($B = -2.51$, 95% CI = [-3.08, -1.94], $p < .001$), suggesting that self-control failure was associated with feelings of guilt. In situations in which desires were not enacted, resistance was positively associated with feelings of pride ($B = 1.13$, 95% CI = [.81, 1.45], $p < .001$). When desires were enacted but not resisted, purchase was also positively related to pride ($B = .78$, 95% CI = [.45, 1.11], $p < .001$). With regards to feelings of happiness, another picture emerged (intercept: $B = 5.87$, 95% CI = [5.61, 6.13], $p < .001$). Successful resistance was positively associated with happiness ($B = .98$, 95% CI = [.65, 1.32], $p < .001$). But interestingly, purchasing clothing was associated with a striking boost in feelings of happiness ($B = 3.19$, 95% CI = [2.87, 3.51], $p < .001$), and this boost largely offset the emotional consequences of self-control failure (interaction effect: $B = -1.23$, 95% CI = [-1.80, -.65], $p < .001$). In other words, succumbing to the temptation to purchase clothing was associated with greater happiness than the successful exertion of self-control (we revisit this interesting finding in the discussion).

Discussion

A growing wave of research has begun to illuminate the conceptual similarities between morality and self-control. The present study sought to further advance this research by exploring how moral considerations translate into moral actions, as well as propose and test a four-step conceptual model of moral self-control. Using data from a large diary study conducted in the United Kingdom, we provide a window into people's self-control decisions and the influence of moral considerations on these decisions. The main insights from this study can be summarized as follows:

First, the effect of moral considerations on clothing purchase decisions was reliably mediated through the self-control processes of conflict and resistance. This finding suggests that there is in fact a conceptual overlap between the way in which moral considerations exert influence on actions and that of self-control processes, as proposed by Hofmann et al. (2018). At the same time, it also supports the distinction between moral and non-moral self-control: People were more motivated to resist desires when moral considerations were activated, which aligns with the proposition that moral concerns and judgments carry great motivational power. Although moral considerations do not always translate into moral actions (Blasi, 1980; Monin, Pizarro, & Beer, 2007), our conceptual model can help point to some of the processes responsible for moral self-control failure. For example, people may fail to identify a conflict between a selfish desire and their moral values (Kotabe & Hofmann, 2015; Sheldon & Fishbach, 2015) or fail to effectively resist the selfish desire, even when motivated to do so (e.g., Gino, Schweitzer, Mead, & Ariely, 2011). These findings are, however, only the first step; the next step may be to distinguish between different types of moral considerations (e.g., personal versus impersonal) and how they relate to self-control decisions.

Second, we observed a residual effect of moral considerations on resistance, indicating that moral considerations exerted an effect on resistance that went beyond raising conflict awareness. This intriguing effect might reflect the existence of a more automatic or habitual pathway that activates resistance without the conscious experience of conflict. For example, research has shown that people can habitualize self-control through repeated practice over time, whereby resistance is initiated automatically upon experiencing a goal-conflicting desire (e.g., Adriaanse et al., 2014). The existence of an automatic pathway for now remains speculative but may represent an interesting avenue for future research on moral self-control. Another possible explanation for the residual effect is that our measure of conflict may capture additional aspects of (cognitive) conflict

or concern that go beyond moral conflict (e.g., whether the money could be used for other, more important purposes).

Third, a direct negative effect was observed between moral considerations and purchase, suggesting that one or multiple mechanism(s) may explain the association between moral considerations and purchase beyond that of conflict and resistance. We can only speculate as to what this or these mechanism(s) may be. One possibility is moral considerations may exert a general inhibitory effect on behavior, much like the observation that many people seem to spontaneously “freeze” and carefully monitor their behavior when seeing a police officer. Another possibility is that participants employed (moral) self-control strategies not captured by our resistance measure, such as attentional deployment (Duckworth et al., 2016) or fault finding (Quoidbach, Berry, Hansenne, & Mikolajczak, 2010), which participants may not have labeled as involving resistance.

Fourth, our findings that self-control failure was associated with feelings of guilt and successful self-control associated with enhanced feelings of pride correspond with previous research on self-control and emotional responses (Dhar & Wertenbroch, 2012; Hofmann et al., 2013). However, contrary to expectations, self-control failure was associated with greater levels of happiness than successful self-control due to the happiness-boost emerging from purchasing clothing. Future research may investigate whether the reversed happiness disparity between self-control failure and success persist over time. For example, it might be that self-conscious emotions, such as regret, emerge once the “honeymoon period” with the purchased clothing wanes, or that delayed feelings of pride and satisfaction emerge from successful self-control.

In conclusion, the present study illuminates the conceptual overlaps between self-control and morality research by showing some of the processes through which moral considerations influence self-control decisions. We hope future research will shed further light on the nature of moral self-control and its distinctive characteristics from non-moral self-control.

Footnotes

1. The analysis excluded environmental considerations due to its conceptual embeddedness within moral considerations ($r = .570$). Sensitivity analyses with environmental considerations included are provided in Supplemental Materials.
2. Due to a technical error, participants could report multiple purposes underlying a purchase on Day 1. The percentages are therefore based on $N = 1,089$.
3. We note that the analysis included 136 reported purchases that were not preceded by a desire experience. Due to the protocol design, participants were not asked questions regarding resistance and to what extent moral considerations were included in resistance decisions when no desire experience was reported. As a result, the direct path between moral considerations and purchase was slightly overestimated. We supply a sensitivity analysis without these 136 purchase occasions in Supplemental Material. The supplemental analysis yielded similar results except for the expected weaker direct association between moral considerations and purchase.
4. The diary study did not include an assessment of moral considerations when participants did not resist a desire. This precluded us from testing how morality may shape guilt/pride over and above resistance/purchase (both of which were affected by morality). The decision to not assess moral considerations in relation non-resisted desires was based on the logic that a non-resisted desire experience, which did not result in a purchase, would reflect a desire that either waned by itself (e.g., due to limited strength and duration) or whose performance was prevented by situational circumstances, thus not demanding active resistance. Nevertheless, the exclusion was, in hindsight, unfortunate, but leaves an intriguing aspect to be investigated in future research.

Appendix A

Overview of central variables

Variable	Description	Range
Desire	Experience of desire to purchase clothing	0-1
Desire conflict	Experienced desire in conflict with personal goals	1-8
Purchase	Purchase of clothing	0-1
Guilt/pride (purchase 1-3)	Feelings of guilt/pride induced by purchase (bipolar scale)	1-11
Happiness (purchase 1-3)	Feelings of unhappiness/happiness induced by purchase (bipolar scale)	1-11
Moral considerations (purchase 1-3)	Inclusion of moral considerations in purchase decision	1-8
Resistance (purchase)	Resistance of desire	0-1
Resistance motivation (purchase)	Motivation to resist desire	1-7
Resistance (no purchase)	Resistance of desire	0-1
Guilt/pride (desire, no resistance)	Feelings of guilt/pride from desire non-enactment (bipolar scale)	1-11
Happiness (desire, no resistance)	Feelings of unhappiness/happiness from desire non-enactment (bipolar scale)	1-11
Resistance motivation (no purchase)	Motivation to resist desire	1-7
Guilt/pride (desire, resistance)	Feelings of guilt/pride from desire non-enactment (bipolar scale)	1-11
Happiness (desire, resistance)	Feelings of unhappiness/happiness from desire non-enactment (bipolar scale)	1-11
Moral considerations (resistance)	Inclusion of moral considerations in desire resistance	1-8

Note: “Purchase 1-3” indicates that this variable was asked for each of the up to three purchases.

Appendix B

Recoding and Relabeling for Analyses

Variable	Composition	Range
Moral considerations	Mean score: <i>purchase moral considerations</i> <i>resistance moral considerations</i>	1-8
Resistance	Merged: <i>resistance (purchase)</i> <i>resistance motivation (purchase)</i> <i>resistance (no purchase)</i> <i>resistance motivation (no purchase)</i>	1-8
Conflict	Desire conflict	1-8
Guilt/pride	Mean score: <i>guilt/pride (purchase)</i> <i>guilt/pride (desire no resistance)</i> <i>guilt/pride (desire, resistance)</i>	1-11
Happiness	Mean score: <i>happiness (purchase)</i> <i>happiness (desire no resistance)</i> <i>happiness (desire, resistance)</i>	1-11

Note: Only transformed and/or relabeled variables are listed here

Supplemental material

Content Summary:

1. Distribution plot of moral considerations
2. Multilevel sensitivity analysis
3. Multilevel path models integrating environmental considerations
4. Multilevel path model with only environmental considerations

1. Distribution plot of moral considerations

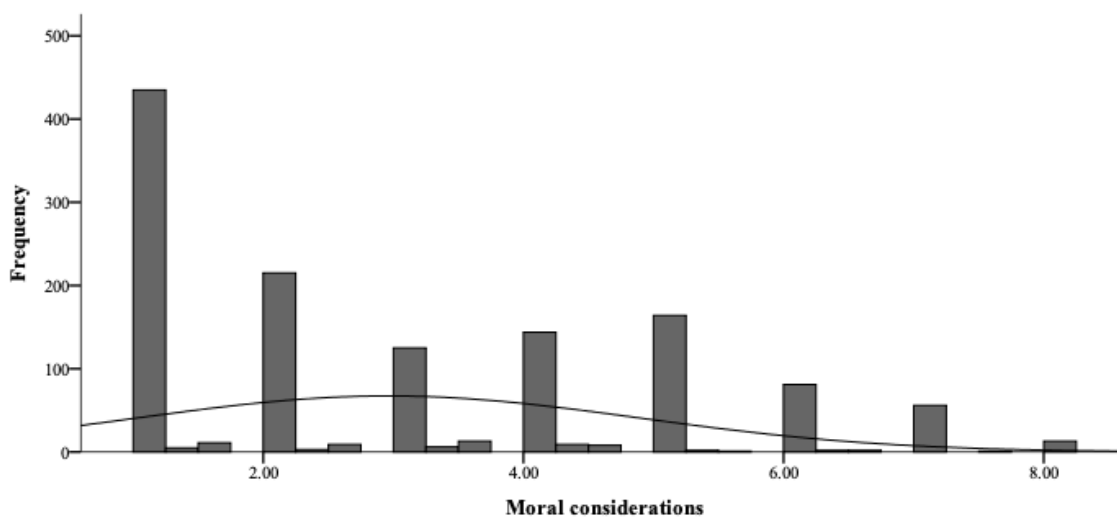


Figure S1. Distribution plot of moral considerations.

2. Multilevel sensitivity analysis

The main analysis presented in manuscript includes, as stated, 136 purchases occasions that were not preceded by a desire experienced. The inclusion may have resulted in a skewed distribution and an overestimation of the direct path between moral considerations and purchase, as participants reporting a purchase without a desire experience did not complete the resistance measure. From a theoretical perspective, the missing desire experience may reflect extremely habitual purchase, or forced ones (e.g., my trousers got a hole, therefore I must buy a new pair even though I do not want to). The desire measure may primarily capture want-to motivation more than have-to motivation, and sometimes clothing purchases may be purely have-to, as the example above illustrates.

Given the potential skewed effect of including the 136 purchase occasions in the multilevel path model analysis, we re-ran the analysis without these purchases. As illustrated in Figure S2, the results resemble the original analysis with three minor exceptions: the direct path from moral considerations to purchase weakened; the association between resistance and purchase slightly strengthened, and the total effect was marginally weakened ($B = -.06$, 95% CI = $[-.09, -.04]$, $p < .001$).

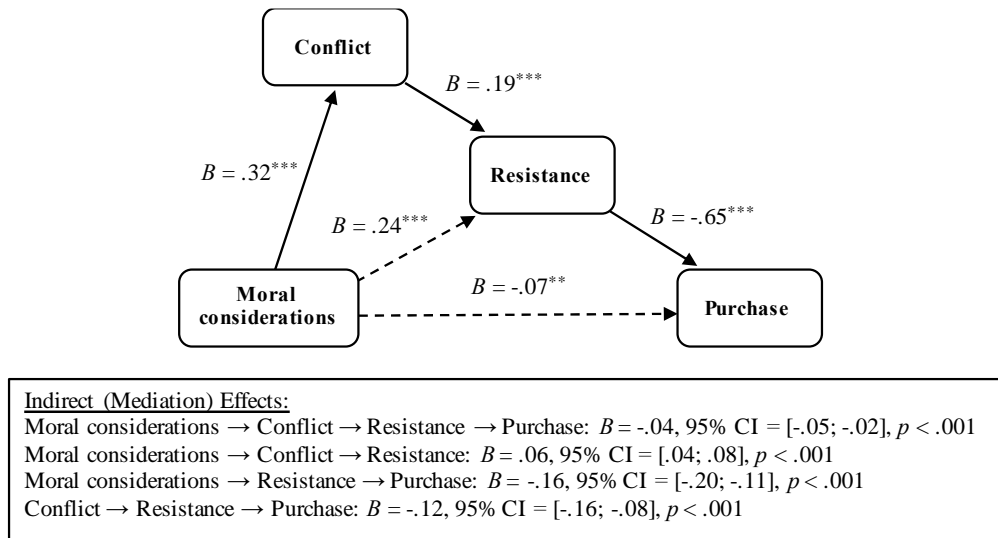
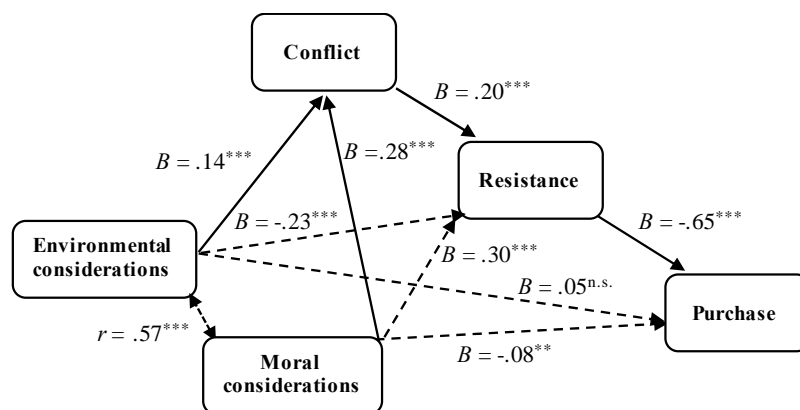


Figure S2. Multilevel mediation model of moral self-control excluding purchases ($n = 136$) that were not preceded by a desire experience. See Figure 2 notes for details.

3. Multilevel path models integrating environmental considerations

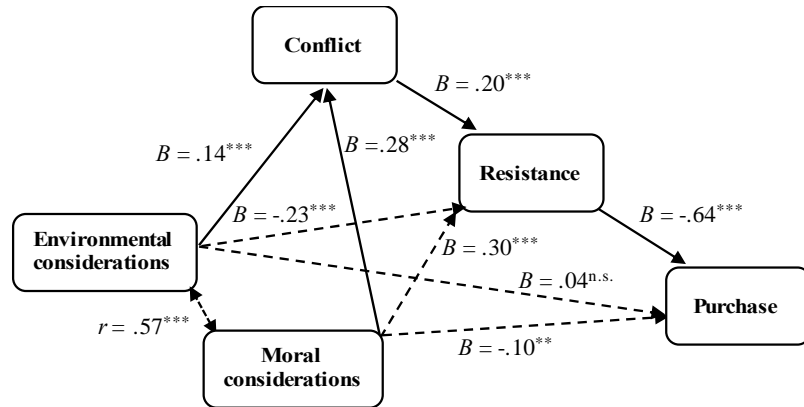
Environmental considerations were omitted from the main multilevel path model analyses presented in the manuscript due to our focus on moral self-control. But resulting from a high correlation between moral and environmental considerations ($r = .57$), we supply sensitivity analyses wherein environmental considerations are included in the multilevel path models (note that environmental considerations were coded exactly as moral considerations). We present two analyses: one analysis that includes the 136 purchase occasions without a desire experience and one analysis excluding these cases. The (probit) regression coefficients are presented in Figure S3 and S4. The results of the models are similar with the minor exception of the direct paths from moral and environmental considerations to purchase and the indirect path from resistance to purchase. In the following presentation of the results, we will focus on the path model including

the 136 purchases mirroring the main analysis of the manuscript. With regards to moral considerations, the path coefficients did not change remarkably. The three main changes were: (1) the relationship between from moral considerations and conflict weakened slightly when introducing environmental considerations to the model; (2) the indirect path from conflict to resistance also weakened; and (3) the direct path from moral considerations to resistance strengthened. The mediation analyses showed that effect of moral considerations was still partially, and reliably, mediated through conflict and resistance (indirect effect: $B = -.04$, 95% CI = $[-.05, -.02]$, $p < .001$). The influence of environmental considerations on purchase decisions were similarly mediated via conflict and resistance, albeit to a lesser extent (indirect effect: $B = -.02$, 95% CI = $[-.03, -.01]$, $p < .001$). Environmental considerations had a weaker positive relationship with conflict than moral considerations. The most noteworthy difference between environmental and moral considerations concerned the path to resistance; here, environmental considerations exhibited a negative relationship to resistance, whereas moral considerations exhibited a positive relationship of roughly similar magnitude.



Indirect (Mediation) Effects:	
Moral considerations → Conflict → Resistance → Purchase:	$B = -.04$, 95% CI = $[-.05; -.02]$, $p < .001$
Environmental considerations → Conflict → Resistance → Purchase:	$B = -.02$, 95% CI = $[-.03; -.01]$, $p = .001$
Moral considerations → Conflict → Resistance:	$B = .06$, 95% CI = $[-.04; .07]$, $p < .001$
Environmental considerations → Conflict → Resistance:	$B = .03$, 95% CI = $[-.01; .04]$, $p = .001$
Moral considerations → Resistance → Purchase:	$B = -.19$, 95% CI = $[-.24; -.14]$, $p < .001$
Environmental considerations → Resistance → Purchase:	$B = .15$, 95% CI = $[-.08; -.21]$, $p < .001$

Figure S3. Multilevel mediation model of moral self-control that integrates environmental considerations and includes purchases not preceded by a desire experience.



