Self-control conflict in the eating domain

A cognitive, affective, and behavioral perspective

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CHAPTER 5

General Discussion

Self-control conflicts are pervasive in everyday life (Hofmann, Baumeister, Förster, & Vohs, 2012). Whether it is the desire to open the box of biscuits right after lunch despite the goal to reduce unhealthy snacking. Or the desire to buy the fancy phone despite the goal to save money. In both cases self-control is needed to inhibit the desire (i.e., impulse) and to bring behavior in line with one's higher-order goal (Milyavskaya & Inzlicht, in press). To improve self-control, we thus need to know how people experience and subsequently deal with self-control conflicts. The present dissertation set out to contribute to this overarching goal through applying the insights from different literatures to the study of self-control conflicts: First, the cognitive control literature suggests that conflict triggers control which brings subsequent behavior in line with (task) goals. Chapter 2 investigated whether this conflict-triggered control mechanism also operates in the presence of motivationally charged distractors (cf. temptations). Second, many different literatures have demonstrated that (e.g., response, attitudinal, decisional) conflicts are associated with negative affect. In Chapter 3, I asked whether this is also the case for self-control conflicts, and if so, how this negativity would influence people's emotions, evaluations and behavioral reactions to their self-control choices. And finally, based on the findings in Chapter 2 and 3 it seemed that reducing impulse strength could be one way of preventing conflict to occur, ultimately increasing the likelihood of making healthy choices. Whether this would indeed be the case was tested in Chapter 4.

  In this General Discussion I will elaborate on the findings pertaining to each of the research questions raised throughout the present dissertation. I will also attempt to integrate the findings across the chapters, and along the way point to possible avenues for future research. After discussing several limitations, I will conclude with some practical advice on how to improve control over eating behavior.

The Benefits of Conflict: Conflict Triggers Control
The present dissertation adopted different perspectives on self-control conflicts and thereby exposed their potential benefits as well as their costs. Highlighting a clear benefit of conflict, the cognitive control literature has demonstrated that the occurrence of response conflict (e.g., in a Stroop task) triggers the mobilization of resources, or control, which are then utilized to solve the conflict in favor of the task-goal (Botvinick, Braver, Barch, Carter, & Cohen, 2001). Moreover, the upregulation of resources does not only serve conflict resolution at the current trial, but carries over to the next trial, in which

performance is typically characterized as relatively more (less) influenced by task relevant (irrelevant) information (i.e., better conflict resolution). The goal of Chapter 2 was to test whether this dynamic control mechanism (i.e., conflict adaptation) also operates in the presence of motivationally charged distractors, cues of motivational relevance which might distract from and thus undermine the execution of the task-rule (cf. temptations). Such a test provided information about the degree to which momentary increases in control can indeed facilitate the inhibition of motivationally charged distractors and bring behavior in line with the higher-order (task) goal.

Chapter 2 reports four experimental studies which tested whether conflict adaptation prevailed in the presence of motivational distractors. More specifically, participants completed a modified Stroop task in which they had to respond to the color of the target figure and ignore the (congruent vs. incongruent) color of the adjacent non-target figure. Motivational (vs. neutral vs. no) distractors were inserted at the non-target location of each following trial, and signaled monetary gain or loss. Importantly, gains or losses were not contingent of current trial performance, but on overall task performance, which further increased their distracting potential (see Bijleveld, Custers, & Aarts, 2011). Considering that conflict adaptation is especially geared towards target activation and non-target inhibition, presenting the motivational distractor at the non-target location created a situation of direct competition between distractor and target processing.

Accumulated evidence from four studies suggested that the conflict adaptation mechanism was not fully protected in the presence of a motivational distractor. Specifically, though conflict adaptation still occurred to some degree, it was significantly reduced in the presence of motivational distractors compared to when there was no or a neutral distractor present. Those findings supported the prediction derived from the resource competition account (Pessoa, 2009), according to which the processing of motivational (or affective) information relies on the same resources as cognitive control. Once both processes are engaged at the same time, as is the case when in direct competition, motivational distractors divert and consume resources needed for the execution of control, thereby undermining the conflict adaptation effect (see Padmala, Bauer, & Pessoa, 2011).

