



Utrecht University

# **Proactive and reactive self-control:**

A study investigating the influence of self-control strategies on response conflict.

## **Master Thesis**

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### Abstract

Self-control is of great importance in many positive life outcomes. Therefore, studies investigating self-control are of great scientific and societal value. Recent papers argue that people use self-control strategies to resolve self-control conflicts. This study suggested a division in proactive and reactive self-control strategies, and examined the tendency to use proactive and reactive self-control strategies and how they are associated with response conflict and trait self-control. Furthermore, the association of trait self-control with response conflict was examined. Participants were recruited through Prolific Academic ( $N = 69$ ;  $M_{age} = 31.87$ ; 72.5% female). A new self-control scale was introduced to measure proactive and reactive self-control strategies. Response conflict magnitude was assessed by reports on pictorial stimuli of foods and phone settings, and trait self-control was measured with the Brief Self-Control Scale. The results show that proactive, reactive and trait self-control strategies are not associated with response conflict. Promising correlations were found between trait self-control and proactive (positive correlation) and reactive (negative correlation) self-control strategies, which are in line with recent developments of self-control studies. Future research is needed to further explore this possible link. This study underscores the value of investigating the domain of self-control and its positive consequences (later) in life.

*Keywords:* Trait self-control, proactive self-control, reactive self-control, self-control strategies, response conflict magnitude, objective conflict, experienced conflict.

## Introduction

Many studies have been done about self-control: it is an interesting study subject, since it leads to a lot of positive life outcomes. Self-control is of great importance in health, well-being, academic performance, and interpersonal success (Adriaanse, Kroese, Gillebaart, & De Ridder, 2014; De Ridder, De Boer, Lugtig, Bakker, & Van Hooft, 2010; Gillebaart & De Ridder, 2015; Gillebaart, Schneider, & De Ridder, 2016). High self-control is related to a lot of beneficial effects for human functioning, whereas low self-control is a core element of a lot of societal problems (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Therefore, studies investigating self-control are of great scientific and societal value.

Self-control is a stable trait shaped early in life and therefore differs in level per person (Frieze, Frankenbach, Job, & Loschelder, 2017), but can also fluctuate over time within persons (Hofmann, Baumeister, Förster, & Vohs, 2012). State self-control is susceptible to situational factors and time (De Ridder et al., 2012). Trait self-control is the main predictor of all the positive life outcomes mentioned above (Gillebaart et al., 2016). Therefore, trait self-control will be used at the base of this study. Self-control is performed to serve personal valued long-term goals. Desirable behavior in order to reach these personal valued goals are defined as “all behaviors that are associated with people’s goals to meet their obligations, duties, and responsibilities and adjust to social norms to live happy, successful, and healthy lives, including psychosocial adjustment, adequate and appropriate expression of emotions, physical exercise, and academic success” (De Ridder et al., 2012, p79). Examples of these desirable behaviors are: going to the gym to stay fit, eating healthy to lose weight, and going to the library to study for an exam. Undesirable behaviors are the opposite: behaviors that interfere with these goals. Examples of these undesirable behaviors are: sitting the whole day when you want to stay fit, eating unhealthy snacks when you want to loose weight, and going to a party when you need to study for an exam.

A model that aims to explain the dynamics of self-control is the dual system theory. The dual system consists of two components: the reflective, cool system and the impulsive, hot system (Frieze, Hofmann, & Wiers, 2011). The cool system is the reflective, cognitive system that serves long-term goals, and the hot system is the fast, automatic system that is driven by impulses. Self-control is described as the ability to regulate impulses of the hot system that are in conflict with attaining personal goals (Duckworth, Gendler, & Gross, 2016). This regulation is a mechanism of effortful inhibition of impulses, the process of delaying immediate gratification of a smaller reward for a long-term goal (Gillebaart, 2018). Likewise, in the discounting model of impulsiveness, self-control is about controlling immediate impulses and

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choosing a delayed but more valuable outcome over an immediate but less valuable outcome (Ainslie, 1975). Also, in the strength model entailing ego-depletion, self-control is seen as deliberate, conscious, and effortful, because of the regulation of behavioral tendencies (such as impulses) (Friese et al., 2017). Giving in to temptation is therefore called self-regulation failure, whereas resisting temptation leads to self-regulation success (Gillebaart & De Ridder, 2015). Hence, the models above all argue that effortful inhibition is necessary to resolve a self-control conflict.