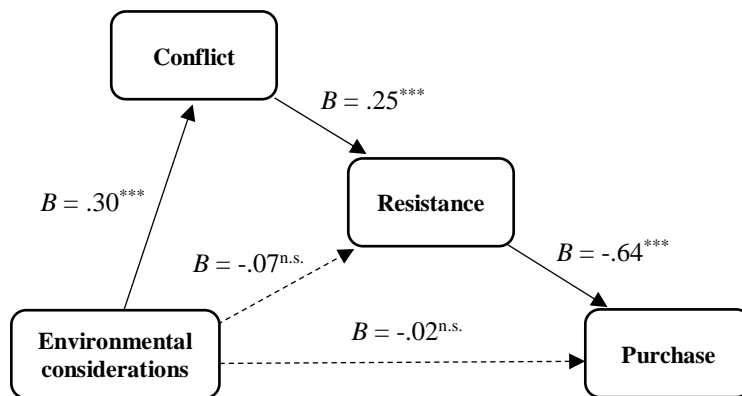
Indirect (Mediation) Effects:

Moral considerations → Conflict → Resistance → Purchase: $B = -.04$, 95% CI = [-.05; -.02], $p < .001$
 Environmental considerations → Conflict → Resistance → Purchase: $B = -.02$, 95% CI = [-.03; -.01], $p = .001$
 Moral considerations → Conflict → Resistance: $B = .06$, 95% CI = [.04; .07], $p < .001$
 Environmental considerations → Conflict → Resistance: $B = .03$, 95% CI = [.01; .04], $p = .001$
 Moral considerations → Resistance → Purchase: $B = -.19$, 95% CI = [-.24; -.14], $p < .001$
 Environmental considerations → Resistance → Purchase: $B = .15$, 95% CI = [-.08; -.22], $p < .001$

Figure S4. Multilevel mediation model of moral self-control that integrates environmental considerations but excludes purchases that were not preceded by a desire experience.

4. Multilevel path model with only environmental considerations (not submitted for publication)

To illustrate environmental considerations’ relationships with conflict, resistance, and purchase, a multilevel path model is provided without the inclusion of moral considerations (see Figure S5). Similar to moral considerations, participants experienced a stronger conflict and were more motivated to resist their purchasing desire whenever environmental considerations were activated. Interestingly, the multilevel path model showed that environmental considerations relationship with purchase was fully mediated via conflict and resistance. This finding suggests that the manner in which environmental considerations influence purchase decisions may be more explicit and deliberate than moral considerations, where a residual direct pathway was observed. But as shown in Figures S3 and S4, when moral considerations are accounted for the indirect pathway between environmental considerations and resistance becomes significant and negative. One possible interpretation of this interesting finding is that when the moral dimension of environmental considerations is taken out, clothing purchases can still be construed of as environmentally friendly (e.g., organic cotton). However, further research is needed to uncover the legitimacy of this interpretation.



Indirect (Mediation) Effects:

Environmental considerations → Conflict → Resistance → Purchase: $B = -.05$, 95% CI = $[-.07; -.03]$, $p < .001$

Environmental considerations → Conflict → Resistance: $B = .08$, 95% CI = $[.05; .10]$, $p < .001$

Environmental considerations → Resistance → Purchase: $B = .05$, 95% CI = $[.11; -.02]$, $p = .169$

Conflict → Resistance → Purchase: $B = -.16$, 95% CI = $[-.20; -.12]$, $p < .001$

Figure S5. Multilevel mediation model of environmental self-control. The model includes purchases not preceded by a desire experience. Parameters are unstandardized (probit) regression coefficients. The box summarizes the estimated mediation effects. * $p < .05$, ** $p < .01$, *** $p < .001$.

Chapter 7: Article III

The merits of goal support as a self-control strategy

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Abstract

In the present study, we investigated the influence of the presence of others and goal support on the performance of goal-directed behavior across different levels of self-control. Our analysis included survey data from 3,972 respondents across four countries. The results of the analysis revealed four important findings. First, high goal support increased the performance of goal-directed behavior when in the presence of others during decision-making. Second, self-control had a positive effect on goal-directed behavior only when individuals were by themselves. Third, while the effect of goal support significantly increased goal-directed behavior independent of self-control ability, people with low self-control reaped the most benefits from having goal support. Finally, we observed that although people with low self-control gained the most benefits from goal support they were also less likely to be positioned in goal-supportive environments.

Keywords: goal support, self-control, goal-directed behavior, environmentally friendly clothing consumption, four-country survey

Introduction

Self-control represents the capability of advancing long-term goals over proximal desires when the two directly conflict (Fujita, 2011; Hofmann & Vohs, 2016). High self-control has been associated with a wealth of positive outcomes including enhanced academic achievement, better mental health, and subjective well-being (Boals, vanDellen, & Banks, 2011; De Ridder et al., 2012; Hofmann et al., 2014; Tangney et al., 2004). Low self-control has been negatively linked to compulsive buying and financial debt (Achtziger, Hubert, Kenning, Raab, & Reisch, 2015). Positive outcomes associated with high self-control have traditionally been ascribed high self-control individuals' competent resistance and inhibition of goal-conflicting desires. Other researchers have challenged this point of view by suggesting that self-control encompasses other behavioral strategies than resistance and inhibition (e.g., Fujita, 2011). This research has found that strategies such as forming goal-consistent habits (Adriaanse et al., 2014; de Ridder et al., 2012, Galla & Duckworth, 2015), proactive avoidance of tempting situations (Ent et al., 2015, Hofmann et al., 2012a; Milyavskaya & Inzlicht, 2017), and reappraising tempting objects or situations (Duckworth et al., 2016) similarly (or possibly better) reflect high self-control individuals. Nonetheless, these self-control strategies predominantly focus on internal regulation processes.

Recent research suggests that individuals with high self-control also regulate their social environments (vanDellen et al., 2015). Social regulation allows them to utilize external resources that may hold a supportive function in their own self-control efforts. To what extent individuals benefit from situational goal support across different levels of self-control has, however, not previously been studied. To explore this notion, we investigate whether the presence of goal-supportive others can increase goal-directed behavior and evaluate its merits as an effective self-control strategy. Importantly, we assess this goal support strategy against decisions made in the absence of goal support (i.e., being alone) and at different levels of goal support when others are present. Our results reveal a positive, yet heterogeneous effect of goal-supportive others that depends on the individual's level of self-control.

Self-control and goal support

Pursuing long-term goals is a complicated endeavor entailing the performance of multiple goal-directed behaviors over time and in diverse decision-environments. The performance of goal-

directed behaviors may be frequently challenged by a large variety of temptations and hindrances capable of undermining goal progress unless self-control is exerted. Many factors influence the emergence of temptations and the exertion of self-control (Hofmann et al., 2012a), but a new wave of research has specifically highlighted the significance of interpersonal processes for goal pursuit and self-control (e.g., Fitzsimons & Finkel, 2011; Righetti & Kumashiro, 2012; vanDellen et al., 2015). Other people can support the pursuit of personal goals by providing feedback and assisting in the monitoring of behavior (Ashford et al., 2003, Fishbach & Trope, 2005), both potentially serving as important information sources to facilitate conflict identification and the exertion of self-control (Carver & Scheier, 1998; Myrseth & Fishbach, 2009). Pursuing goals in the presence of people may, however, also have a counteractive effect. For instance, other people can inspire indulgence by acting as enactment models of behaviors that are conflicting with personal goals (Dzhogleva & Lambertson, 2014; Hofmann et al., 2012a).

An interesting question that has received limited attention in self-control research is how goal support from others influences behavioral enactment. More specifically, can the presence of goal-supportive others in moments of decision-making positively affect the performance of goal-directed behavior? Previous research indicates that goal support benefits people in their goal pursuit (Brunstein, Dangelmayer, & Schultheiss, 1996; Feeney, 2004; Righetti & Kumashiro, 2012). Goal support may benefit goal pursuit in at least two ways. First, supportive others can help ensure that temptations are not elicited (e.g., by restricting exposure to tempting environments), and second, they can remind people of their important goals when temptations have emerged. The latter may occur either implicitly (e.g., the supportive person acts as a role model) or explicitly (e.g., by vocally reminding the person). But not everyone is able to provide effective goal support for the different types of goals that are pursued (Righetti & Kumashiro, 2012). People should therefore thoughtfully consider the ways in which other people's goal support might be helpful. Fitzsimons & Shah (2008) found that people categorize others based on their instrumentality for goal pursuits. This process involves approaching goal-facilitating others and avoiding goal-obstructing others. The more people select the company of others based on their potential impact on goal pursuits, the more likely they are to succeed (Fitzsimons & Shah, 2008). The preference for goal-supportive environments was recently linked to self-control ability. Over a series of experiments, vanDellen et al. (2015) observed that individuals with high self-control showed a stronger preference for goal-supportive environments compared to individuals with low self-control. Combined, these results suggest that goal support may be

beneficial for goal pursuit and self-control.

Present study

In this study, we explored the effect of goal support on the performance of goal-directed behavior across self-control levels. We also investigated how the presence or absence of others in moments of decision-making influenced the performance of goal-directed behavior. This is an important addition to the studies of vanDellen et al. (2015), wherein respondents only were presented with the option of choosing between others with either low or high self-control and not the option of acting alone. In our investigation of goal-directed behavior, self-control, and goal support, we formulated the following hypotheses: (i) high goal support increases goal-directed behavior; (ii) high self-control increases the performance of goal-directed behavior; and (iii) individuals with high self-control are more likely to be accompanied by goal-supportive others.

The hypotheses were examined in the context of clothing consumption with people pursuing a goal to acquire environmentally friendly clothing. Clothing consumption is an interesting domain to explore both self-control and goal support. First, the clothing industry is renowned for its extensive marketing efforts attempting to create purchasing desires in consumers. The industry is similarly recognized for its heavy impact on the environment (Roos, Sandin, Zamani, Peters, & Svanström, 2017). People pursuing a goal to reduce the environmental impacts of their clothing consumption are, as a result, particularly relevant subjects for research in self-control. This is especially due to the widespread presence of clothing advertisements (e.g., in magazines, on the streets, online, or in shopping malls) and the limited availability of environmentally friendly alternatives, which coupled together suggest a heightened likelihood of experiencing goal-conflicting desires. Second, clothing is highly interrelated with social processes. Not only does clothing represent a means of personal communication to others, but the purchase of clothing also frequently happens in the company of other people.

Previous empirical studies exploring the influence of goal support on self-control have mainly relied on one-country (usually the United States) and/or college samples (e.g., Righetti & Kumashiro, 2012; vanDellen et al., 2015). The present study sought to complement and advance this research by employing another methodological approach to test our hypotheses. Here, we present findings from a large-scale survey undertaken in four countries.

Method

The data used in this study was collected as part of a larger survey assessing environmentally friendly clothing consumption. The survey included various measurements of consumer behavior and psychological constructs relating to the consumption of clothing with a particular environmental focus. Data was collected in Germany, Poland, Sweden, and the United States using an online survey. Due to its broad inclusion of measurements, the survey was divided in two parts, which were completed with a two- to four-week interval. All the below reported materials, except self-control, were included in the first survey part.

Data collection

The data collection took place between October 2016 and January 2017, which was administered by Qualtrics through their panel service. All respondents received an incentive for taking part in the study in the form of points that could be redeemed for different products (e.g., gift cards). The questionnaire was developed in English and subsequently translated into German, Polish and Swedish by qualified translators certified with ISO17100. Translations were proofread by native speakers and all ambiguities were settled in collaboration with the translators before implementing the survey online. Numerous quality measures were implemented in both survey parts to maximize data quality and to screen out careless responses (DeSimone, Harms, & DeSimone, 2015; Meade & Craig, 2011). Among those measures were attention filters including instructed items (e.g., “Please select strongly agree”), bogus items (e.g., “I always sleep less than one hour per night”), measures for answering in patterns (i.e., straight-lining), and self-reported data on answer quality (e.g., “In your honest opinion, should we use your data in our analysis of this study”). Participants failing instructed items were filtered out automatically and participants failing multiple quality checks were replaced (see appendix A for detailed information).

Measures

Goal intention. Respondents rated the statement “I intend to acquire mainly environmentally friendly clothing” on a likert scale from 1 (strongly disagree) to 7 (strongly agree). The word “mainly” was included in the phrasing to more accurately reflect the contextual reality of environmentally friendly clothing consumption with environmentally friendly alternatives not

always being available (see supplemental materials for completely overview of all measurement items).

Self-efficacy. Previous research indicates that the effect of social support (a closely related construct to goal support)¹ is mediated by self-efficacy (Anderson, Wojcik, Winett, & Williams, 2006; Bandura, 1997). To exclude the possibility of a confounding effect of self-efficacy, we included a one-item measure of self-efficacy derived from Galla and Duckworth (2015). Respondents rated the statement “I am confident that the next time I want to acquire clothes, I can do it environmentally friendly” on a likert scale from 1 (strongly disagree) to 7 (strongly agree).

Environmental clothing consumption. To assess environmental clothing consumption (ECC), we used the Environmental Apparel Consumption scale by Kim & Damhorst (1998). The scale consists of a mean score based on eight items to measure the environmental friendliness of clothing consumption ($\alpha = 0.836$). All eight items were measured on a 5-point likert scale (1 = very rarely or never; 5 = very often or always) with the following introductory text: “When acquiring clothing items, I...” Example items include “buy clothes with environmentally friendly labeling or packaging techniques,” “avoid clothes products because of environmental concerns,” and “buy clothing made from organically grown natural fibers.”

Presence of others and goal support. Before answering the goal support question, respondents reported whether there were other people present during the “last 5 shopping experiences”. The respondents reporting having been accompanied by others at least once during their last five shopping experience were asked an additional goal support question: “In case other people were present during your shopping experiences, were they generally supportive of your goal of acquiring environmentally friendly clothing?” The goal support measure was rated on a 7-point likert scale from 1 (not at all) to 7 (very much) with ‘neutral’ as the mid-point. This scaling implies that values below 4 could indicate goal hindrance, whereas values above 4 clearly reflect goal support.

Self-control. To measure self-control, we used the well-validated Brief Self-Control Scale (Tangney et al., 2004) consisting of 13 items ($\alpha = 0.845$). Participants rated their general self-control tendencies on a 7-point likert scale (1 = not at all to 7 = very much). Example items include

“I am good at resisting temptation,” “People would say that I have iron self-discipline,” and “I am able to work effectively toward long-term goals.”

Sample

The target group for the survey was individuals aged between 18 and 65 years and the sample for survey part I was representative of the population with regard to age, gender, region and education (N = 10,363), which was achieved by resembling the proportions of the population. But as participants themselves decided whether or not to return for part II, subjecting the process to a self-selection bias, we did not achieve full representativeness. The final sample consisted of respondents participating in both survey part I and part II resulting in a total sample of N = 4,591 (see Appendix B for sample and country overview). The total re-contact rate for survey part II was 44.3% and by country: Germany (48.2%), Poland (44.4%), Sweden (50.7%), and United States (36.4%).

For this analysis, we restricted our sample in two ways. First, because the question about goal support was conditional on having a goal to acquire environmentally friendly clothing, we excluded respondents who indicated that they did not have a personal goal to live environmentally friendly (N = 427). This exclusion decision was made a priori through a filter embedded in the survey structure. The goal to live environmentally friendly was indicated among seven other life goals derived from the ‘Aspirations Index’ (Kasser & Ryan, 1996) with one item representing each aspiration category. Second, we excluded respondents with incomplete responses (N = 192). The resulting sample for our analysis consisted of 3,972 respondents.

Analysis strategy

Our dataset contained samples from four different countries and therefore required an exploration of its nested structure. Accounting for such a low number of higher-level units is generally problematic (Cameron & Miller, 2015), making the benefits of a multilevel modeling (MLM) approach unclear (e.g., Gorard, 2007). For data with very few clusters like ours, a recent simulation study highlighted the benefits of using a single-level regression and including cluster affiliation as a fixed effect, particularly whenever no second-level variables are of interest (McNeish & Stapleton, 2016). We used this modelling technique as our main specification and

provide the results from different comparative multilevel approaches in the supplemental material. Overall, we observed little differences between the models.

We estimated the association between environmental clothing consumption, self-control and goal support. For the regression, we created z-scores of goal intention, goal support, self-control, and self-efficacy to allow for an easier interpretation of the coefficients. This is particularly helpful to interpret interaction effects, as a z-score of 0 reflects a meaningful and interpretable value. Following Enders and Tofighi (2007), we standardized all variables on the country-level. Results remained qualitatively similar to the uncentered case (results available upon request). To control for potential differences in socio-demographic characteristics that were predictive of our dependent variable, we added the following covariates to our regression analysis: age, gender, income, marital status, employment, and country. An unconditional analysis without covariate adjustment is provided in supplemental materials (Table S3).

Results

The descriptive statistics displayed in Table 1 show a summary of the variables used in our analysis. The full sample was equally composed of the four countries with slightly more female participants and an average age of 42. The next two columns highlight the descriptive statistics based on the two main groups of interest: the 836 respondents shopping alone and the 3,136 respondents shopping in the company of others. The sample split based on the presence of others underlines the need for the use of covariates in our analysis as characteristics differ significantly between the two groups. Respondents shopping alone reported lower income levels and were more likely to be unmarried. This subsample also consisted of more respondents from Germany and reported lower levels of environmental clothing consumption despite an insignificant difference in the level of goal intention. Goal support from other people present during shopping was on average “neutral” (scale mid-point).