Each of the four studies tested the same basic question, but looked at one additional aspect of the process of interest. Study 2.1, for example, tested whether conflict adaptation might be better protected when the motivational distractor appeared on the non-target (vs. target) location. Results, however,

showed that motivational distractors demanded and consumed resources independent of their location, and thus independent of one's current control state. Study 2.3 demonstrated that the reduction of conflict adaptation was similar for motivational cues signaling monetary gains and losses (for a null-finding see Study 2.2). This was an important finding because it ruled out one alternative explanation, according to which only positive gain cues should undermine conflict adaptation because they cancel out the aversive conflict signal and thereby weaken control (van Steenbergen, Band, & Hommel, 2009). Moreover, finding a reduction of conflict adaptation for both types of cues also showed that motivational gain cues not always boost control (see Braem, Verguts, Roggeman, & Notebaert, 2012; Stürmer, Nigbur, Schacht, & Sommer, 2011), but can also undermine control when in direct competition with target processing. Finally, Study 2.4 partly replicated the overall pattern of results in a paradigm that controlled for possible feature repetition confounds (Hommel, Proctor, & Vu, 2004). Together, the set of studies and the collapsed analyses across these studies suggests that conflict adaptation is not fully protected in the presence of motivational distractors, and that this can best be explained by resource competition between distractor and target processing, which eventually compromised the efficiency of dynamic control adjustments (see Conclusion #1).

The line of studies presented in Chapter 2 was inspired by the conceptual overlap between response conflicts, as studied in Stroop tasks, and more complex self-control conflicts. Both types of conflict share the presence of incompatible response tendencies, the effortful inhibition of the incompatible response, and both signal the need for behavioral adjustment, which results in the mobilization of resources (Botvinick et al., 2001; Hofmann et al., 2012; Inzlicht, Bartholow, & Hirsh, 2015). One important difference is, however, that more complex self-control conflicts usually involve motivationally charged, 'hot' impulses, whereas mere response conflicts involve habitual, 'cool' impulses (e.g., automatic word reading). The goal of Chapter 2 was, therefore, to investigate whether the effectiveness of conflict-triggered control processes differed depending on the type of impulse. As the results suggest, conflict-triggered control adjustments were reduced, but not completely eliminated, in the presence of motivational distractors. It follows that even when control processes are optimally prepared, their effectiveness remains constrained by the motivational pull of the desire, because both consume resources which are shared. This in turn could explain why self-control can still fail even when goals are highly accessible and ready to be executed.

Even though Chapter 2 incorporated one of the main differences between simple response and more complex self-control conflicts (i.e., cold vs. hot impulses, respectively), it did not address another important difference between the two. Whereas response conflicts in a Stroop task have a clear and unambiguous solution (i.e., task rule), this is usually not the case for self-control conflicts which entail two competing goals that are currently about equally strong. To illustrate, in situations in which I know I should order the healthy salad, but still would rather eat the tasty pizza, both choices are – for different reasons – 'valid' choices. Considering that learning accounts of conflict adaptation stress that conflict reinforces 'task-relevant' associations (Verguts & Notebaert, 2008), both goals might get reinforced and thus receive a share of the mobilized resources. As a consequence, the enhanced processing of hedonic goals could make them grow into full-blown desires (see Hofmann & van Dillen, 2012) taking up resources and thus impeding the controlled pursuit of the higher-order goal (cf. Pessoa, 2009). Conflict might thus be one way through which desires gain access to cognitive resources (i.e., working memory) and get amplified. Future research is needed to test this hypothesis, and to study how desires and higher-order goals are then balanced once they have both received reinforcement.

Conclusion #1

Conflict triggers control adjustments which bring subsequent behavior in line with task-goals. Such conflict adaptation is, however, not fully protected in the presence of motivational distractors.

The Costs of Conflict: Conflict is Aversive

Many different lines of research have demonstrated that conflict – be it response, attitudinal, or decisional conflict – is characterized by negative affect and a general sense of discomfort (Dreisbach & Fischer, 2012a; Festinger, 1964). This negativity is thought to act as an 'alarm signal' telling the organism that goal-pursuit is threatened and that action is required to get back on track. It had been hypothesized that the same would apply to self-control conflict (Inzlicht et al., 2015), but direct evidence for this link between self-control conflict and negative affect is, however, still scarce (e.g., Berrios, Totterdell, & Kellett, 2015; Grund, Schmid, & Fries, 2015; Hofmann, Kotabe, & Luhmann, 2013). More specifically, what had not been investigated yet is how variations in self-control conflict strength influence affective and emotional reactions to people's self-

control choices (i.e., resisting vs. giving in). This is an important question, though, because if self-control conflict was also experienced as negative, this could have a significant influence on how people feel about exerting self-control and about their self-control choices. The goal of Chapter 3 was, therefore, to investigate the affective experience of varying degrees of self-control conflict, and its influence on people's emotional reactions, evaluations and future self-control.