Table 1. Descriptive statistics

Variable	Full sample	Shopping alone	Shopping in company	Min	Max
ECC	2.76	2.71	2.78*	1	5
Self-control	4.45	4.53	4.44*	1	7
Goal support	-	-	4.00	1	7
Goal intention	4.38	4.25	4.42	1	7
Self-efficacy	4.23	4.17	4.24*	1	7
Age (years)	42.37	46.51	41.26*	18	65
Female (%)	58	57	59	0	1
Income (category)	4.64	4.43	4.70*	1	11
Married/living together (%)	59	41	64*	0	1
Full-time (%)	54	53	54	0	1
Part-time (%)	11	13	11	0	1
Germany (%)	26	43	21*	0	1
Poland (%)	25	18	27*	0	1
Sweden (%)	24	19	26*	0	1
United States (%)	25	20	26*	0	1
N	3,972	836	3,136		

Note: Test for significant differences on the 5% level compared to shopping alone. Income is measured in country-specific ranked categories (see Gwozdz et al., 2017 for further details).

Goal Support and Goal-Directed Behavior

Table 2 provides the regression results from our main analysis. The relationship between ECC and the main variables of interest is shown in Model 1. To test the impact of having other people present on the performance of goal-directed behavior, we regressed ECC on presence of others with people shopping alone as the reference category. Compared to this reference, people shopping in the presence of others showed a small but significantly higher performance of ECC. In order to test the influence of goal support, we next looked only at the people who shopped in the company of others (Model 2). Here, we found that the performance of ECC increased with rising levels of goal support. As expected, the goal intention itself had a significant and positive relationship with ECC. Despite holding goal intention constant during our main analysis, the positive interaction effect between goal intention and goal support shows that the effect of goal support increased with goal intention (Model 3). Self-efficacy was significant throughout all our models. Nonetheless, goal support remained statistically significant showing that goal support had

a distinct relationship with ECC beyond self-efficacy. Comparing these OLS estimates with the MLM (see supplemental material Table S4 and S5), we observed two minor but noteworthy differences: first, the interaction term between goal intention and goal support (Model 3) was estimated less precise and p-values of 0.06 slightly exceeded our usual level of significance. Second, the interaction term in Model 4 was estimated more precisely using different MLMs, which increased our confidence in the main results that are discussed in the next section.

Table 2. Regression results

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	ECC	ECC	ECC	ECC	Presence of others (yes/no)	Goal support
Presence of others (yes)	.06* [.01, .10]			.06* [.01, .10]		
Presence of others x self-control (z-score)				-.06* [-.10, -.01]		
Goal support (z-score)		.16*** [.14, .18]	.16*** [.13, .18]			
Goal intention x goal support (z-scores)			.04*** [.02, .06]			
Goal intention (z-score)	.41*** [.38, .43]	.35*** [.32, .38]	.36*** [.33, .39]	.41*** [.39, .44]	-.00 [-.02, .01]	.62*** [.55, .69]
Self-control (z-score)	.00 [-.02, .02]	-.03* [-.05, -.01]	-.03** [-.05, -.01]	.04* [.00, .08]	-.00 [-.02, .01]	.13*** [.07, .18]
Self-efficacy (z-score)	.15*** [.12, .17]	.13*** [.10, .15]	.12*** [.10, .15]	.15*** [.12, .17]	.02** [.01, .04]	.26*** [.18, .33]
<i>N</i>	3972	3136	3136	3972	3972	3136
adj. <i>R</i> ²	.47	.51	.51	.48	.10	.32

Note: All regressions estimated via ordinary least square (OLS) include the additional covariates: age, sex, income, marital status, full-time & part-time employment, and a set of country dummies. Confidence intervals on a 95% level are in brackets. * $p < .05$, ** $p < .01$, *** $p < .001$. The complete regression table and an analysis without covariates are provided in supplemental materials Table S2 and S3 respectively.

Self-control and goal-directed behavior

As evidenced by Model 1, we did not observe a significant relationship between self-control and ECC at a given level of goal intention. But a more detailed look into this relationship reveals that the impact of self-control differs between people shopping alone or in the presence of others. To

more effectively carve out the precise influence of self-control, we had to consider the relationship between goal support and goal-directed behavior. Model 4 highlights the heterogeneous relationship between self-control and the presence of others. Introducing an interaction term showed a positive and significant relation between self-control and ECC for people shopping alone. However, this was not observed for people shopping in the presence of others where ECC did not increase with higher levels of self-control. Even though the relationship was negative, the difference was not statistically significant ($B = -.01$, CI $[-.04, .01]$). This effect was smaller compared to the coefficients in Model 2 and Model 3 (this sample only included people with others present), which could be attributed to the indirect effect of self-control on ECC through goal support (see discussion below). Goal support was, however, not included in Model 4.

These findings highlight that looking at the overall results (Model 1) overshadows important heterogeneity between shopping alone or with others. This heterogeneity is best highlighted by Figure 1, showing an interaction effect between the presence of others and self-control (based on Model 4). While people with low self-control clearly benefited from having other people present, this was not true for people with high self-control (+2 SD of the mean). There was no significant difference between going alone or with others for people with high self-control ($F(1, 3957) = 1.16, p = .28$).

The comparison between going alone and in company of others was based on the average level of goal support, thus neglecting differences in the actual level of support. Figure 2 allows a closer look into this second level of heterogeneity. The bar charts display the difference in predicted ECC scores between people going alone versus people with different levels of goal support, a relation sensitive to the actual level of self-control. These estimates were based on a set of dummy variables for each level of goal support (range 1 to 7) with shopping alone as reference and an interaction with self-control (numerical results and significance tests between groups are presented in the supplemental material S4 and S5). The upper graph presents the results for a low level of self-control (-2 SD). For these people, the point estimates suggest a positive impact on ECC for virtually any value of the goal support scale with a significant positive difference for people with “neutral” goal support indicated by the numerical value 4 in Figure 2. There was no statistical difference between going alone or with “neutral” goal support for people with average self-control (middle graph), which reflects the inverse relationship of self-control across the two groups. By contrast, “neutral” goal support had a significantly negative effect on ECC for people with high self-control (+2 SD) compared to going alone. People with high self-control showed a

comparably high level of ECC when going alone and therefore only benefited from the presence of others when the accompanying people were highly goal-supportive.

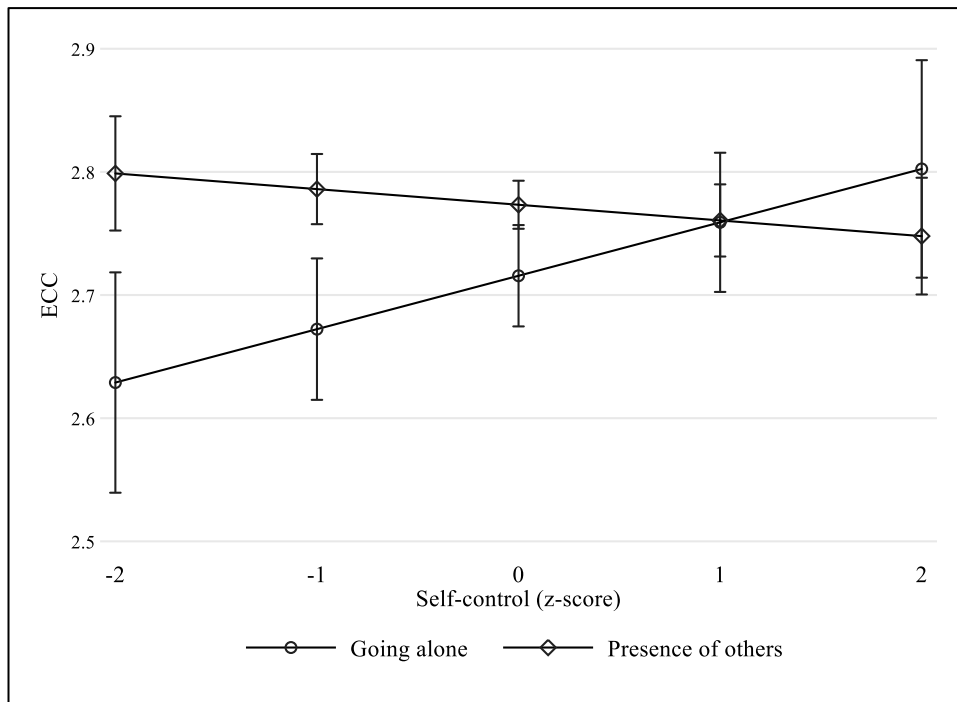


Figure 1. The marginal effects of self-control interacted with presence of others. Predicted ECC is based on Model 4 in Table 2. Bars indicate the 95% confidence intervals.

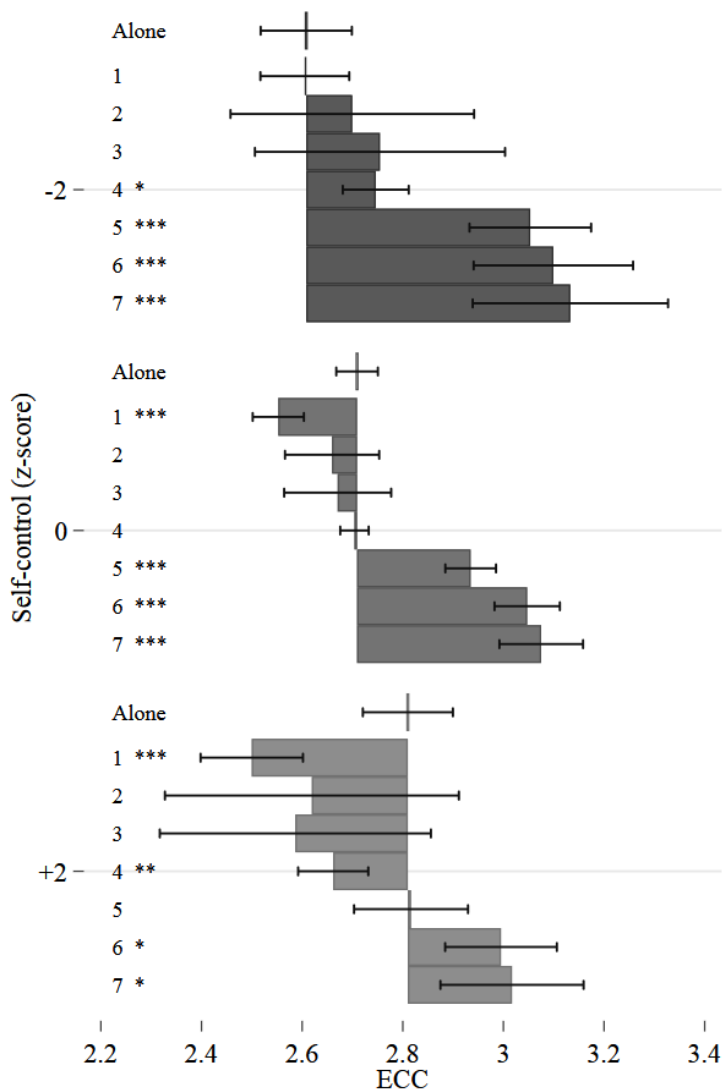


Figure 2. Bars indicate the marginal differences in predicted ECC compared to people going alone for different levels of self-control. Subscale indicates people with other people present at different levels of goal support ranging from 1 to 7 (1 = *not at all*, 4 = *neutral*, 7 = *very much*). Error bars indicate the 95% confidence intervals and significant differences compared to alone are indicated by * $p < .05$, ** $p < .01$, *** $p < .001$. Complete regression results and predictions are presented in the supplemental material S6 and S7.

Who brings goal support?

Hypothesis 3 builds on the work by vanDellen et. al (2015) suggesting that people with high self-control purposefully select themselves into goal-supportive environments in order to achieve their goals. This cross-sectional study cannot claim to identify a clear causal relationship but demonstrates that people with similar goal intentions show different (self-reported) behavior,

which depends on the interplay between self-control and goal support. To shed more light on the question of what actually determines whether someone goes shopping alone, we regressed a binary variable concerning the presence of others (1) or not (0) on self-control and included the usual covariates variables (Model 5, Table 2). The results showed that self-control did not predict the probability of being alone or with others during shopping in our main analysis.² But importantly, when people were accompanied by others, people with higher self-control were more likely to be accompanied by highly goal-supportive others (Model 6).

Discussion

Social processes have recently gained increasing prominence in self-control research. The present study sought to contribute to this research by investigating the effectiveness of using goal support from others as a self-control strategy in the pursuit of an environmental clothing goal. Our analyses support that the strategy of bringing goal-supportive others has merits as a self-control strategy. We formulated three hypotheses relating to goal-directed behavior, self-control, and goal support. Our first hypothesis stated that the presence of highly goal-supportive others would increase goal-directed behavior. This hypothesis was strongly supported. The company of goal-supportive others can assist individuals in monitoring behavior and act as a reminder to self about one's goals. Previous research has found similar results in that supportive others can help bolster self-control (Brunstein et al., 1996; Righetti & Kumashiro, 2012; Rusbult, Finkel, & Kumashiro, 2009). By contrast, we suspect that the company of others who are not goal-supportive may cause people to more frequently resist the enactment of goal-consistent desires and instead perform goal-conflicting behaviors (see also Hofmann et al., 2012a). While this result clearly indicates a positive effect of high goal support on goal-directed behavior, we should entertain the possibility that the mere presence of others had a systematic effect on goal-directed behavior (Lou, 2005; Zajonc, 1965). Empirically disentangling a mere presence effect from the effect of social influences (e.g., goal support) exerted by others present is, however, challenging. But Figure 2 suggests that accompanying others with a “neutral” level of support — assumed to most closely resemble a mere presence — do not have a consistent effect on behavior compared to going alone. The effect of “neutral” support varied significantly with the level of self-control. Unless the accompanying others differed systematically in some unobserved characteristic, these findings are hard to align with the existence of strong effect of the mere presence of others.

Our second hypothesis posited that having high self-control would increase the performance of goal-directed behavior. We did not find a statistically significant main effect of self-control, which contradicts most previous findings (e.g., de Ridder et al., 2012). However, subsequent analyses revealed a heterogeneous interplay between self-control, presence of others, and goal support. To our surprise, the expected effect of self-control on the performance of goal-directed behavior was limited to people shopping alone. In contrast, self-control had a slightly negative effect on the performance of goal-directed behavior when other people were present (independent of goal support level). This finding is rather surprising and we can only speculate on possible explanations for this pattern. One explanation could be that individuals with high self-control instead balance their goal pursuit (e.g. Carver & Scheier, 1981; Higgins, 1996; Hofmann et al., 2014). This would imply that other important goals may be similarly prioritized such as financial or appearance goals. Future research should validate and explore this potential self-control dynamic in greater detail.

The heterogeneous effect of self-control with regards to goal support has important implications for the effectiveness of goal support itself as a self-control strategy. As people with high self-control only benefitted from goal support (compared to going alone) when the accompanying others were highly supportive of their goal, high self-control individuals should be particularly sensitive towards goal supportiveness when deciding whether or not to bring other people shopping. Similar care is not required for people with lower levels of self-control, who benefit from virtually any positively valenced level of goal support. In general, the effect of bringing high goal support was strongest for people with low self-control, which suggests that goal support might be a particularly effective self-control strategy for these people.

The third hypothesis concerned who were more likely to bring goal-supportive others. We did not observe any differences across self-control ability in whether people preferred going alone or with others in our main analysis. But when people were accompanied by others, self-control did have an effect on how supportive these people were. We predicted that high self-control individuals would be the most likely to bring goal-supportive others. Our analysis supported this hypothesis with high self-control individuals more often positioning themselves in supportive environments than low self-control individuals. High self-control individuals were also less likely to bring low-supportive others. These results are in line with the findings of VanDellen et al. (2015) and insinuate the importance of goal instrumentality in the accompanying people (Fitzsimons & Shah, 2008).

Limitations

The present study has several noteworthy limitations. The primary limitations are the reliance on self-reported behavior to assess the effectiveness of self-control and goal support as well as the use of single-item measurements for goal support, self-efficacy, and goal intention without any known psychometric properties. This issue also translates into a remaining uncertainty about potential differences in those psychometric properties across the four countries. Single-item measurements make it impossible to fully assess potential measurement invariance for our models (Putnick & Bornstein, 2016; Steenkamp & Baumgartner, 1998). A related issue associated with a four-country sample is the difficulty in perfectly accounting for the nested structure of the data. However, as the intra-cluster correlation (ICC) for our dependent variable shows to be very small ($ICC < 0.01$) and results remain robust across different estimation techniques, we expect any exiting bias to be small.

Another limitation is the inability to determine the exact role played by goal-supportive others based on the collected data as well as ascribe the origin of goal support to any specific group of people (e.g., friends, partners, or family). Although we find that people with self-control are more likely to be accompanied by highly supportive others, we do not know whether this reflects an active selection from their social network or whether it reflects a higher availability of goal support within their social network. We also cannot entirely disentangle the true effect of (situational) goal support from general goal-supportiveness. For instance, a person could be accompanied by others that are unsupportive of the environmental goal but who are otherwise supportive of that person's goals. Similarly, a person could be accompanied by others who are supportive of the environmental goal, although they are generally unsupportive of the person's goals. Future experimental studies are encouraged to control for the general goal-supportiveness of accompanying others in the process of explicating the exact function and effect of goal support. Finally, we merely explored goal support as a self-control strategy within one behavioral domain, thus future research should seek to broaden the scope by incorporating other domains.

Conclusion

Taken together, the present study supports the merits of bringing goal support as an effective self-control strategy. This is especially true for individuals with low self-control. Our findings also

suggest that individual differences in self-control are important for the effectiveness of goal support on the performance of goal-directed behavior. Our study, thus, joins recent studies in highlighting the importance of external environments for self-control success. While self-control did not have a direct effect on the presence of others, it did influence the goal-supportiveness of the accompanying people.

Notes

1. While goal support conceptually resembles social support, we see the two constructs as being distinct in at least one important way. Social support is typically defined to include both the structure of person's social life (e.g., group membership) and more explicit functions such as emotional support (Uchino, 2006). Although social support can be goal-specific (Brunstein et al., 1996), it refers to received or perceived support occurring across time and situations. Our conceptualization of goal support, by contrast, strictly refers to support for a particular goal in a specific situation.
2. A slightly negative effect was observed for the unconditional results presented in Supplemental Table S3 (see [online supplemental material](#)). Similar results are obtained from using a logit model presented in Table S8.

Appendix A

Criteria	Number of respondents disqualified
1. Failing two or more quality checks <ul style="list-style-type: none"> • Please select very much like me (if like me or very much like me is not selected) • I put enough effort towards this study (if disagree or strongly disagree is selected) • I gave this study enough attention (if disagree or strongly disagree is selected) • In your honest opinion, should we use your data in our analysis in this study? (if no is selected) 	N = 345
2. More than 10% missing values	N = 25
3. Answering in patterns <ul style="list-style-type: none"> • Answering the highest category for all items in a scale; or • Participants that are in the first variance percentile for all three variables that are expected to vary significantly: life goals, goal commitment, and values. 	N = 187
4. Straight-lining <ul style="list-style-type: none"> • All respondents that clicked the same answer category for all of the goal commitment items 	N = 1,141

Note: the measurements of life goals, goal commitment, and values are not included in this article.

Appendix B

	Survey Part I	Final Sample
Total <i>N</i>	10,363	4,591
Germany	2,427	1,170
Poland	2,485	1,105
Sweden	2,316	1,176
United States	3,135	1,140

Chapter 8: Article IV

Unravelling the relationship between trait self-control and subjective well-being:
The mediating role of four self-control strategies

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Abstract

Although several studies provide evidence that trait self-control contributes to subjective well-being, the self-control strategies that promotes happiness and life satisfaction remains unknown. The present study aims to shed light on this relation by investigating the mediating role of four self-control strategies: situation selection, attentional deployment, reappraisal, and inhibition. To test the hypothesis that self-control strategies mediate trait self-control's effect on well-being, an online questionnaire on trait self-control, self-control strategies, and cognitive and affective well-being was administered to 4,036 participants from four countries (ages 18 to 65 and 56.4% female), whose responses were analyzed using structural equation modeling. Our analysis replicates previous studies that trait self-control positively relates to subjective well-being. Moreover, our analysis provides evidence that this relation is indeed mediated by the tendency to employ particular self-control strategies. Attentional deployment and reappraisal positively relate to subjective well-being, whereas inhibition exhibits a negative relation. Situation selection was unrelated to subjective well-being. The incorporation of self-control strategies represents the first attempt to empirically disentangle the positive relation between trait self-control and subjective well-being. The heterogeneous effects of self-control strategies suggest the importance of obtaining a better understanding of which aspects of trait self-control positively contributes to subjective well-being.

Keywords: trait self-control, self-control strategies, subjective well-being, structural equation modeling, cross-cultural survey

Introduction

Abundant evidence is accumulating on high self-control's wide-reaching benefits, ranging from enhanced academic performance to stronger interpersonal relationships to better mental and physical health (De Ridder et al., 2012; Tangney et al., 2004). Low self-control, in contrast, is associated with numerous negative personal and societal outcomes, including obesity, criminality, substance abuse, and procrastination (Baumeister & Heatherton, 1996; Gottfredson & Hirschi, 1990; Patton et al., 1995). These observations give good reason to expect a positive relation between trait self-control and subjective well-being, which has also been found in recent studies (e.g., Cheung, Gillebaart, Kroese, & De Ridder, 2014; De Ridder & Gillebaart, 2017; Hofmann et al., 2014; Wiese et al., 2017).

One of the first studies to empirically test the relation between trait self-control and subjective well-being is Hofmann et al. (2014). In three studies, the authors find that trait self-control is positively correlated with both affective and cognitive well-being. Specifically, high trait self-control is linked to greater levels of cognitive well-being and positive affect and less frequent experiences of negative affect. Whereas Hofmann and colleagues (2014) suggest that the effect is mediated by affective experiences, other studies that validate this positive relationship propose regulatory focus (Higgins, 1997) as mediator of the relation (Cheung et al., 2014). But importantly, the specific aspects of trait self-control that positively contribute to subjective well-being have yet to be uncovered.

In the process of unravelling trait self-control's relationship with subjective well-being, we adapt the widely recognized conceptualization of subjective well-being as consisting of two distinct components: affective well-being and cognitive well-being (Diener, 1984; Luhmann, Hofmann, Eid, & Lucas, 2012b). Affective well-being refers to the frequency and intensity of positive and negative emotions and mood (Luhmann, Hawkley, Eid, & Cacioppo, 2012a), whereas cognitive well-being entails the cognitive evaluation of people's overall satisfaction with life (Diener, Ng, Harter, & Arora, 2010a).

The positive association between trait self-control and subjective well-being is particularly intriguing because it challenges the stereotypical perception of high self-control as a dutiful self-discipline in which individuals deny themselves (short-term) joys and pleasure (Hofmann et al., 2014; Wirtz, Stalls, Scollon, & Wuensch, 2016). It thus raises the question of which aspects of trait self-control are actually making people happier and more satisfied with their lives. Whereas the exercise of self-control has traditionally been interpreted as a process of overriding or

inhibiting unwanted impulses that may interfere with long-term goal striving (Baumeister et al., 1998), several scholars now suggest that the concept should be broadened to encompass strategies other than effortful inhibition (e.g., Duckworth et al., 2016; Fujita, 2011; Gillebaart & De Ridder, 2015; Hofmann & Kotabe, 2012; Hoyle & Davisson, 2016). These additional self-control strategies include forming goal-congruent habits (Adriaanse et al., 2014; De Ridder et al., 2012; Galla & Duckworth, 2015) and using goal support from others (Nielsen & Bauer, 2018). In relation to subjective well-being, De Ridder and Gillebaart (2017) argue that individuals with high trait self-control report higher subjective well-being not because they are more competent in inhibiting short-term temptations but because they are better at initiating goal-directed behaviors.

To account for other self-control strategies that supplement effortful inhibition, some scholars propose an altered definition of self-control as “the process or behavior of overcoming a temptation or prepotent response in favor of a competing goal” (Milyavskaya et al., 2019). This definition better allows for the integration of different regulation strategies, some of which are derived from the related fields of self-regulation, desire regulation, emotion regulation, and mood regulation. Hence, to better understand the underlying mechanisms of self-control’s contribution to subjective well-being, we explore the role of effortful inhibition and three other self-control strategies.

Self-control strategies

Our investigation focuses on four self-control strategies: *situation selection*, *attentional deployment*, *reappraisal*, and *inhibition*. These strategies draw inspiration from recent theoretical research on self-control strategies, including the process model of self-control (Duckworth et al., 2016). The process model of self-control stipulates that desires develop in an iterative process beginning with the situation and ending with a response tendency. This model builds on Gross’s (1998) well-established process model of emotion regulation, and outlines the cyclic stages in which desires evolve and are amplified or weakened over time (Duckworth et al., 2016). Specifically, we adopt the process model’s hierarchical categorization of self-control strategies to support our aim of providing evidence that a tendency to use particular strategies can advance our understanding of the relation between self-control and well-being.

Recent research has proposed that self-control is most effective when exerted as early in the process as possible (Fujita, 2011; Gillebaart, Schneider, & De Ridder, 2016; Hofmann & Kotabe, 2012; Mann et al., 2013). For example, individuals at a pub with friends who see other customers

smoking may themselves experience the desire for a cigarette. Although this scenario does not automatically represent a self-control dilemma, it can do so for individuals who are trying to break the smoking habit. Although the first and most proactive approach is to avoid such a tempting situation (situation selection) in favor of others that support long-term goals, once the desire has arisen, the second approach is to shift attention away from the problematic situation (attentional deployment) and towards non-tempting stimuli or thoughts such as thinking about the next holiday destination. The third and fourth approaches are to alter the meaning of the cigarette (reappraisal) – for example, to a source of bad smelling clothes and hair or cause of cancer – or simply inhibit the desire to smoke (inhibition). Each of these strategies is further detailed in the discussion below:

Situation selection plays on the unique human ability to imagine and forecast future events, including their consequences for affect, motivation, and cognition (Gilbert & Wilson, 2007). By employing this capability, individuals can identify future situations that might elicit tempting desires. The most effective self-control strategy relies on this prospective ability and involves the selection and prioritization of situations that support long-term goals and restrict the availability of such desires (Aspinwall & Taylor, 1997). Situation selection thus refers to approaching or avoiding certain situations, places, people, or objects in order to shield and advance important long-term goals (Gross, 1998). Recent evidence suggests that trait self-control is associated with the employment of this kind of strategies, as is for example demonstrated with more frequent use of proactive strategies (Ent et al., 2015; Gillebaart et al., 2015; Hofmann et al., 2012a) and earlier detection of self-control conflicts. Although an effective strategy for all individuals, this strategy may be especially beneficial for individuals with limited capabilities in later stages of the self-control cycle, who can use it to reduce their likelihood of self-control failures. On the other hand, because the complexity and unpredictability of everyday life may sometimes make the strategy infeasible, it cannot be the only means of effective self-control and should be supplemented with other strategies.

One such alternative is *attentional deployment*, which allows individuals to voluntarily focus or shift attention elsewhere in situations that cannot be changed or escaped (Eisenberg et al., 2001). In this strategy, attentional processes are used to direct attention away from tempting stimuli and facilitate the refocusing of attention on neutral and non-tempting stimuli or thoughts (Eisenberg et al., 2016). Two attentional deployment techniques (Gross, 1998) are particularly relevant for self-control: distraction, the selective focusing of attention on a specific situational aspect or shifting attention away from the situation altogether (Mallory & Rupp, 2016); and concentration, the ability to actively focus on specific tasks. In a situation of temptation,

distraction may entail focusing on other objects or events in the physical environment or redirecting attention inwards to non-tempting memories or images (Gross & Thompson, 2007). Consistent with the elaborated intrusion theory of desire (Kavanagh et al., 2005), distraction should be engaged in as early in the process as possible to constrain the development and elaboration of a tempting desire (Hofmann et al., 2012b). Concentration, on the other hand, involves focusing on tasks that promote long-term goals while blocking intrusive thoughts of proximal desires. This strategy, being highly adaptive in a self-control context (Shah, Friedman, & Kruglanski, 2002), tends to be frequently employed from infancy to adulthood when other more prospective strategies are impossible or unsuccessful (Magen & Gross, 2010).

When paying attention to tempting stimuli is unavoidable, *reappraisal* can diminish the strength of tempting desires and amplify the strength of desires congruent with long-term goals (Ochsner & Gross, 2005). Reappraisal involves the use of mental strategies to alter perceptions of an object, behavior, situation, or feeling (Gross, 1998; Mischel, Ebbesen, & Raskoff Zeiss, 1972) either prior to, during, or after an event (see Quoidbach et al., 2015, for an overview). Put simply, reappraisal entails thinking about something in a different way that favors a person's long-term goals. In general, converging evidence indicates that reappraisal can strongly impact affective reactions to tempting stimuli and provide an effective means of down regulating desires (e.g., Hofmann, Deutsch, Lancaster, & Banaji, 2010). Moreover, although reappraisal is a valuable self-control strategy, it is mainly effective for low to modest levels of affective intensity. When applied under very high affective intensity, its effect seems to break down (Gross, 2015; Sheppes, Catran, & Meiran, 2009), indicating that in these situations, other self-control strategies should take precedence.

The most studied strategy in the self-control research is *inhibition*, which refers to the process of inhibiting pre-potent thoughts, feelings, or behavioral tendencies and refraining from acting on them (Tangney et al., 2004; Vohs et al., 2008). Individuals call upon inhibition when the experience of a tempting desire triggers a pre-potent action tendency. If unattended, the tempting desire will be enacted, leading to self-control failure. Because the purpose of inhibition is to prevent the action tendency from influencing behavior until the desire episode fades out, it is deemed to be necessary when other self-control strategies have been unsuccessful. It is also considered the last stage in the self-control cycle (Mann et al., 2013), primarily because of its reliance on an effortful allocation of both cognitive and motivational resources. Here, the cognitive component is the inhibitory control capacity, which is strongly dependent on dispositional (e.g., working memory capacity) and situational (e.g., cognitive capacity) factors

(Frieze et al., 2009), while the motivational component is the motivation to recruit these inhibitory capacities when available, a concept that lies at the core of research on ego depletion and willpower (Baumeister et al., 1998; Baumeister, Vohs, & Tice, 2007; Frieze et al., 2018; Inzlicht & Schmeichel, 2012). This prerequisite of both cognitive and motivational resources, however, makes inhibition a difficult undertaking, one whose effectiveness can be expected to fluctuate considerably.

Self-control and subjective well-being

Not only does previous research document the positive correlation between trait self-control and subjective well-being (e.g., Cheung et al., 2014; Hofmann et al., 2014), it also adds important nuances to the conventional view of high self-control as stifled by dutiful self-discipline and a blatant defiance of pleasurable experiences. Among these is its broadened focus on the features of trait self-control that actually make people happier and more satisfied with their lives. For example, Hofmann and colleagues (2014) attribute the positive relation to more adept goal balancing and less frequent experiences of goal conflict in individuals with high trait self-control. De Ridder and Gillebaart (2017), on the other hand, credit a better initiation of goal-directed behavior rather than a competent inhibition of short-term temptations. Given inhibition's greater error proneness relative to more prospective strategies, both these explanations are hard to reconcile with its role as major driver of the positive relation (Fujita, 2011; Hofmann et al., 2012a). Rather, other self-control strategies may be more effective in reducing goal conflicts and inducing subjective well-being. For instance, the process model of self-control (Duckworth et al., 2016) suggests that early intervention strategies (e.g., situation selection) are preferable to late intervention strategies (e.g., inhibition) in facilitating effective self-control. Such strategies, by hindering temptation development and making resistance less effortful (Kotabe & Hofmann, 2015), facilitate self-control and promote goal progress, which is positively linked to positive affect and subjective well-being (Carver & Scheier, 2016; Klug & Maier, 2015). Restraining the potency of temptations may also help reduce the potentially negative affective impact of resisting temptation (Kavanagh et al., 2005).

Based on the above, we predict that the early stage intervention strategies of situation selection and attentional deployment will be more positively linked to subjective well-being than the later stage strategies of reappraisal and inhibition. In particular, we expect inhibition to exhibit a negative relation to subjective well-being because of the affective costs of inhibiting fully

developed temptations and its more unstable effectiveness in facilitating goal progress. While we expect the four strategies to mediate the relationship between trait self-control and subjective well-being, a full mediation is unlikely to be observed as other unassessed strategies also exist (e.g., habit formation, implementation intentions, and goal support).

Materials and method

The data used in this study were part of a larger survey assessing environmentally friendly consumer behavior. Survey responses were collected in Germany, Poland, Sweden, and the United States using an online questionnaire that included numerous measures of psychological constructs and consumer behavior (see Gwozdz et al., 2017, and Nielsen & Bauer, 2018, for further details). Because of its breadth, the survey was divided in two parts completed within a two- to four-week interval. All measurements discussed here were included in survey part II.

Procedures

The questionnaire, administered by the market research company Qualtrics between October 2016 and January 2017, was developed in English and subsequently translated into German, Polish, and Swedish by certified ISO17100 translators. All participants were incentivized by points redeemable for different products (e.g., gift cards). To maximize data quality, the questionnaire incorporated several quality measures used to screen out careless responses (DeSimone et al., 2015; Meade & Craig, 2011). The quality measures included instructed items (e.g., “Please select strongly agree”), bogus items (e.g., “I always sleep less than one hour per night”), checks for answering in patterns (i.e., straight lining), and self-reported data on answer quality (e.g., “In your honest opinion, should we use your data in our analysis of this study”). Respondents who failed instructed items were screened out automatically, while those who failed multiple quality checks were replaced.

Participants

The target group for the questionnaire was individuals aged 18 to 65 years. Although the sample for Part I of the survey was representative of the population with regard to age, gender, region, and education ($N = 10,363$), because participants themselves decided whether or not to return for Part II, the process was subject to a self-selection bias and full representativeness unachievable.

4,591 respondents filled in Part I and Part II. Due to missing values in the variables employed – mainly in the self-control strategies (missing values $n = 555$) – in our models, we ended up with a final sample of 4,036 respondents with the following breakout by country: Germany ($n = 1,059$), Poland ($n = 972$), Sweden ($n = 1,028$), and the United States ($n = 977$). We decided to delete the cases with missing values as IBM SPSS AMOS 25.0 (and especially the bootstrapping procedure) cannot handle missing values. The demographic profile of the deleted cases is similar to the remaining cases, thus there was not a systematic bias in who was excluded (descriptive statistics of deleted cases are available from the authors upon request). The mean age of the entire sample was 42.66 ($SD = 13.53$), with 56.4% being female.

Measures

Trait self-control. Our measure for trait self-control was the well-validated Trait Self-Control Scale (Tangney et al., 2004), whose 13 items were answered on a 7-point Likert scale (1 = *not at all* to 7 = *very much*) indicating general self-control tendencies; for example, “I am good at resisting temptation,” “People would say that I have iron self-discipline,” and “I am able to work effectively toward long-term goals.” Cronbach’s alpha for this trait self-control scale was .85.

Situation selection. We quantified the ability to select situations that favor long-term goals and avoid tempting desires using the scale developed by Ent et al. (2015), which comprise the following 5 items: “I avoid situations in which I might be tempted to act immorally,” “I choose friends who keep me on track to accomplishing my long-term goals,” “When I work or study, I deliberately seek out a place with no distractions,” “In my life, the line between right and wrong is very clear and sharply drawn,” and “When I want something, I work out a systematic plan for how to get it.” Participants answered on a 7-point Likert scale (1 = *not at all* to 7 = *very much*). Cronbach’s alpha for this situation selection scale was .68.