To test this, participants were presented with a choice between a relatively more and a relatively less healthy food option (e.g., salad vs. pizza). Choices were either hypothetical (Study 3.1, 3.2 and 3.5) or real (Study 3.3 and 3.4). After they had made their choice their conflict strength (or choice difficulty, a proxy) and their affective and emotional reactions were assessed (via self-report). In line with what is known about other forms of conflict, the first three studies of Chapter 3 demonstrated that conflict strength was related to increased negative affect and stronger negative emotions (i.e., guilt and regret). Strikingly, those relationships were observed for both unhealthy and healthy choices (though guilt effects were usually stronger for unhealthy choices), suggesting that conflict spoiled hedonic pleasure as well as self-control success, respectively. Moreover, in Study 3.2 it was found that conflict strength had a significant effect on participants' evaluations of their chosen and non-chosen food option. Whereas under low conflict participants' evaluations of the chosen (non-chosen) food option increased (decreased), this spreading of alternatives was less pronounced for highly conflicted choices, suggesting that conflict undermined cognitive dissonance reduction. And finally, Study 3.3 demonstrated that the experience of self-control conflict influences future behavior. Whereas participants who experienced low levels of conflict tended to make a similar food choice at an upcoming self-control situation, participants who experienced high levels of conflict did not show such behavioral consistency.

The findings in Chapter 3 highlight the affective, evaluative and behavioral costs of experiencing self-control conflict. Those costs are especially high for people who resisted temptations, as they were left with a negative aftertaste even though they had all reasons to be proud of their self-control success. The crucial question, therefore, was, how it can be explained that resisting temptations did not lead to feelings of pride and accomplishment, as would have been predicted by the self-control literature (Giner-Sorolla, 2001; Hofmann et al., 2013), as well as by the literature on goal pursuit (Higgins, 2006). I had argued that whether or not conflict strength was related to more

negative or more positive affect and emotions depends on whether or not the self-control conflict is perceived to be successfully solved. That prediction was based on research showing that unresolved conflict continues to be experienced as negative, whereas resolved conflict can lead to a proportional increase in positivity (e.g., Dreisbach & Fischer, 2012a; Schouppe et al., 2015). Because self-control conflicts entail two incompatible goals, enacting one goal can leave the other, choice-inconsistent, goal unfulfilled and lingering, which might prevent a sense of successful conflict resolution, and thus bias emotional and evaluative processes accordingly (Carmon, Wertenbroch, & Zeelenberg, 2003).

It follows that one way of unlocking the positive potential of self-control conflict is to resolve the conflict experience through, for example, putting the focus back on the choice-consistent goal (see Study 3.4). This prediction was tested in Study 3.5 in which participants appraised their choice as an act of self-control before (vs. after) they reported their emotions. As predicted, only when healthy choices were first appraised as acts of self-control did conflict predict higher levels of pride (based on simple slope analyses, higher-order interaction was not significant) and was unrelated to negative affect and emotions. For unhealthy choices (and for healthy and unhealthy choices that were not first reappraised), conflict was still related to negative affect and emotions. Together, the set of studies showed that in the absence of specific appraisal manipulations, self-control conflicts are associated with increased negative affect, emotions and evaluations – independent of whether one resisted or gave in to the temptation (see Conclusion #2). This also suggests that the experience of conflict may indeed increase the chances of using the choice-inconsistent goal as a subsequent appraisal standard (see Carmon et al., 2003). Future research is, however, needed to further support this claim.

Those findings seem to be at odds with the notion that people are generally motivated to resolve conflict in order to reestablish cognitive consistency (Festinger, 1964; Gawronski, 2012; Inzlicht et al., 2015). For example, if people behave in a way that is inconsistent with their beliefs (e.g., telling people that a task is exciting if in fact it was boring), they tend to adjust their beliefs afterwards to justify their behavior (e.g., they find the task less boring; Festinger & Carlsmith, 1959). According to such a general dissonance reduction motive, participants in Chapter 3 should have adopted the choice-consistent goal as an appraisal standard in order to justify their choice – especially when the choice was difficult (Harmon-Jones & Harmon-Jones, 2002). It is also striking that even when people could have used contextual cues to justify their hedonic choice (e.g., being in a restaurant with a friend), people did

not do so. Instead, conflict strength was in all studies strongly associated with lower levels of choice confidence, which further stressed the costs of dealing with self-control conflicts. Taken together, Chapter 3 highlights one of the important differences between response and more complex self-control (i.e., goal) conflicts. Whereas making a choice might have solved the conflict on the response level, people still felt negative about their choice afterwards, suggesting that conflict was not solved on the affective level. This could partly be due to self-control conflicts involving two attractive goals rather than one clear task-rule, so that any choice might be less likely appraised as *the* successful solution. Instead, the unfulfilled goal remains accessible, biasing further processing.

Unhealthy behavior is not always triggered by hedonic goals, but also by habits (Orbell & Verplanken, 2010). Under the assumption that habits are automatically activated response tendencies that do not necessarily involve the activation of conscious goals (Wood & Neal, 2007; but see also Aarts & Dijksterhuis, 2000), conflicts between habits and higher-order goals could have less detrimental affective consequences, at least when behavior is aligned with the higher-order goal, because the non-enacted habitual response will not linger. It is, however, also possible that a conflict between a habit and a higher-order goal is less likely to reach consciousness, given that habits are usually executed in a fast and automatic fashion, thus before the conflict experience might even arise. In fact, Myrseth and Fishbach (2009) proposed that conflicts need to be identified in order to trigger self-control processes, otherwise they will lead straight to indulgence (see also van der Laan, De Ridder, Charbonnier, Viergever, & Smeets, 2014). This corresponds to work in the domain of cognitive control, which has shown that anterior cingulate cortex (ACC) activation and dynamic control adjustments (i.e., conflict adaptation effect) only occur for consciously perceived but not for masked response conflict (Ansorge, Fuchs, Khalid, & Kunde, 2011; but see Desender, van Lierde, & van den Bussche, 2013). Future research is needed to study whether habitual responses can trigger self-control conflict, and the degree to which conflict needs to be consciously identified in order to elicit negative affect and self-control.

Conclusion #2

Experiencing conflict during self-control decision making has negative affective and emotional consequences, unless people appraise their choice with the choice-consistent goal.

No Benefits without Costs?

The present dissertation highlights the benefits as well as the potential costs of self-control conflict. Chapter 2 replicated earlier work and showed that conflict triggers control which remains high and thus facilitates future control. Even though this conflict adaptation mechanism was weakened in the presence of motivational distractors, it still operated to some degree. That successful conflict resolution at time one can trigger control at time two has also been found for self-control conflicts (Hofmann & Fisher, 2012). Specifically, participants who resisted temptation at time one were also more likely to resist temptation at time two. Importantly, this 'self-control conflict adaptation' was mediated by elevated levels of pride, suggesting that positive emotions after self-control success were responsible for future self-control success. This is, however, at odds with one of the influential theoretical accounts, according to which conflict adaptation is mediated by the negativity of the conflict signal (Dreisbach & Fischer, 2012a; van Steenbergen et al., 2009). The negative conflict signal supposedly initiates an avoidance learning mechanism with the goal to reduce present and future conflict. Several studies by van Steenbergen and colleagues (2009) supported this idea by showing that presenting positive affective information between trials of a flanker task reduced the conflict adaptation effect. They argue that positive information cancelled out the negativity of the conflict signal and therefore interrupted the learning and control mechanism.

The pride-mediated 'self-control conflict adaptation' effect is, however, in line with an alternative account, which posits that conflict acts as a learning signal reinforcing currently active task-representations (Verguts & Notebaert, 2008). This learning signal, and thus conflict adaptation, can be further enhanced by reward feedback following the successful resolution of conflict (Braem et al., 2012; Stürmer et al., 2011; see also Satterthwaite et al., 2012). There is even evidence that correctly responding to (i.e., solving) response conflict alone releases positive affect (Schouppe et al., 2015). The authors explain their finding with research on prediction errors, according to which positive affect but also learning is enhanced when the outcome was unexpectedly successful. In high conflict situations success is less likely, so the potential for positive affect and learning is especially high (e.g., Silvetti, Seurinck, & Verguts, 2011). Taken together, the existing evidence suggests that post-conflict positivity might be crucial for sustained control.