Attentional deployment. To measure attentional deployment, we used the Attention Control subscale of the Adult Temperament Questionnaire – Short Form (Evans & Rothbart, 2007), in which attention control is part of the broader measure of effortful control but specifically measures effortful attention (i.e., the capacity to intentionally focus or shift attention). This scale thus encompasses both distraction and concentration. Participants rated all 5 items on a 7-point Likert scale (1 = *extremely untrue of me* to 7 = *extremely true of me*), including “When I am trying to focus my attention, I am easily distracted,” “It is hard for me to focus my attention when I am

distressed,” and “It’s often hard for me to alternate between two tasks.” Cronbach’s alpha for this scale was .75.

Reappraisal. We assessed this strategy using the Reappraisal Scale from Gross and John’s (2003) well-validated Emotion Regulation Questionnaire (ERQ), which although focused on emotion regulation, has also been used to assess the cognitive reappraisal of desire-related objects, situations, and behaviors (e.g., Giuliani, Calcott, & Berkman, 2013). This scale consists of 6 items measured on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*), including “I control my emotions by changing the way I think about the situation I’m in,” “When I want to feel more positive emotion, I change the way I’m thinking about the situation,” and “When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.” Cronbach’s alpha was .85.

Inhibition. Our measure of inhibition was the Inhibitory Control subscale of the Adult Temperament Questionnaire – Short Form (Evans & Rothbart, 2007), which assesses the ability to bear down positively toned impulses and withstand approach tendencies. All 7 items were measured on a 7-point Likert scale (1 = *extremely untrue of me* to 7 = *extremely true of me*), including “It is easy for me to inhibit fun behavior that would be inappropriate” and “When I see an attractive item in a store, it’s usually very hard for me to resist buying it” (reverse coded). Cronbach’s alpha was .53.

Affective well-being. We assessed affective well-being based on the Scale of Positive and Negative Experience (SPANE) (Diener et al., 2010b), whose 12 items are evenly devoted to positive and negative experiences (6 items each). Although all items are scored on a scale from 1 (*very rarely or never*) to 5 (*very often or always*), the positive and negative scales are scored separately because of the distinction and partial independence of the two types of feelings. The summed positive score (SPANE-P) can range from 6 to 30 with a Cronbach’s alpha of .91, while the negative scale (SPANE-N) has the same range but a Cronbach’s alpha of .87. The two measures can be combined by subtracting the negative score from the positive score to give SPANE-B scores ranging from -24 to 24.

Cognitive well-being. Our measure of cognitive well-being was the mean score over all 5 items of the widely-used Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), which is designed to assess the cognitive aspects of subjective well-being (e.g., “in most ways my life is close to ideal”). Scored on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*), the scale had a Cronbach’s alpha of .90.

Subjective well-being. To measure subjective well-being, we created a composite measure of affective and cognitive well-being by applying a confirmatory factor analysis to the measure items for both components. All factor loadings were around .70, the average variance explained (AVE) was .50, composite reliability (CR) was .73 and Cronbach's alpha was 0.71.

Control variables. Our control variables were age, measured in years; sex, a binary variable equal to 1 if female; country, denoted by a dummy variable for each of the four countries; and income, measured as net income in 11 comparable categories based on national statistics (Eurostat for Germany, Poland and Sweden; U.S. Census Bureau for the U.S.). The income calculation algorithm, using the 2014 statistic for the monthly net income of the 18–64 age group in each country, ensured cross-country comparability through employing a four-step process: (1) identifying the median income per country and using this as the lower boundary of the middle-income category; (2) defining the upper boundary of the lowest category as the poverty line for singles (i.e., 60% of the median income of a single household); (3) defining the lower boundary of the upper level as approximately 2.5 times the median income; and (4) spreading the intervals for the 11 categories evenly.

Analytic strategy

To analyze our hypothesized model in which trait self-control was the exogenous variable and the four self-control strategies as well as subjective well-being (affective and cognitive well-being) the endogenous variable, we applied structural equation modeling (SEM) with a maximum likelihood estimator to our calculated scores. All calculations were performed on IBM® SPSS® Amos 25.0, which we also used to estimate the measurement model (see Supplementary Material). Our structural model mirrored the hypothesized relation between trait self-control and subjective well-being both directly and mediated by the four self-control strategies. Testing for mediation, we used the Preacher and Hayes's (2008) bootstrapping approach in which mediation was accepted if the indirect paths were statistically significant (based on the bootstrapped standard errors). We redrew 2,000 samples for the bootstrapping. We accounted for the nested data structure (i.e., individual respondents within countries) by using a multi-group comparison model, but we did not adjust for multiple testing.

We estimated our structural model three times with varying subjective well-being variables, including a composite measure of subjective well-being as the dependent variable (Model 1), cognitive well-being (Model 2), and affective well-being (Model 3). The overall model fit for all

three models met the criteria proposed by Hair, Black, Babin, and Anderson (2010): the comparative fit index (CFI), the normed fit index (NFI), and the adjusted goodness of fit (AGFI) were all around .94, with a .03 root mean square error of approximation (RMSEA).

Results

Table 1, which reports the descriptive statistics for all measures and the zero-order correlations among them, reveals positive correlations between trait self-control and all four strategies, with correlation coefficients that varied from $r = .15$ for reappraisal to $r = .54$ for attentional deployment (all at $p < .001$). The correlations between trait self-control and the composite measures for subjective well-being were $r = .26$ for cognitive well-being and $r = .39$ for affective and subjective well-being (all at $p < .001$). Affective and cognitive well-being correlated highly with each other ($r = .64, p < .001$). Table 1 also shows positive correlations between the self-control strategies and the various well-being measures, with a range from $r = .07$ (inhibition and cognitive well-being) to $r = .34$ (attentional deployment and affective well-being). All these correlations were statistically significant.

Table 1 Descriptive statistics and correlations

#	Variable	M	SD	Min	Max	1	2	3	4	5	6	7	8
1	Trait self-control	4.44	1.01	1	7	-							
2	Situation selection	4.89	1.03	1	7	.30***	-						
3	Attentional deployment	4.45	1.21	1	7	.54***	.04***	-					
4	Reappraisal	4.71	1.13	1	7	.15***	.45***	.05***	-				
5	Inhibition	4.50	.90	1	7	.46***	.14***	.44***	.11***	-			
6	SWB	5.22	1.01	1.60	7.56	.39***	.23***	.33***	.14***	.31***	-		
7	CWB	4.28	1.48	1	7	.26***	.17***	.19***	.07***	.17***	.76***	-	
8	AWB	6.45	8.12	-24	24	.39***	.17***	.34***	.16***	.25***	.96***	.64***	-

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1 outlines the SEM results for Model 1 in which subjective well-being was the endogenous variable. Although all strategies were statistically significantly associated with trait self-control, the paths were stronger between trait self-control and attentional deployment ($\beta = .54, p < .001$) and inhibition ($\beta = .45, p < .001$) than between trait self-control and situation selection ($\beta = .30, p < .001$) and reappraisal ($\beta = .15, p < .001$). This stronger association was confirmed by the 95% confidence intervals reported in Table 2, column 1, which did not overlap with those for situation selection and reappraisal. The associations between trait self-control and the strategies were naturally the same for all three well-being models (note that we cannot infer causality in these associations due to the study's cross-sectional design).

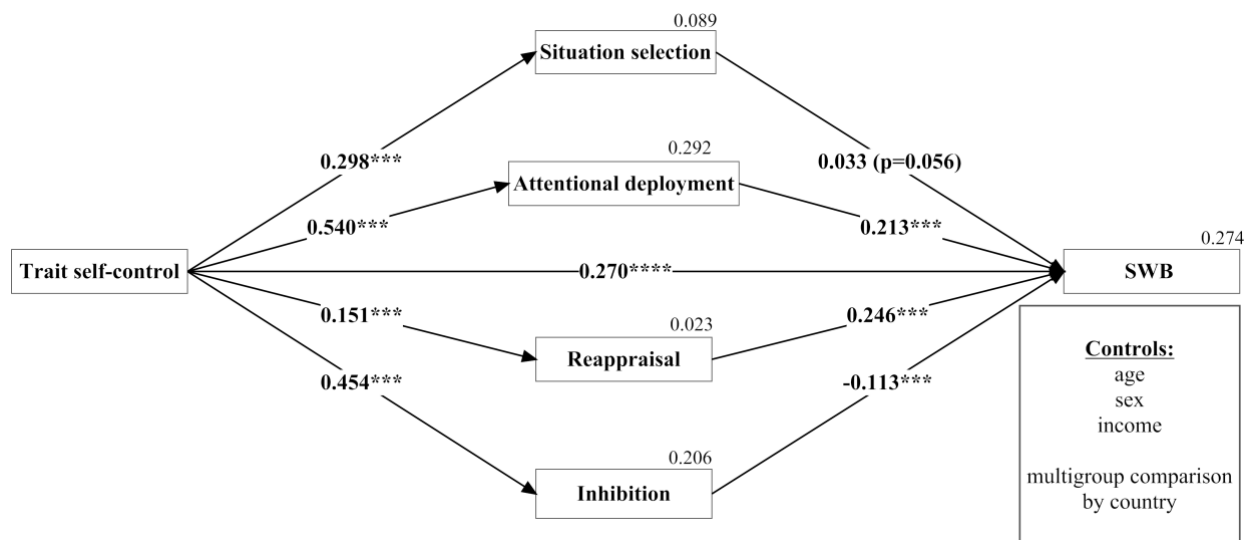


Figure 1. Mediation analysis of the effect of trait self-control on subjective well-being mediated through four self-control strategies. Note the following: * $p < .05$, ** $p < .01$, *** $p < .001$; standardized coefficients, bootstrapped standard errors $n=2,000$, multiple squared correlations for dependent variables.

Table 2. The relation between trait self-control (direct and indirect effects), self-control strategies, and subjective well-being

From	To	(1) SWB¹	(2) CWB²	(3) AWB³
Trait self-control	Situation selection	.298*** [.268, .330]		
	Attentional deployment	.540*** [.516, .563]		
	Reappraisal	.151*** [.113, .185]		
	Inhibition	.454*** [.427, .480]		
Situation selection	SWB/CWB/AWB	.033 [-.001, .067]	.042* [.006, .078]	-.003 [-.039, .033]
Attentional deployment	SWB/CWB/AWB	.213*** [.178, .250]	.100*** [.062, .138]	.202*** [.166, .240]
Reappraisal	SWB/CWB/AWB	.246*** [.214, .278]	.111*** [.075, .146]	.208*** [.174, .242]
Inhibition	SWB/CWB/AWB	-.113*** [-.146, -.081]	-.083*** [-.118, -.047]	-.087*** [-.121, -.054]
Trait self-control (direct effect)	SWB/CWB/AWB	.270*** [.236, .308]	.211*** [.171, .252]	.269*** [.233, .306]
Trait self-control (indirect effect)	SWB/CWB/AWB	.111*** [.083, .136]	.045*** [.019, .072]	.100*** [.072, .124]
Obs.		4,036	4,036	4,036

Model fit:
¹ X²=663.26; df=70; p=.000; X²/df=9.475; CFI=.954; AGFI=.943; NFI=.943; RMSEA=.032
² X²=663.26; df=70; p=.000; X²/df=9.475; CFI=.948; AGFI=.943; NFI=.943; RMSEA=.032
³ X²=663.26; df=70; p=.000; X²/df=9.475; CFI=.952; AGFI=.943; NFI=.947; RMSEA=.032

Notes: Standardized coefficients; bias-corrected bootstrapped standard errors. $n = 2,000$; bootstrapped 95% confidence intervals in parentheses; controls: age, income, sex, and multi-group comparison by country to account for nested data structure; * $p < .05$, ** $p < .01$, *** $p < .001$.

In addition to demonstrating a positive direct effect between trait self-control and subjective well-being ($\beta = .27, p < .001$), we also found that of the four strategies, situation selection was least associated with subjective well-being ($\beta = .03, p = .056$), followed by inhibition, which was negatively related ($\beta = -.113, p < .001$). We observed the strongest positive associations with subjective well-being for attentional deployment ($\beta = .21, p < .001$) and reappraisal ($\beta = .25, p < .001$). Not only was the indirect effect of trait self-control through mediation of the strategies positive and statistically significant ($\beta = .11, p < .001$), but including the strategies as mediators partially explained the total relation between trait self-control and subjective well-being. This total

effect (i.e., the sum of the direct and indirect effect) was thus also positive and relatively strong ($\beta = .38, p < .001$).

One interesting result of calculating separate structural models for cognitive and affective well-being (Table 2, columns 2 and 3, respectively) was that attentional deployment and reappraisal seemed to be more strongly related to affective well-being than to cognitive well-being. For example, the path coefficient of attentional deployment on cognitive well-being was $\beta = .10$ ($p < .001$), whereas that on affective well-being was $\beta = .21$ ($p < .001$) with no overlapping 95% confidence intervals. Moreover, although the direct effects of trait self-control on both subjective well-being measures could be the same (because the 95% confidence intervals overlap), trait self-control had a stronger indirect effect on affective well-being ($\beta = .10, p < .001$) than on cognitive well-being ($\beta = .05, p < .001$). This finding could suggest that the strategies played a larger mediating role between trait self-control and affective well-being than between trait self-control and cognitive well-being.

Discussion

Given the growing attention in recent years to self-control strategies as important explanatory factors of trait self-control's influence over myriad positive outcomes, including cognitive and affective well-being, this present research examines these strategies in the hope of increasing comprehension of the now firmly established association between trait self-control and well-being. More specifically, because the disconnect between self-discipline and pleasurable experience (e.g., happiness) makes it difficult to understand how self-control driven solely by inhibition positively relates to subjective well-being (Cheung et al., 2014; De Ridder & Gillebaart, 2017; Hofmann et al., 2014), we focus on four strategies recently suggested to be essential for understanding self-control's link to desired outcomes. By incorporating the strategies of situation selection, attentional deployment, reappraisal, and inhibition, we are able to better determine the specific contribution of self-control's inhibitive aspect in relation to other strategies. Prior to our analysis, we predicted three outcomes: replication of the earlier research finding that trait self-control is associated with cognitive and affective well-being; self-control strategies would mediate the effect of trait self-control on subjective well-being; and evidence that the early stage strategies of situation selection and attentional deployment are more likely to account for positive effects on well-being.

Our findings lend partial support to these predictions. First, our analysis yields path coefficients of similar magnitude to those of Cheung et al. (2014) and Hofmann et al. (2014), supporting trait self-control's direct contribution to both the cognitive and affective components of subjective well-being. In reporting these results, we focus on our general model, which indexes both cognitive and affective well-being, because our separate analyses for these two variables revealed no notable differences (although the coefficients of attentional deployment and reappraisal were slightly lower for cognitive than for affective well-being). By incorporating several self-control strategies, we provide empirical evidence for partial mediation; that is, trait self-control is associated with all four strategies, with medium to strong relations for situation selection, attentional deployment, and inhibition and a slightly lower relation for reappraisal. In turn, all strategies except situation selection are related to subjective well-being, with attentional deployment and reappraisal associated with greater well-being but inhibition having a negative relation. Subjective well-being thus seems most strongly associated with attentional deployment and reappraisal. When individuals rely on inhibition as their primary self-control strategy, in contrast, their subjective well-being appears to suffer.

Our findings show that it is not only trait self-control per se that is responsible for subjective well-being but also the tendency to use particular strategies that accompany high trait self-control. The expected strong and positive associations between early-stage strategies and subjective well-being are, however, not supported by the results. Particularly, the null-finding between situation selection and subjective well-being contrasts our prediction. This null-finding primarily leaves two possibilities: (1) our way of measuring situation selection was unsuccessful in fully capturing the essence of the strategy; or (2) that the current theorizing around situation selection needs to be revised—at least insofar well-being, instead of other effects, are involved. Future research is encouraged to provide further clarity on the feasibility of either possibilities.

We demonstrate, as predicted, that attentional deployment is significant for subjective well-being, lending some credence to the idea that restraining the potency of temptations can contribute to better well-being outcomes and should be preferred over late stage strategies. Similarly, and in line with our prediction, inhibition is found negatively associated with well-being, no matter whether cognitive or affective. Although supporting our prediction, this observation should be interpreted with some caution due to the low reliability of the inhibition measure, thus restricting our ability to draw strong conclusions about inhibition's effect on subjective well-being. Inhibition also displays a positive bivariate correlation with subjective well-being—likely

suggesting a suppression effect emerging from the introduction of other self-control strategies in the model.

Our study follows a very recent stream of studies showing that trait self-control is associated with a variety of self-control strategies (e.g., Hennecke, Czikmantor, & Brandstätter, 2018). This relation is specifically alluded to in the literature aimed at advancing our understanding of self-control beyond effortful inhibition, which challenges the classic definition of self-control in terms of the self's capacity to override or inhibit undesired inner responses and behavioral tendencies, and to refrain from acting on them (Baumeister et al., 1998; Tangney et al., 2004). In general, these theoretical papers emphasize the strategic nature of self-control, suggesting that as long as reactions are initiated by a self-control dilemma, self-control can take many forms beyond effortfully controlled processes, including the avoidance of tempting situations or the formation of adaptive routines (Fujita, 2011; Gillebaart & De Ridder, 2015; Hofmann & Kotabe, 2012).

Our results suggest that rather than being exclusively or more strongly related to inhibition, trait self-control is also associated with such strategies as situation selection and attentional deployment, albeit rather weakly with reappraisal. This weak association, however, may result from our measure's strong focus on emotional reappraisal (see Gross & John, 2003), which might insufficiently capture the essence of experiencing a self-control dilemma. Future research might thus examine whether a reappraisal assessment that is more geared toward this dilemma can establish stronger relations with self-control.

Showing that trait self-control relates to other strategies than inhibition, and that the four strategies partially mediate the relationship between trait self-control and subjective well-being, is the most important result of our study. That being said, it should be acknowledged that the direct path between trait self-control and subjective well-being has a stronger effect than the indirect path through the four strategies. The stronger direct effect indicates that while the four strategies account for parts of the relationship, much has yet to be understood in terms of which mechanisms drive the positive relation between trait self-control and subjective well-being.