But how can we relate the centrality of positive affect in sustained control to the findings in Chapter 3, which showed that people do not usually

feel positive about self-control successes? First, people's overall negative response to real-life self-control successes might help explain why sustained self-control often fails, especially for those who experience strong temptations. Second, our research also stresses the positive potential of overcoming conflict (i.e., resisting temptations) for sustaining self-control – given it is appraised as a success. And last, it highlights the pivotal importance of studying factors other than self-control appraisals which might also help generate feelings of success. In summary, it seems that negative affect might still be important for triggering online control (i.e., on the trial level). For sustained control (i.e., conflict adaptation), however, post-conflict positive affect (i.e., feelings of success) might be more important, but also less easily generated, than previously thought.

Reducing Conflict to Prevent Self-control Failure
Considering the potential costs of self-control conflicts, one way to increase the likelihood of making 'healthy' choices could be through decreasing impulse and thus conflict strength (i.e., making the healthy choice easier, see Gillebaart & De Ridder, 2015). Accordingly, Chapter 4 tested whether decreasing impulse strength by means of approach avoidance training would indeed lead to beneficial changes in eating behavior. The approach avoidance training is an associative learning paradigm, which aims at lowering people's immediate approach response towards critical stimuli (e.g., unhealthy but palatable foods). It has been successfully applied in the alcohol domain, where it was found to reduce implicit liking and alcohol consumption (Wiers, Rinck, Kordts, Houben, & Strack, 2010), but its effectiveness in the eating domain had yet to be established. To this end, I conducted three studies in which participants (healthy weight students) received one session of approach avoidance training. Specifically, they were trained to associate unhealthy foods with avoidance movements and healthy foods (or control stimuli, Study 4.3) with approach movements. Participants in the control condition approached and avoided an equal amount of healthy and unhealthy foods. Before and after the training session, participants' response bias was assessed. Study 4.1 and Study 4.3 also tested whether training affected participants' food choices or food consumption, respectively. In contrast to the predictions, approach avoidance training neither affected participants' response biases towards unhealthy or healthy food items, nor did it affect their eating behavior. Individual differences in BMI, trait self-control, or concern for dieting did not contribute to explaining for whom the training might have worked best. From that I concluded that the

approach avoidance training might not be as effective in the eating domain compared to, for example, the alcohol domain.

Given the possibility that people who have a stronger approach bias for unhealthy foods might benefit more from the training, the training could work better in a sample with a higher BMI. Moreover, considering that the approach avoidance training is an associative learning paradigm, its effectiveness might be improved if multiple sessions were administered (see Eberl et al., 2013). Those potential limitations were addressed in a follow-up study (see Supplementary Materials 2), in which a more diverse and overweight sample followed five training sessions of approach avoidance training (administered online). Replicating the pattern of results of Chapter 4, preliminary data analyses showed that even after five sessions there was still no evidence for a training effect. Specifically, neither participants' behavioral response tendencies nor their self-reported eating behavior (difficulty resisting temptation vs. making healthy choice) changed as a function of repeatedly coupling (un)healthy food with approach (avoidance) movements. Interestingly, resisting temptations became easier over time, independent of whether participants were assigned to the experimental or control condition. This suggests that following the training program had some beneficial effects on people's perceived self-efficacy concerning their eating behavior, possibly through being actively involved in the pursuit of their weight-loss goal.

Together, results from four studies showed that the approach avoidance training in the eating domain might not be as effective a paradigm as predicted (see Conclusion #3). It should be noted, though, that after the publication of Chapter 4 two more papers were published reporting one study each that did find evidence for its effectiveness (Dickson, Kavanagh, & MacLeod, 2016; Schumacher, Kemps, & Tiggemann, 2016). Both single session studies found that training changed response biases, and one study even found a beneficial effect on subsequent food consumption. Importantly, both studies used a more liberal control group, in which participants approached unhealthy and avoided healthy foods. As the authors acknowledged themselves, this methodological choice could have artificially inflated the group differences, and might, therefore, be partly responsible for explaining the observed statistical differences. Those findings were recently summarized in a literature review concluding – in my opinion prematurely – that approach avoidance training works for several health domains including the eating domain (Kakoschke, Kemps, & Tiggemann, 2017). Despite those optimistic additional pieces of

evidence, more well-designed research is still needed to determine the effectiveness of the approach avoidance training in the eating domain.

One obvious question is why the approach avoidance training appears to be less effective in the eating domain compared to the alcohol domain. First, this might have to do with the fact that the categories of healthy and unhealthy foods are not as clearly defined as the categories of alcoholic and non-alcoholic beverages, which might impede category-based learning. However, even employing a non-food control group (Study 4.3), which should facilitate the learning process, did not produce a reliable training effect. Second, while alcohol consumption can be categorically avoided, food consumption cannot, but must instead be regulated. Whereas the approach avoidance training could still help to improve such regulation, category-based learning might be less effective given that the 'avoid' category is less definitive. Third, the most convincing supportive evidence for approach avoidance in the alcohol domain comes from clinical studies, which incorporated the training as part of a larger intervention program (Eberl et al., 2013; Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011). Additional motivational factors might have, therefore, played a role in driving the success of the training. If that was the case, then this could also enhance the training effectiveness in the eating domain – a possibility that future research should investigate. And finally, given that survival is dependent on eating (but not on drinking alcohol), and that some (especially fatty and sweet) food preferences are innate (Drewnowski, 1997), it might simply be more difficult (and in fact even undesirable) to 'unlearn' those strong and evolutionarily functional associations. Together, the effectiveness of the approach avoidance training in the eating domain seems constrained by stimulus or category complexity, and by motivational variables (for a discussion on the multiple determinants of associative learning see De Houwer, 2009).

Some of the above points are at odds with the comparatively large body of evidence suggesting people's food preferences and eating behavior can be effectively changed through, for example, response inhibition training (Veling, Aarts, & Papies, 2011; Chen, Veling, Dijksterhuis, & Holland, in press). So why is inhibition training superior to the approach avoidance training? In the inhibition training, participants have to repeatedly inhibit their response to unhealthy food cues rather than make an avoidance movement. It has been proposed that putting the entire motor system on hold might be a more effective approach to changing people's responses to appetitive cues because it

corresponds to the organism's basic principles of activation and inhibition (Chiu, Cools, & Aron, 2014).

Based on the results of Chapter 2 and 3, I have argued that one way of attaining self-control goals may be through decreasing impulse strength and thus conflict strength. Such an approach corresponds to the idea of preventive self-control, as the elimination or avoidance of self-control conflict would naturally make the use of self-control unnecessary and failures less likely. This is, however, in contrast to a more recent theoretical development which stresses that control might be enhanced through increasing conflict awareness. To illustrate, in a recent study van der Laan and colleagues (2014) showed that weight-concerned individuals who should be most likely to experience conflict upon perceiving unhealthy foods were actually less likely to experience it. They conclude that the reason why so many dieters fail might not be because conflicts are not optimally solved, but because conflicts are not experienced it in the first place (see also Myrseth & Fishbach, 2009). Researchers in the area of mindfulness have, therefore, argued that increasing people's interoceptive awareness might help them pick up on conflict signals more readily. And there is indeed evidence that acceptance towards errors, which is one of the core aspects of mindfulness, is associated with more sensitive conflict monitoring (i.e., larger error-related negativity) and more self-control in a Stroop task (i.e., less mistakes; Teper & Inzlicht, 2013). However, in real life (i.e., outside the Stroop task), conflict awareness cannot be the sole predictor of self-control success, since even when one has noticed the conflict one still needs to be motivated and able to subsequently bring behavior and appraisals (see Chapter 3) in line with the higher-order goal.

> **Conclusion #3**
>
> The approach avoidance training, at least in our studies, does not succeed in reducing people's desire for food cues, and has no effect on eating behavior.

Limitations and (more) Future Directions

The strength of the current dissertation is that it encompasses many different perspectives on conflict and applies them to the study of self-control. However, such a broad approach comes with limitations. First, Chapter 2 reports a set of studies in which I aimed at studying self-control in a response conflict paradigm. Though there are several important commonalities between the two types of conflict, self-control conflicts as they are encountered in everyday life

are significantly more complex than response conflicts in a Stroop task. It is, therefore, important to test the ecologically validity of the results in Chapter 2. One way of doing that would be to relate the pattern of results on the task-level to stable individual differences, or behavioral outcomes. More specifically, one could use food cues as motivational distractors and test whether the degree to which they reduce the conflict adaptation effect is related to participants' sensitivity to food cues (e.g., high BMI, concern for dieting) or real-life eating behavior.