Limitations and future research

Despite its valuable contribution, our study has several limitations. Our study's cross-sectional design implies that we cannot infer any causality in the model and are unable to test the superiority of early stage strategies implied by the hierarchy of self-control strategies assumed in our hypotheses (cf. Duckworth et al., 2016). Our use of trait measures that report participant

tendencies to employ rather than actual use of the self-control strategies renders an analysis of the immediate affective consequences induced from the use of the strategies impossible.

Another limitation is the low reliability of the inhibition measurement, which prevents us from drawing strong conclusions about inhibition's relation to subjective well-being. There may also be a non-ideal match between our conceptualization of the self-control strategies and the measurements thereof. Namely, because we decided to adopt existing scales that were not necessarily developed for exact purpose (but previously showed high construct validity), there is a risk that they do not fully correspond to what was conceptually intended. For example, our situation-selection measurement may not capture the full essence of the strategy. As a result, we cannot exclude the possibility that certain elements of situation selection may be associated – either positively or negatively – with subjective well-being.

It is likewise important to note that the survey data has been subjected to multiple testing, as other manuscripts have been published from the same data set (although not with any of the variables included here). Moreover, our hypotheses were not pre-registered. We also recognize the limitations of relying on self-reported strategy use, as people may not be unaware of their strategy use and the self-report could create problems of social desirability, memory bias, and reporting bias. With these limitations in mind, and despite a large cross-country sample, our results should predominantly be regarded as suggestive evidence of the role of self-control strategies in explaining the positive relationship between trait self-control and subjective well-being.

Future research can address many of the shortcomings of our study by employing a longitudinal design. A longitudinal design allows for an assessment of people's actual employment of the self-control strategies including the affective implications of using either of the strategies (e.g., feelings of guilt or pride), a test of the hierarchical and temporal viewpoint of the strategies, and a generally stronger test of mediation. Future research may also develop more precise measurements of the self-control strategies that more strongly correspond to the conceptualization in recent theoretical research, including the process model of self-control. For example, the current situation-selection measure has low face validity and may be improved by developing items that specifically assess the deliberate preference for situations that promote goal-directed behavior and subjective well-being. Future research may also seek to further develop the conceptualization of situation selection and empirically validate its uniqueness from other situational strategies, such as situation modification (cf. Duckworth et al., 2016).

Most importantly, future research may further investigate which strategies and components of trait self-control are driving its positive relation to subjective well-being. These may include habitualizing goal-directed behavior, using implementation intentions, or engaging in mental contrasting. Future research may similarly investigate the existence of other, non-strategy-related mediators, such as goal attainment, cognitive effort in solving self-control dilemmas, or adept goal setting (potentially coupled with affective forecasting).

Chapter 9: General discussion

The human species is confronted with an unprecedented task that necessitates fundamental societal challenges to avoid dangerous climate change and environmental deterioration. Accomplishing this task requires pursuing rapid, scalable, and complementary solutions that address all corners of society. This dissertation focuses on one such solution for climate-change mitigation, namely that of making lifestyle and behavioral changes that reduce GHG emissions and lessen environmental impacts. Specifically, the dissertation has aimed to investigate the role of self-regulation in the behavior-change process, as summarized in the single research question: *What are the self-regulatory problems challenging environmental behavior change and which self-regulatory strategies can enable successful change?*

The research question is answered through the introductory frame and thoroughly elaborated and discussed throughout the four articles. The introductory frame provides a theoretical account of self-regulation and associated processes, including goal setting, monitoring, and goal striving. It also highlights some of the key self-regulatory problems that may challenge successful behavior change. Article I elaborates on these self-regulatory problems and discusses them in the context of environmental behavior change. Such problems include setting environmental goals that are incompatible with existing goals and whose characteristics complicate goal achievement, poor planning and implementation of goal-directed behaviors, and failure to forego temptations and disruptions. The article also presents a broad repertoire of self-regulation strategies and discusses their instrumentality in supporting goal striving.

Article II focuses on self-control, a sub-component of self-regulation, and the function of self-control in goal striving. Through testing a conceptual model of moral self-control, the article reveals the processes through which moral considerations influence purchasing decisions and shows that moral self-control is distinct from non-moral self-control. Specifically, the article exposes that activated moral considerations are associated with stronger conflict experiences and greater motivation to resist purchasing desires, which in turn results in fewer desire enactments. These results detail how (state) self-control unfolds in a given situation and highlight the different stages in which self-control failure may occur (e.g., not identifying a goal conflict or failing to successfully resist a desire). Importantly, moral considerations were strongly correlated with environmental considerations, which suggests a considerable conceptual overlap between the two. Moreover, the supplemental analysis shows how the influence of environmental considerations on purchase decisions, when omitting moral considerations from the model, is fully mediated via

conflict and resistance. Combined, these results suggest that moral and environmental self-control are indeed distinct from self-control exerted to advance non-moral (or self-interested) goals and that people are more motivated to exert self-control when moral and/or environmental considerations are salient.

Behavior change rarely occurs in solitude and the success or failure of such changes can be strongly influenced by other people. Accordingly, Article III investigates how the presence or absence of other people influences self-control and the performance of goal-directed behavior (i.e., purchasing environmentally friendly clothing). More precisely, it explores the effectiveness of goal support as a self-control strategy and whether the effectiveness of goal support is contingent on people's trait self-control. Article III's results clearly suggest that goal support from other people facilitates self-control (at least for people with a goal to purchase environmentally friendly clothing), and this positive effect is found to be present across of trait self-control levels. Interestingly, however, even moderate goal support is found to benefit people with low trait self-control, indicating that goal support may be a particularly relevant self-control strategy for people with poor self-control. Differences in trait self-control did not predict whether people went clothes shopping alone or with others; however, when people were with others, trait self-control positively predicted the goal supportiveness of the accompanying others. This paradoxical finding that the people who stand to benefit most from goal support are less likely to find themselves in goal-supportive environments raises the important question of whether the absence of goal support is a matter of selection or availability.

Trait self-control is a significant determinant of the outcome of behavior-change efforts. Despite this important role of trait self-control in securing successful behavior change and its positive relationship with numerous desirable life outcomes, however, self-control researchers are still trying to uncover exactly which aspects of trait self-control are responsible for its positive effects. Article IV seeks to advance this research objective by exploring the mediating role of four self-control strategies in the relationship between trait self-control and subjective well-being. This is because subjective well-being, though not directly related to climate change mitigation and environmental behavior change, will become a critical factor in any societal transformation that seeks to address climate change (e.g., O'Neill, Fanning, Lamb, & Steinberger, 2017). Article IV provides a number of important insights in this respect. First, it successfully replicates the positive relationship between trait self-control and subjective well-being. Second, it evidences that trait self-control is positively linked to the tendency to use the four self-control strategies of situation selection, attentional deployment, reappraisal, and inhibition. Third, and most importantly, the

article shows that the tendency to employ particular self-control strategies partially mediates the relationship between trait self-control and subjective well-being. With these findings in mind, Article IV makes a considerable contribution in detailing the repertoire of self-control strategies utilized by people with high trait self-control, as well as showing the implications of these strategies for subjective well-being. The article proposes (but does not test the proposal) that self-control strategies are effective and instrumental in ensuring goal progress as the mechanism that drives their association with subjective well-being. The same logic applies to ensuring successful behavior change (as also argued in Article I); however, because Article IV does not specifically test the potentially mediating role of goal progress, further research is needed to legitimize this theorizing.

Theoretical contributions

This dissertation makes a number of theoretical contributions related to research on environmental behavior change, self-regulation and self-control, morality, and subjective well-being. These contributions are outlined in the following sub-sections.

Environmental behavior change

The dissertation adds a new perspective to research on environmental behavior change. Previous psychological research on environmental behavior change has focused predominantly on either the psychological constructs that predict the performance of environmentally friendly behaviors or on developing interventions that manipulate or utilize psychological constructs to encourage and bring about environmental behavior change. However, the specific processes involved in environmental behavior change have been subject to only limited research. This dissertation addresses this research gap by adopting a process-oriented approach to understand the behavior-change process, and specifically the self-regulatory processes that occur after a goal intention has been formed. In this way it aims to demystify the intention-behavior gap in order to better understand why even people who are motivated to reduce their environmental impacts through behavior change may fail to do so. The dissertation also provides a number of important theoretical perspectives with regards to goal setting, which are outlined below.

Environmental goal setting. The behavior-change process is typically initiated by the adoption of a goal or behavioral intention. The introductory frame and Article I contribute to

research on environmental behavior change by highlighting the important conceptual distinction between goals and behavioral intentions that is too often ignored by environmental psychologists. Goal intentions (also referred to as goals) are outcome-focused and are more complex, effortful, and longitudinal in nature than behavioral intentions. Behavioral intentions, by contrast, are self-instructions to perform particular behaviors that are instrumental in achieving the desired goal outcomes (Sheeran & Webb, 2016). This distinction between goal and behavioral intentions is critical for understanding the structure and interconnectedness between the environmental goals for which people strive and the behaviors they perform to achieve these goals. This distinction is rarely made explicit in the psychological and conceptual models commonly applied in environmental psychology, where intention is theorized to be the primary antecedent to behavior (e.g., the theory of planned behavior; Ajzen, 1991), although these models do implicitly refer to behavioral intentions. By not drawing this distinction, researchers (and readers) lose predictive nuances that could help explain why environmentally friendly behaviors are performed and whether they are likely to be performed again. For example, a man may respond positively to an intention measure about whether he intends to eat one or more vegetarian meal(s) over the next week. While this response suggests he is likely to perform an environmentally friendly act over the coming week, the positive answer may reflect the fact that he will be visiting his vegetarian mother next week and therefore expects to eat a vegetarian meal. At the same time, however, it may also be the case that he is actively trying to become a vegetarian. Thus, the motivations underlying a response may fundamentally differ and, even more importantly, the explanations behind a possible failure to enact the intention may similarly differ (e.g., failure may arise because his mother decides to cater to his meat wishes or because he succumbs to his past behavioral tendency of eating meat). Moreover, the likelihood that he will eat vegetarian meals in subsequent weeks will vary considerably between the two motivations. Becoming more mindful of the conceptual distinction between goals and behavioral intentions will result in better analyses of environmentally friendly behavior and behavior change, which in turn will better inform behavioral interventions as to which behaviors and factors should be intervened against.

Article I dwells further on some important nuances of goal intentions and goal setting. Goals are not uniform but can assume different characteristics, such as motivational orientation or achievement orientation (Austin & Vancouver, 1996; Elliot & Harackiewicz, 1996; Locke & Latham, 2002). Despite considerable research on goal setting in environmental psychology (e.g., Osbaldiston & Scott, 2012), limited research has been focused on the characteristics of these goals. Article I presents evidence on the impact of goal characteristics on later stages in the

behavior-change process and the probability of behavior-change success, and theorizes how this research might relate to environmental behavior change. Article I thus represents a useful starting point for future exploration of the goal characteristics that are especially instrumental for environmental behavior change.

Another theoretical contribution of the dissertation is the discussion and theorizing around the hierarchical organization of environmental goals and the significance of how these interconnects with other personal goals. In common with other personal goals, environmental goals are organized hierarchically, with abstract and long-term goals at the top of a person's goal system (Kruglanski et al., 2002). These abstract long-term environmental goals are then represented by more concrete goals and the behaviors that serve their achievement. Goal-directed behaviors may serve solely an environmental goal, but they may also simultaneously serve the achievement of other goals (e.g., eating vegetarian can advance both an environmental goal and a health goal; Clark et al., 2018). Given that people strive for multiple goals at any point in time, however, they only have limited amount resources available to dedicate to each goal. As a consequence, environmental goals are more likely to be achieved when goal-directed behaviors are multifinal, i.e., when their performance simultaneously advances other important goals (Köpetz et al., 2011). Despite the relevance of the goal-systems perspective on environmental behavior change, this perspective has not yet been widely adopted in environmental psychology, though several attempts have been made (e.g., Unsworth, Dmitrieva, & Adriasola, 2012; Unsworth & McNeill, 2017).

Ensuring interconnectedness between environmental goals and other personal goals is important for several reasons. First, a high degree of interconnectedness reduces the probability of experiencing goal-goal conflicts that force people to choose between the goals to pursue (e.g., whether to forego airplane flights on a family holiday in order to avoid GHG emissions or to fly in order to advance one's family relationships). While goal-goal conflicts are not a central focus of this dissertation, they do play a key role in the behavior-change process, since when goals are nonconcordant with other goals then people must be highly committed to achieving their environmental goals if advancing these is to be prioritized at the expense of other goals. A second reason, albeit speculative, why ensuring interconnectedness is important is that people may be more motivated to exert self-control if doing so helps protect the advancement of multiple personal goals. Third, high goal interconnectedness optimizes the allocation of cognitive, affective, and behavioral resources to maximize overall goal progress and goal outcomes (Shah, Kruglanski, & Friedman, 2003).

An obvious entry point for the goal-systems perspective is in research on behavioral spillover. Environmental psychologists have long been interested in understanding the extent to which the performance of one environmentally friendly behavior makes the performance of another more likely (e.g., Maki et al., 2019; Thøgersen & Ölander, 2003). Construing the concept of behavioral spillover from a goal-systems perspective allows researchers to map the hierarchical relations between people's environmental goals and the interconnections of these with other existing goals (Shah et al., 2003). Because recent research has found spillover effects to be highly inconsistent (Maki et al., 2019), adopting a goal-systems perspective may help better understand when and under which conditions to expect spillover effects.

Environmental goal striving. The key objective of this dissertation is to investigate the self-regulatory processes that occur once a goal intention has been formed. Much behavioral research, including in the environmental domain, has showcased the gap that exists between what people intend to do and what they actually do (Bamberg & Möser, 2007; Sheeran, 2002). An important determinant of the size and frequency of this intention-behavior gap is the level of people's self-regulatory ability. Given that the role of self-regulation—and of its sub-component, self-control—has not been the subject of much research in environmental behavior change, this dissertation makes several noteworthy contributions.

Article I outlines some of the self-regulatory problems that may confront people when trying to change their behavior. Such self-regulatory problems include a failure to initiate behavior change or to shield environmental goals from past behavioral tendencies, goal conflicts and temptations. These self-regulatory problems can confront anyone at any stage throughout the behavior-change process, but not everyone is equally or sufficiently capable and motivated to handle these problems successfully. The main contribution of Article I, which primarily presents evidence from non-environmental domains, thus lies in its pinpointing the key self-regulatory processes that deserve further investigation in the environmental domain, including the exertion of self-control and the repertoire of self-regulatory strategies. Attaining a better understanding of these key processes can help identify when and why behavior-change failures may occur, facilitating more targeted interventions to assist people with their environmental behavior changes and helping to remove barriers that undermine such change. Furthermore, and most importantly, this understanding would increase the plasticity of frequently performed behaviors, thereby making behavior change a more promising strategy for climate change mitigation (Dietz et al., 2009; Nielsen et al., 2019a).

A central problem that can make or break behavior change is the handling of desires to enact past behavioral tendencies and other goal-conflicting temptations. This especially applies to changing frequently performed behaviors like clothing consumption and dietary choices, where people may regularly be tempted to fall back into past behavioral routines. Avoiding and overcoming such temptations demands self-control.

Despite the importance of self-control, however, there has been a paucity of research on its role in the environmental domain. Article II breaks new ground by showing how the influence of environmental considerations on purchasing decisions is mediated via inducing a sense of conflict and motivating desire resistance. To my knowledge, only limited research has shown the specific self-control processes through which environmental considerations influence decision-making. Identifying these processes can help improve our theoretical understanding of why self-control failures occur. For example, this research suggests that self-control failures can occur in the following conditions: (i) when a temptation is too potent to resist; (ii) when an environmental goal is weakly represented—either temporarily or chronically; (iii) when the goal-conflicting nature of a temptation is undetected in the situation; (iv) when there is low motivation to resist the temptation; (v) when there is low capacity—whether temporarily or chronically—to resist the temptation; or (vi) when no enactment constraints are present (i.e., external factors such as limited time or money that prevent the temptation being enacted; see Hofmann et al., 2018).

Article II provides another theoretical contribution by showing that environmental considerations, when activated, carry substantial motivational power by making people more motivated to resist a purchasing desire. However, the results do indicate that the experience of conflict is a critical antecedent to elicit this motivational power. These results could act as a starting point for future studies that aim to better understand when environmental considerations may be activated and under which conditions they elicit conflict experiences.

Articles I and II focus predominantly on internal self-regulatory processes; but environmental behavior change rarely takes place in solitude. By exploring the social dimension of environmental goal striving, Article III thus adds an important dimension to the assessment of the role of self-regulation in environmental behavior change. Humans are social beings and our behavior is frequently influenced by other people. Psychologists have extensively studied the powerful role of social norms in facilitating or hindering the performance of environmentally friendly behavior (Cialdini, 2003; Goldstein et al., 2008), while environmental psychologists have further detailed the importance of social identity and group membership for the performance of environmentally friendly behaviors (e.g., Fielding, Hornsey, & Swim, 2014; Pearson, Schuldt, &

Romero-Canyas, 2016). Little research has been undertaken, however, on the ways in which people can utilize others' support to increase the likelihood of achieving their environmental behavior-change ambitions. Article III suggests that receiving goal support from others can indeed help people perform behaviors that are in accordance with their environmental goal to purchase environmentally friendly clothing. It also reveals that being around non-supportive others can lure people into enacting temptations and derail efforts to achieve behavior-change. These findings constitute a novel contribution to the study of environmental behavior change in demonstrating that social surroundings can affect the probability of self-control failure in any given situation. The extent to which these findings extend to other domain beyond clothing seems a useful avenue for future research. In the case of a person who wants to avoid flying, for example, social surroundings unsupportive of this goal may actively encourage self-control failure, placing extra strain on self-control ability and thus increasing the probability that the behavioral change will fail.

While the significance of social surroundings for self-control is interesting in its own right, Article III adds another layer by detailing the intervening influence of trait self-control. Differences in trait self-control prove predictive of the performance of goal-directed behavior when shopping alone as well as the probability of being in goal-supportive environments. In addition, differences in trait self-control influence the intensity of goal support required to elicit the benefits of such goal support. To my knowledge this is the first analysis to show the importance of being mindful not only of one's own self-control abilities when pursuing an environmental behavior change but also of the goal supportiveness of the social environments in which one's goal striving takes place.

Self-regulation and self-control

This dissertation makes several contributions to research on self-regulation and self-control. These contributions primarily relate to research on state self-control and research on the self-regulation strategies embodied within trait self-control and their effectiveness in supporting goal progress and behavior change. Given that Article I reviews existing research on self-regulation emerging from psychological subdisciplines other than environmental psychology, this section will primarily focus on Articles II–IV.

Extensive research has been conducted on state self-control and the factors and individual differences that predict its effectiveness (e.g., Kotabe & Hofmann, 2015). Article II adds to this

extensive body of research by providing exploratory evidence for the conceptual distinction between moral (and environmental) self-control and non-moral (or self-interested) self-control. The results, which showed that people were more motivated to resist and more often resisted purchasing desires when moral and environmental considerations were salient, suggest that self-control is more likely exerted to protect morally and environmentally relevant goals than purely self-interested goals. This speaks to the significant role of motivation in the effectiveness of self-control exertions (Milyavskaya et al., 2019). The variance decomposition presented in Article II, which shows that 71% of the variance in resistance arose at the within-person level, further attests to and reinforces the significance of motivation in self-control.

Self-control exertions have emotional implications. Previous research has shown that self-control failure may elicit feelings of guilt, shame and regret, whereas self-control success may elicit feelings of pride and satisfaction (Dhar & Werternbroch, 2012; Hofmann et al., 2013). Article II contributes to this research stream by providing supporting evidence for the emergence of guilt from self-control failure and pride from self-control success. It also contributes with the novel finding that self-control failure is typically linked with greater feelings of happiness than self-control success. It may seem intuitive that purchasing clothing elicits feelings of happiness, but the potency of the happiness boost was surprising and partially contradicts findings from other domains (Hofmann et al., 2013). Consequently, this finding deserves further investigation, first of all to validate it but also to investigate whether it transfers to other domains than clothing and whether the happiness disparity between self-control failure and success persists over time.

A center-stage focus in self-control research is on unpacking the aspects of trait self-control that drive its association with positive life outcomes. This dissertation advances this research in several ways. First, Article III provides exploratory evidence that people with high trait self-control either implicitly or explicitly regulate their social environments in a fashion that supports their goal striving. Although trait self-control did not predict the probability of clothes shopping alone or with other people, it did predict the goal supportiveness of accompanying people whenever they went with someone. The findings of Article III contribute to the emergent research on the social dimensions of self-regulation and self-control (e.g., Dzhogleva & Lamberton, 2014; Righetti & Kumashiro, 2012; vanDellen et al., 2015). Second, Article IV contributes to a very recent stream of research by showing that trait self-control is associated with a tendency to employ a range of self-control strategies (Hennecke et al., 2018). Previous studies have managed to add individual pieces to the puzzle surrounding the success of trait self-control (e.g., that it is related to the swifter habitualization of goal-directed behavior; Galla & Duckworth, 2015); however,

Article IV contributes with a broader view of the puzzle by detailing the plurality of strategies embodied in trait self-control.

A third contribution of this dissertation to research aiming to unpack the concept of trait self-control relates to the implications of self-control strategies for subjective well-being. Article IV draws inspiration from the process model of self-control (Duckworth et al., 2016) to identify situational self-control strategies that could explain the positive link between trait self-control and subjective well-being. The process model postulates that situation selection, which is the strategy of deliberately foregoing potentially tempting situations, is the most effective self-control strategy because it restricts the emergence of temptations (for similar theorizing, see Fujita, 2011; Hofmann & Kotabe, 2012). While Article IV's results do not contest this theorizing, they suggest that this strategy (or at least our operationalization thereof) is not responsible for the positive association of trait self-control with subjective well-being. If these findings are confirmed in future research they may have theoretical implications for our current understanding of which self-control strategies both ensure effective self-control and produce positive life outcomes.

Another contribution made here to self-control research is the addition of goal support to the mix of effective self-control strategies. Article III provides compelling evidence, albeit only exploratory, for the merits of goal support as a self-control strategy, most importantly finding that such support appears to work across trait self-control levels. Although the positive effect of goal support needs to be replicated in future research, it opens the way for an enticing number of follow-up research questions aimed at uncovering the mechanisms through which goal support exerts its influence (I will return to these mechanisms in the section on future research).

Morality

Moral values and convictions can sometimes have powerful behavioral effects and motivate self-restraint. The behavior-constraining function of moral values shares considerable conceptual overlap with self-control. In recognition of this overlap, a recent stream of research has sought to bridge research on morality and self-control (e.g., Hofmann et al., 2018; Mooijman et al., 2017). The contributions of Article II are firmly planted within this research stream. Given that the preceding sections have already highlighted the article's contributions to self-control research, the emphasis here is on how Article II contributes to morality research.

Although moral values and convictions can have powerful behavioral effects, researchers of morality have observed, as have environmental researchers, that moral judgments and moral

intentions do not always result in actual moral behavior (Blasi, 1980, Monin et al., 2007). Given this observation, Article II developed and tested a conceptual model of moral self-control to investigate the processes by which moral considerations translate into moral actions. The multilevel modeling analyses demonstrated that the processes through which moral considerations influenced purchasing decisions are indeed reminiscent of those involved in self-control exertions. Namely, the two self-control-related processes of conflict and resistance were identified as important mediators of the effect of moral considerations on purchasing decisions. Identifying these processes can help isolate specific problem spots that can help explain why moral considerations do not always predict behavior (e.g., strong selfish desire, poor conflict identification, or low motivation to resist selfish desire). Morality research may also benefit from incorporating research on self-regulation strategies (Hofmann et al., 2018); for example, goal support may work equally well in ensuring morality-congruent behavior.

Another contribution to morality research is the identification of the existence of residual pathways between moral considerations and purchasing decisions that go beyond conflict and resistance. First, moral considerations were found to exert an effect on resistance beyond that of raising conflict awareness, which could suggest the existence of a more automatic pathway to resistance that circumvents the conscious experience of conflict. This finding may connect with intuition-based and social-emotional accounts of morality that have been found to be related to less intense experiences of conflict (Greene, Nystrom, Engell, Darley, & Cohen, 2001; see also Haidt, 2001). Second, the surprising finding of a direct pathway between moral considerations and purchasing decisions may provide an interesting starting point for future morality research to integrate self-regulation strategies, and especially early-stage strategies that restrain the development of conflicting desire experiences but that might not be construed as resistance (e.g., attentional deployment).

Subjective well-being

The results obtained in this dissertation similarly inform research on subjective well-being, which is currently one of the hottest topics in social science, with more than 10,000 articles published every year (Diener & Scollon, 2014). Subjective well-being is impacted by a wealth of individual and societal factors, key amongst which are basic needs satisfaction, physical and mental health, and quality of social relations (Diener, Seligman, Choi, & Oishi, 2018). Given these multifarious factors, the findings of this dissertation, therefore, make only incremental contributions to the

understanding of which factors predict subjective well-being. Nevertheless, Article IV joins forces with previous research to show that trait self-control is indeed a meaningful predictor of subjective well-being (Cheung et al., 2014; Hofmann et al., 2014; Wiese et al., 2017). Although it is beyond the scope of this dissertation to discuss the many mechanisms by which trait self-control may relate to subjective well-being, there are good reasons to expect that it may do so both directly and indirectly. For example, trait self-control may influence subjective well-being directly through better emotion regulation and indirectly through its instrumental role in ensuring positive life outcomes, such as better academic achievement, improved mental and physical health, and more fulfilling social relationships. These suggested mechanisms detail how trait self-control can influence subjective well-being, though the relationship between self-control and subjective well-being is almost certainly bidirectional, meaning that subjective well-being also influences trait self-control.

The contributions to the research on self-control lie in unpacking the specific self-control strategies that are embodied in trait self-control and drive both the direct and indirect relationship with subjective well-being. Article IV shows that the tendency to use certain self-control strategies has implications for both the cognitive and affective dimensions of subjective well-being (albeit most strongly for the affective dimension). Attentional deployment and reappraisal were found to be especially positively related to subjective well-being. These self-control strategies may also influence subjective well-being both directly and indirectly. For example, attentional deployment can exert both a direct influence through shifting attention away from negative thoughts and towards positive thoughts, and an indirect influence through preventing self-control failure and ensuring goal progress on well-being-inducing goals.

The findings presented in Article IV do suggest, however, that the four self-control strategies examined can only explain part of the positive association between trait self-control and subjective well-being. In fact, the direct pathway between trait self-control and subjective well-being was found to be stronger than the indirect pathway through the four examined strategies. Uncovering which aspects or strategies are the main drivers of this association may therefore be an appealing research endeavor both for researchers of self-control and for researchers of well-being.

Practical implications: Improving self-regulation

In addition to its theoretical contributions, the findings of this dissertation also have practical relevance for policymakers, practitioners and citizens interested in improving self-regulation and the prospects of environmental behavior change. This section aims to address the important question of how to improve self-regulation. In doing so it will predominantly discuss ways to improve self-regulation without the need to improving people's cognitive capacity for self-regulation. More specifically, the focus will be on three particularly promising intervention avenues for improving self-regulation (and self-control): transmitting knowledge of self-regulation strategies; moralizing self-control decisions; and policy interventions to alter decision environments in order to facilitate self-regulation.

Transmitting knowledge of self-regulation strategies

Self-regulation strategies are not equally instrumental in enabling successful behavior change. Few people are knowledgeable about the full repertoire of self-regulation strategies or about the differences in the functions and relative effectiveness of these strategies. Transmitting such knowledge may therefore better equip people to tackle the self-regulatory problems that will undoubtedly confront them during a behavior change. In terms of their function, self-regulation strategies differ in terms of which phase of the behavior-change process they address. Some strategies are helpful for initiating behavior changes (e.g., implementation intentions) whereas others help protect the behavior-change process from being disrupted by enacting temptations (e.g., situation selection, attentional deployment, reappraisal, and inhibition). To optimize the chances of self-regulatory success, the overall ambition during goal striving should be to automatize and habitualize self-regulation. When automatized/habitualized, self-regulation is more resistant to disruptions, thus increasing the probability that goal-directed behaviors will be continuously performed and freeing up cognitive resources to be allocated elsewhere. Automatizing/habitualizing self-regulation requires time, however, and may not always be achievable, hence other situational strategies are demanded as well.

As discussed in Article IV, and rooted in the process model of self-control (Duckworth et al., 2016), self-regulation strategies can be utilized at multiple stages during the temporal development of temptations. Current evidence suggests that the most effective strategies involve restricting the emergence and development of temptations (Casey et al., 2011; Hofmann et al., 2012a). This can be achieved by avoiding potentially tempting situations (situation selection) or

by quickly shifting attention towards non-tempting stimuli when a temptation is elicited (attentional deployment). Goal support may be instrumental to this end. For example, being in the company of goal-supportive others can help ensure (i) that non-tempting environments are prioritized, (ii) that experienced temptations are swiftly regulated, and (iii) that the motivation to resist temptations is high. As highlighted in Articles I and IV, the reason why temptations should be avoided or constrained is—to put it generally—that people’s self-regulation capacity fluctuates considerably over time (e.g., when intoxicated, stressed, or living in poverty), which can impede successful self-regulation (Frieze et al., 2009; Shah et al., 2012). Increasing awareness of self-regulation strategies may assist people in identifying not only their dominant self-regulatory problems but also which strategies are likely to be effective in solving these problems.

Moralizing self-control decisions

Motivation is increasingly recognized as having an imperative function in self-control. Several recent state self-control accounts have detailed how motivation influences decisions about whether or not to control desire experiences and how much cognitive effort is allocated to solving a self-control dilemma (Kotabe & Hofmann, 2015; Milyavskaya & Inzlicht, 2017). A direct implication of the findings of Article II is that moralized self-control decisions increase the odds of resistance and the likelihood of success. These results suggest that moralizing decisions can be a promising strategy for improving self-regulation and self-control. By being moralized, self-control decisions shift from being merely a question of protecting a focal goal to a question of what is right or wrong (Graham et al., 2011; Mooijman et al., 2017). Previous research also supports the positive effect of moralization on self-control. For example, one study found that participants who became vegetarian for environmental and moral reasons had an easier time resisting the temptation to eat meat than participants who did so for health reasons (Rozin et al., 1997).

The moralization of self-control can occur at both individual and institutional level (Rozin, 1999). Individuals may choose of their own accord to convert a self-control preference into a moral value. For example, a person may have initially become vegetarian solely for health reasons but subsequently convert what was formerly a non-moral self-control preference into a moral value after becoming aware of the moral issues linked to meat consumption. Because moral considerations increase motivation to exert self-control (as shown in Article II), individual moralization may help improve the effectiveness of self-control.

The moralization of self-control and behavior may also be a promising intervention strategy at institutional level. Moralization at institutional level—such as occurs for example when political institutions or non-governmental organizations highlight the moral dimensions and implications of a decision—may facilitate moralization for people for whom the decision in question is already a self-control issue (similar to individual moralization). But moralization can also be utilized to imbue a previously neutral decision, activity or object with moral properties among people for whom that decision, activity or object was not previously a self-control issue. For example, a recent study found that the moralization of meat consumption among a sample of people who did not previously regard meat consumption as a moral topic increased the participants' willingness to engage in behaviors aimed at minimizing their own and others' meat consumption (Feinberg et al., 2019). This suggests that institutional moralization may function as a promising and highly cost-effective behavioral intervention to induce environmental behavior change. An important caveat to this claim, as Feinberg et al. (2019) have also found, is that institutional moralizing may also provoke moral reactance among certain people; for example, some people may even increase their meat consumption in response to a moralization campaign.

Policy interventions to facilitate self-regulation

A principal argument in this dissertation is that self-regulation is inherently difficult and subject to repeated failure. Self-regulation encompasses numerous processes, around each of which there lurks the possibility of failure that can destabilize the behavior-change process. While self-regulation is difficult for all people, some find it more difficult than others. As highlighted throughout the dissertation, there are profound and stable individual differences, such as in executive functions, that influence people's self-regulation capacity (Diamond, 2013). People may also live in poor socioeconomic conditions that further impede the opportunity for successful self-regulation and behavior change (Farah, 2017; Shah et al., 2012). Bearing in mind these possible self-regulation constraints, the most effective interventions would logically be interventions that render self-regulation (and self-control in particular) unnecessary (see Loewenstein, 2019, for an eloquent discussion of this point). Thus, policy interventions that alter decision-making environments to support self-regulation have a profound and still largely untapped potential. Such interventions include reshaping situational environments to remove tempting stimuli and to facilitate monitoring and the performance of goal-directed behavior. These interventions are briefly discussed below, but it should be noted here that the following policy

recommendations can be initiated both by public and private institutions. Indeed, given the political gridlock that currently prevails in many countries and which can prevent the implementation of ambitious legislation, private governance initiatives may be able to offer faster and potentially more widespread implementation of the policy recommendations (see Vandenberg & Gilligan, 2017; Victor, 2011).

Everyday life is flooded with tempting stimuli that promote indulgence and undermine people's intentions to lead a low-carbon lifestyle. Such stimuli may take the form of advertisements presenting the unique emotional satisfaction of travelling to remote locations or of purchasing a certain consumer product or eating carbon-intensive diets. People who are actively undergoing an environmental behavior change are likely to frequently encounter tempting stimuli, adding further pressure on their ability to monitor and regulate their thoughts, emotions, and behavior. One way to tackle this is for policymakers to regulate advertising content in order to minimize exposure to carbon-intensive stimuli and thus minimize the need for self-regulation. Enacting such legal measures, similar to regulations already undertaken in many countries to reduce cigarette consumption, would not only improve the prospects of environmental behavior change but also help advance progress towards achieving national and international climate targets, including those prescribed in the Paris Agreement.

A less radical form of intervention involves a subtler restructuring of decision contexts. The idea of intervening through subtle changes to decision contexts has gained far-reaching popularity with the rise of the concept of 'nudging', defined as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008). The nudging concept encompasses a range of subtle interventions such as priming, default setting, pre-planning, and changing the physical environment. Nudging is a promising intervention strategy to change decisions that are made using only limited cognitive effort. In the food domain, for example, nudging has been shown to improve self-control and healthy food choices (Kroese, Marchiori, & de Ridder, 2015). Another study showed that even a simple nudging intervention via people's smartphones could improve self-control (Fishbach & Hofmann, 2015). Nudging may thus be a profitable method for promoting self-regulation and self-control. It has also been shown to be effective in initiating the performance of environmentally friendly behaviors; for example, several studies have found that changing a cafeteria's default menu to vegetarian can significantly increase the proportion of vegetarian meals ordered (Campbell-Arvai & Arvai, 2015; Campbell-

Arvai, Arvai, & Kalof, 2014; for a review of nudging and environmental behavior, see Byerly et al., 2018).