The study reported in Supplementary Materials 1 investigated those relationships, but failed to produce an overall conflict adaptation effect, which makes it impossible to interpret (the absence of) its moderation. This study should, therefore, be replicated with a more suitable conflict adaptation paradigm. Interestingly, a recent study investigated a very similar question, namely whether momentary increases in cognitive control (triggered by an incongruent Stroop trial) could increase subsequent attentional control over high caloric food cues (measured with a dot-probe trial, Kleiman, Trope, & Amodio, 2016). It was found that attentional control over food cues was indeed enhanced following incongruent Stroop trials, but only for people with a high BMI, suggesting that control readiness helps those who need it the most. It should be noted, however, that the authors' proposal that conflict triggers general control readiness, rather than reinforces task-relevant associations, is still under debate within the conflict adaptation literature (see Braem, Abrahamse, Duthoo, & Notebaert, 2014). In summary, future research should continue to study the dynamics of self-control conflict in a variety of research paradigms, but should also strive to anchor those findings in individual differences or indices of real-life behavior.

A second limitation concerns the degree to which the different empirical chapters are directly related to each other. Even though all chapters are centered around the concept of self-control conflict, their theoretical as well as methodological approaches differ significantly. On the one hand this could be seen as a weakness, as the different chapters do not build upon each other in a progressive way. On the other hand, this approach has the advantage of providing a broad perspective, highlighting commonalities and differences, which raise new and interesting research questions. Those questions can be more global and theoretically driven (see preceding sections), or more concrete and paradigm driven. For example, it will be interesting to test whether reducing the impulse strength of a specific hedonic food cue by means of, for example, approach avoidance training or inhibition training (see Chapter 4),

will influence the degree to which that same cue undermines conflict-triggered control adjustments (see Chapter 2). Such a test, administered before and after the training, could also serve as an additional diagnostic tool assessing the training's effectiveness. Likewise, it is important to further investigate whether such an intervention paradigm can indeed decrease the experience of self-control conflict when those food cues are encountered in real life (see Chapter 3). Healthy choices should not only be easier, but they should also be affectively less costly. Together, I am convinced that each empirical chapter presented as part of this dissertation not only contributed to the immediate literature in which it is primarily set, but also to a more profound understanding of self-control conflicts in general.

To Conclude

Theories on self-control have always acknowledged the central role of conflicts in behavior regulation (Baumeister, 2002; Carver & Scheier, 2002; Hofmann et al., 2012). The present dissertation explored some of the potential benefits as well as costs of self-control conflict, and identified several factors determining when conflicts might be favorable or detrimental for sustaining self-control. But how can those findings help me resist temptations? First, it is of pivotal importance to appraise the resisting of temptations as self-control success. Only then can the positive potential of overcoming self-control conflict be unlocked. Second, in situations in which helpful appraisals are unlikely to be generated (e.g., when one is tired), conflicts (i.e., temptations) are probably best avoided. Third, reducing impulse strength might still be a potential route to more healthy eating behavior, but it seems that the approach avoidance training is not (yet) the most suitable paradigm for achieving this (Chapter 4).

On a final note, self-control conflicts have been defined as 'alarm signals' urging the organism to adjust behavior to ensure goal attainment (e.g., Inzlicht et al., 2015). In the literature, this focal goal is typically a personally relevant health, or self-control, goal, so conflicts tell you to resist temptation. In my personal opinion, however, a healthy lifestyle is not exclusively about pursuing health goals, but about a 'healthy' balance between several conflicting goals. Therefore, this focal goal can, and should, also sometimes be a personally relevant hedonic goal. Then, conflicts may tell you that it is time to sit back and enjoy.

He calls himself part wolf, part man, and with that he thinks he has come to an end and exhausted the matter. With the 'man' he packs in everything spiritual and sublimated or even cultivated to be found in himself, and with the wolf all that is instinctive, savage, and chaotic. But things are not so simple in life as in our thoughts […]. Harry consists of a hundred or a thousand selves, not two. His life oscillates, as everyone's does, not merely between two poles, such as the body and the spirit, the saint and the sinner, but between thousands, between innumerable poles.

−Hermann Hesse, *The Steppenwolf*