Another promising intervention opportunity to facilitate self-regulation and environmental behavior change is carbon labeling. Carbon-labeling schemes convey information about the CO₂ emissions of a given consumer good or service in a way that makes it easy to integrate such data in decision-making processes (Cohen & Vandenbergh, 2012; Thøgersen & Nielsen, 2016; Vandenbergh, Dietz, & Stern, 2011). Carbon labeling may promote environmental behavior change and self-regulation for at least four reasons. First, carbon labels accessibly inform consumers about the emissions associated with a given consumer good or service and therefore have the potential to correct misperceptions of climate impacts and thus improve effectiveness of environmental goal setting (Camilleri et al., 2019; Vandenbergh & Nielsen, 2019). Second, the implementation of carbon labeling can help overcome some of the self-regulatory problems associated with monitoring environmental goal progress. This is because labeling provides direct feedback on (domain-specific) behavioral outcomes, facilitating the identification of goal-behavior discrepancies which, when present, signal the need for self-regulation to ensure goal progress. Moreover, the availability of feedback provides the information required to substitute behavioral means that are ineffective in delivering the expected goal outcomes, potentially reducing the intent-behavior gap. Third, a visually accessible carbon label can increase the probability that environmental considerations are activated in moments of decision-making. The activation of environmental considerations, as shown by the findings of Article II, may facilitate the identification of goal conflicts and promote the exertion of self-control. Fourth, carbon labels may encourage environmental behavior change and self-regulation among people who do not yet have an environmental goal by making them more aware of the climate impacts associated with their behavior and the consumer goods and services they purchase.

Implications for climate change mitigation

Executing a voluntary behavior change is rarely easy and subject to many challenges—an assumption implicit in my research question and one that should have become evident from this dissertation. Challenges include numerous self-regulatory problems each capable of undermining progress in behavior-change. These self-regulatory problems grow in severity in line with the complexity of the behavioral change and when the behavior(s) to be changed still elicit positive affect and/or is reinforced by social and other external factors. Environmental behavior change

involves an added level of complexity, moreover, since the benefits of such behavioral change largely transcend the self and are often only to be reaped far into the future. (This is not to deny, however, that some environmental behaviors offer benefits that can be immediately internalized, such as improved self-image or moral identity). Substituting air travel with train travel to reduce GHG emissions, for example, generally involves more expensive, time-consuming and complicated travels, placing additional pressure on people's self-regulation abilities to ensure that their temptations to fly are not enacted. Certain environmental behavior changes may also meet social resistance because they confront prevailing norms (e.g., vegetarianism or veganism; Minson & Monin, 2012). The prevalence of problem spots in self-regulation indicates that behavior-change efforts will not always be successful.

Despite the difficulty and challenges involved in bringing about environmental behavior change and the many problem spots of self-regulation, there remains some room for optimism. As proposed throughout this dissertation, as well as in the section above, people's self-regulation abilities may be improved through moralization, policy interventions, and smarter use of self-regulation strategies. From a climate-change-mitigation perspective, the ambition should also be to enhance the perceived importance of environmental goals on the part of people who are already striving to change their behavior. This would ensure that environmental goals gain priority over other personal goals when people are allocating their motivational and cognitive resources to secure the advancement and protection of these environmental goals in the face of obstacles and temptations. Additionally, and in recognition of people's limited resources, it is pivotal that people who wish to reduce the GHG intensity of their lifestyles direct their attention towards those behaviors that really matter and that can feasibly be changed (Stern, 2000). In other words, people should consider the technical potential and behavioral plasticity of a target behavior before undertaking a voluntary behavior change (Dietz et al., 2009; Nielsen et al., 2019a). This not only speaks to the fact that people's resources are limited (e.g., time, mental, and financial resources), but also that there is a limit (albeit fluid) to how much effort people are willing to dedicate to environmental goals (see a recent review of the literature on behavioral spillover by Maki et al., 2019). The dual objective should thus be to maximize reductions in emissions to the extent possible within this limit and to ensure that this limit shifts upwards over time.

A further testament to the potential of behavior change as a climate-mitigation strategy is the observation that many people have indeed successfully changed their behavior. For example, a recent survey conducted by WWF in Sweden found that upwards of 23% of Swedes had foregone flying to reduce GHG emissions during the preceding year (WWF, 2019). Furthermore,

a recent review that screened 427 peer-reviewed articles has shown that behavioral interventions can effectively and significantly reduce GHG emissions (Wynes, Nicholas, Zhao, & Donner, 2018). The review found that behavioral interventions worked across domains, though the evidence was strongest with regards to reducing household energy consumption.

Several recent mitigation-scenario studies have also tried to incorporate lifestyle and behavioral changes into integrated assessment models in order to assess their potential for climate change mitigation. These studies clearly suggest that lifestyle changes are an effective and cost-effective means to reduce emissions (van Sluisveld, Martínez, Daioglou, & van Vuuren, 2016; van Vuuren et al., 2018). One study which incorporated a set of lifestyle-change measures found that lifestyle changes could be a particularly effective means to affect end-use sectors (van Sluisveld et al., 2016). For example, the study calculated that by 2050 that the assessed lifestyle changes could reduce CO₂ emissions in the residential sector by 13% and in the transport sector by 35% compared to baseline emissions. Another study with a more comprehensive measure of lifestyle changes similarly showed the potential role of such changes in global climate-mitigation efforts and in reducing other important environmental impacts, including agricultural land use (van Vuuren et al., 2018). While these recent mitigation-scenario studies have made important strides in assessing the mitigation potential of behavioral changes and in better representing behavior in the model assumptions, additional research with stronger integration of non-economic dimensions of behavior is still required to improve the realism of the mitigation scenarios (McCollum et al., 2017).

This dissertation has highlighted the complexity and difficulty of self-regulation and environmental behavior change. And while this complexity is not properly integrated in current mitigation scenarios, there remains room for optimism about the role of behavior change in climate change mitigation. This optimism is rooted in the fact that the mitigation potential of behavioral changes has not yet been systematically pursued (Dietz et al., 2009) and that behavioral changes, unlike technological solutions, offer emissions reductions on a short time scale. Accordingly, behavior change deserves a much greater priority in public and private responses to climate change in order to turn the global GHG emissions curve downward and to increase the probability of limiting global warming to below 2°C. It will be crucial, furthermore, to ensure that behavioral interventions are targeted at those people who are on average most capable of changing their behavior and those who have the highest carbon footprints (Nielsen et al., 2019a).

Limitations and future research

The present research, while breaking new ground on the role of self-regulation in environmental behavior change, is not without limitations, including both methodological and conceptual limitations. The nature and severity of these limitations are discussed below. However, since the individual empirical articles already separately present their associated limitations, the emphasis here will be on general and cross-cutting limitations. Following this discussion of limitations, recommendations for future research are provided.

Methodological limitations

The most prominent methodological limitations of this dissertation concern the reliance on self-reports and the correlational nature of the statistical results. Though these limitations are typical in behavioral research, it does not invalidate their significance. Self-reported behavior and cognition can reduce accuracy due to memory bias and social desirability bias, as well as increase the probability of overestimating associations due to shared method variance. The correlational nature of the research also disallows causal claims from being made, which limits the conclusions that can be drawn regarding the temporal sequence of state and moral self-control, the potential benefits of shifting between self-regulation strategies, or the potential implications for subjective well-being of improving trait and state self-control. The cross-sectional design of the four-country survey also includes well-recognized limitations that make it imperfect for testing mediation (Maxwell & Cole, 2007).

Other methodological limitations refer to the generalizability of the articles' findings. Although great efforts were made to ensure the representativeness of the four-country survey, this was ultimately not achieved. The diary study was based on a sample dominated by females and the sample's educational level and political beliefs were not representative of adults in the United Kingdom. Together, these limitations set constraints on the generalizability of the reported results (see Simons, Shoda, & Lindsay, 2017). Relatedly, and equally important, the results presented in Article II–IV were exploratory; thus, readers of these results should not interpret them as confirmatory but rather as interesting results that deserve further empirical validation.

Another limitation of the findings is the reliance on WEIRD samples and the generalizability of such samples. The use of WEIRD samples was motivated in part by the higher average carbon footprint of this population segment. From a problem-oriented perspective, the focus on WEIRD samples was arguably legitimate; from a theoretical perspective, however, the generalizability of

the evidence of the role of self-regulation in environmental behavior change is subject to the same limitations as other WEIRD research (Henrich et al., 2010; Rad et al., 2018).

Some of the measurements used in this research also have possible limitations. One prevalent issue in this regard is Article IV's measurement of the use of self-control strategies. Whilst this issue pertains to most research on self-control strategies (e.g., Hennecke et al., 2019), Article IV's operationalization of the strategies was not ideal (as discussed in the limitations section of that article). The scale adopted in Article III to measure the dependent variable of environmental clothing consumption was also not ideal. The scale did show good internal consistency, but because its mean score was used as the dependent variable the participants whose clothing consumption induced a low environmental impact could have been mislabeled by receiving a low mean score. For example, a person may have a strong goal to acquire environmentally friendly clothing and serve this goal solely by purchasing secondhand clothing; this person's mean score would then be low despite the fact that their induced environmental impact would be limited.

Conceptual limitations

Self-regulation encompasses the broad set of processes by which people set, monitor, strive for, and attain goals. Due to the complexity and number of processes associated with self-regulation, this dissertation was only able to focus on a subset of these processes. The empirical articles were therefore confined in scope to the processes embedded in environmental goal striving, and especially to those linked to self-control. This means that important self-regulation processes were not investigated empirically, including the processes of goal setting and monitoring, thereby preventing a fully comprehensive account of the role of self-regulation in environmental behavior change.

Most self-regulation research focuses on internal regulatory processes that determine self-regulatory failure or success. This dissertation had a similar focus, but also sought to incorporate social dynamics in order to better understand how these interact with self-regulation and self-control processes. Despite taking a broader view of self-regulation than most research, however, several other external influences were not discussed, including economic, structural, physical, and institutional factors that can prevent or facilitate self-regulation and environmental behavior change. For example, socioeconomic inequality has repeatedly been shown to undermine

cognitive development and to impede people's capacity to exert self-control (Farah, 2017; Hackman & Farah, 2009; Shah et al., 2012).

Another conceptual limitation is that the scope of the dissertation did not allow for an account of the cultural dynamics involved in shaping environmental behavior change, self-regulation decisions, and the overall behavior-change process. Research on culture and cultural dynamics both within and outside psychology has shown that individual behavior and decision-making can be strongly influenced by cultural factors (Kashima, Bain, & Perfors, 2019; Nielsen et al., 2019a; Oyserman, 2017). Culture can severely constrain what people think or even imagine they can do (Dietz & Burns, 1992). Accordingly, culture could influence behavioral plasticity and even determine which behaviors people perceive as possible to change. Moreover, conforming to culture can be a central human value, residing at the top of the goal hierarchy, which may lead people to reject behavior changes that conflict with prevailing cultural practices.

A final conceptual limitation relates to how the dissertation studied self-regulation and environmental behavior change through only one disciplinary lens. Self-regulation and self-control are interdisciplinary phenomena that cut across disciplines, including economics (Thaler & Shefrin, 1981), neuropsychology (Hofmann et al., 2012b), neurobiology (Hare, Camerer, & Rangel, 2009), criminology (Gottfredson & Hirschi, 1990), political science (Schelling, 1980), and philosophy (Davidson, 1980). The same is true of environmental behavior change, which has also been studied in numerous disciplines (e.g., sociology, neuroscience, law, political science, economics, and environmental science). An interdisciplinary research approach is therefore necessary to fully grasp and assess the role of self-regulation in environmental behavior change. Although the dissertation did incorporate interdisciplinary research, especially in the introductory frame, a more structured (and extensive) synthesis of available theoretical frameworks might have led to different foci and thus different recommendations.

Future research

This dissertation investigated the behavior-change process by bridging research on self-regulation and environmental behavior change. Although the dissertation makes significant strides in more precisely delineating the role of self-regulation processes in environmental behavior change, there are numerous unaddressed aspects that open up exciting avenues for future research. One important avenue, for example, would be to attain a better understanding of the exact role played by cognitive functions in success or failure to change frequently performed GHG-intensive

behaviors. A very recent and enticing stream of research has initiated this research agenda by applying novel methodologies to demonstrate how individual differences in working memory capacity and neural traits can predict environmental attitude-behavior consistency (Baumgartner, Langenbach, Gianotti, Müri, & Knoch, 2018; Langenbach, Berger, Baumgartner, & Knoch, 2019). While this research is interesting, it addresses the capacity component of self-regulation and self-control whose malleability in adults is the subject of intense and ongoing debate (Berkman, 2016; Friese, Frankenbach, Job, & Loschelder, 2017; Katz, Shah, & Meyer, 2018). Supplementary research is thus needed to identify ways to strengthen self-regulation without capacity improvements.

One possible way to circumvent capacity improvements is through using self-regulation strategies whose effectiveness is less determined by cognitive functions. This dissertation studied several of these strategies, but additional research is warranted to address the limitations of the present articles. First, future research is encouraged to better operationalize and examine people's actual use of self-regulation strategies. Second, and relatedly, there is a need for comparable and integrative research to ascertain the differences in effectiveness between self-regulation strategies and to identify which conditions and for which goals the individual strategies work best.

Additional research is also needed to further isolate the mechanisms driving trait self-control's success story. The existing research is far from settled with some of the core mechanisms being surrounded by contradictory findings. For example, some studies suggest that high trait self-control is linked with greater state self-control (e.g., DeWall, Baumeister, Stillman, & Galliot, 2007), whereas other studies find the opposite relationship (e.g., Imhoff, Schmidt, & Gestenberg, 2014). Another related and unsettled question is whether people with high trait self-control are better at self-control because they chronically experience impulses, desires, and temptations less frequently and less potently than people with low trait self-control. A recent study supported this proposition by showing that high trait self-control was linked to less intense and a lower presence of visceral states (Baldwin, Garrison, Crowell, & Schmeichel, 2018). Nevertheless, more research is needed to determine whether this extends to all types of impulses and desires or whether it is domain specific.

Article II shows that moral and environmental considerations are positively correlated with self-control exertion. While providing novel contributions, many questions remain. More research is required to examine the perceived intrinsic or extrinsic benefits that motivate people to act in accordance with their moral and environmental values and standards (when they are activated). In addition, future research can distinguish between different types of moral and environmental

considerations to better understand their nature, specificity, and motivational potency. Another interesting question for future research is whether “environmentalizing” – imbuing a previously neutral decision, activity, or object with environmental properties – function in a similar, and equally powerful, manner as moralization.

Article III suggests that goal support, when sufficiently strong, can benefit people independent of their trait self-control. However, the study was unable to explain how goal support works and whether it works similarly for all people. Consequently, the exact mechanisms through which goal support benefits goal striving are unknown. The study also cannot explain why people with high trait self-control are more likely to find themselves in goal-supportive environments when they are accompanied by others. Do they explicitly or implicitly opt themselves into goal-supportive environments and/or do they have a wider availability of goal-supportive others to choose from?

The positive relationship between trait self-control and subjective well-being is well-established and Article IV helps further unravel the relationship by showing the role of four self-control strategies. But the important question of causality and directionality remains: does improving trait self-control cause an improvement in subjective well-being (or vice versa)? And does shifting the use of self-control strategies toward those that positive correlate with subjective well-being cause a similar improvement in subjective well-being? These are enticing and important questions for future research to address.

Much research has reported the difficulty of environmental behavior change and its frequent breakdown. But limited research has examined at what stage of the process this most likely occurs. Because any substantial environmental behavior change will involve occasional self-control failures, there might be a tipping point in the behavior-change process where one self-control failure too many causes the abortion of the whole endeavor. Future research may investigate the existence of such a tipping point, and if existent, illuminate when the tipping point is reached and why it occurs. Knowledge about tipping points in the behavior-change process may help backtrack the root cause of the behavior-change failure, and to identify intervention points to strengthen persistence and facilitate successful behavior change.

Future research may also address the dissertation’s dominant limitations. Most notably, this involves further investigating self-regulation’s role in environmental behavior in non-Western settings, as well as its role in the process of changing high-impact behaviors that are infrequently performed. Likewise, because the concepts of moral (and environmental) self-control and goal support were investigated in the clothing domain, which may embody unique features compared

to other GHG intensive frequently performed behaviors, its generalizability to other domains may be explored in future research.

Concluding remarks

The dissertation's principal argument is that research on environmental behavior and behavior change would profit from integrating the concepts of self-regulation and self-control. A greater research focus on the integral processes of self-regulation can facilitate the identification of key self-regulatory problems spots and effective methods and strategies for overcoming these. Moreover, behavioral interventions that specifically target self-regulation abilities may increase the feasibility of environmental behavior change and strengthen its prominence as a climate-mitigation strategy.

Improving people's self-regulation abilities is important and the opportunities thereto should be exhausted. But it is essential not to become blind sighted and ignore underlying the structural (and other external) factors that counteract successful self-regulation and environmental behavior change. Improving self-regulation is not a panacea and there is a potential danger in solely attributing self-regulatory success or failure to individual abilities or the lack thereof. Many prevalent societal and individual problems can be construed as both a problem of self-regulation (or self-control) and that of structural and systemic factors (Loewenstein, 2019). Sometimes doing the right thing is made difficult by society, thus we must not resort to victim blaming. Even when construing prevalent societal and individual problems as resulting from people's inadequate self-regulation or self-control, structural and socioeconomic factors may still be at fault. For example, structurally and socioeconomically induced conditions, such as stress and poverty, can have powerful and detrimental effects on both the development of self-regulation and the situational capacity for self-regulation (Evans & Schamberg, 2009; Farah, 2017; Sapolsky, 2004; Shah et al., 2012). Consequently, removing structural barriers that undermine self-regulation may greatly outperform individual-focused behavioral interventions in improving self-regulation.

Rapid and widespread reductions in people's carbon footprints are also, in principle, best achieved through implementing supply-side solutions. Supply-side solutions, such as rapidly transitioning into renewable energy production, have crosscutting effects on people's carbon footprints in a way that circumvent the need for behavior change. But if history has taught us anything it is that high-impact supply-side solutions will not be implemented fast enough to

effectively meet GHG-reduction targets. Thus, if the worst consequences of climate change are to be avoided, transformative lifestyle and behavioral changes are unavoidable.

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