### **Effortless self-control**

Current research argues the possibility of another component of self-control that operates in a different manner, whereby behavior is not inhibited but initiated to serve a long-term goal (De Ridder et al., 2010). Evidence was found for the two different types of self-control, wherein inhibitory self-control was a better predictor for refraining from undesired behavior and initiatory self-control was a better predictor for engaging in desired behavior. This creates the idea that self-control does not only consist of refraining from undesired behavior, but also of engaging in desired behavior. This new insight gives a more positive view on self-control and enables to not only look at self-control failure, but to also look at self-control success (Gillebaart & De Ridder, 2015).

Furthermore, a recent meta-analysis found some surprising results about the effortful, controlled aspect of self-control (De Ridder et al., 2012). Associations of self-control with controlled behavior were smaller compared to associations of self-control with automatic behaviors. These automatic behaviors are effortless and unconsciously performed, contrary to the former beliefs that self-control is deliberate, conscious, and effortful. Self-control therefore might function more through, automatic, and effortless behaviors without conscious attention than through effortful, controlled behaviors. People with high self-control might therefore be more successful because they formed effective, adaptive routines and as a result do not have control themselves frequently in resisting single temptations (Adriaanse et al., 2014).

These two discoveries lead to new questions in the research of self-control. There seems to be a component of self-control that initiates desired behavior, and a relatively large relationship between automatic behaviors and high trait self-control. Gillebaart and De Ridder (2015) propose that people who are naturally high in trait self-control might have effortless strategies, or ways to manipulate their surroundings to advantage to conquer self-control conflicts. It is valuable to find out what the mechanisms behind these effortless strategies are.

### **Response conflict**

At first, it is important to understand the importance of response conflict in self-control (Gillebaart & De Ridder, 2015). Response conflict is when one is confronted with two options, one that brings immediate gratification and the other that serves a more important long-term goal (Duckworth et al., 2016). These two options have to be asymmetric in terms of value and are therefore competing (Gillebaart & De Ridder, 2015). The more the two options are competing, the larger the response conflict magnitude (Gillebaart et al., 2016).

Recent research discovered that people with high trait self-control are faster in resolving the conflict (Gillebaart et al., 2016). The findings even suggest that they are able to quicker identify the conflict than people with low trait self-control. When a person can quickly identify that there is a conflict, then he/she also has the ability to quicker resolve the conflict. Remarkably, people with high trait self-control also seem to experience fewer response conflicts than people with low trait self-control (Hofmann et al., 2012). It is interesting to find out why people with high trait self-control are faster in resolving conflicts and experience fewer response conflicts.

### **Self-control strategies**

Ways of dealing with response conflict could be using the self-control strategies that have been specified in the Process Model of Self-Control (Duckworth et al., 2016). This model entails the impulse generation cycle: regulating an impulse with a strategy should be done the earliest in the impulse generation cycle as possible, as the impulse will get stronger over time. Duckworth et al. (2016) make a division between situational strategies and intrapsychic strategies. Situational strategies are “proactively choosing or changing situations in ways that weaken undesirable impulses or potentiate desirable ones” (Duckworth et al., 2016, p.35). The situational strategies consist of situation selection and situation modification. Situation selection is similar to avoiding situations (Ent, Baumeister, & Tice, 2015), it is forward looking and choosing to be in situations that are in favour of the personal valued long-term goal. Situation modification entails deliberately changing our social and/or our physical circumstances to advantage. Situational strategies will from now on be designated in this study as proactive self-control strategies. These self-control strategies are proactive because they are prior or preparatory of a self-control conflict.

Intrapsychic strategies are applied in a later stage of the impulse generation cycle when the conflict is already occurring (Duckworth et al., 2016). The intrapsychic strategies consist of attentional deployment, cognitive change, and response modulation. Attentional deployment

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consists of strategies that direct our focus on aspects of the situation that facilitate self-control, moving our attention away from the temptation. Cognitive change strategies are ways to think about the situation differently by mentally constructing an alternative, less desirable representation of the temptation. Cognitive change is similar to downregulate response conflict. Downregulating response conflict is done by downregulating the conflict by compensating the advantage of the temptation in a way that it is attenuated and the conflict becomes smaller (Gillebaart & De Ridder, 2015). Response modulation is about suppressing undesired behavioral responses on the temptation and amplifying desirable ones. Intrapsychic strategies will from now on be designated in this study as reactive self-control strategies. These self-control strategies are reactive because they are applied when a conflict situation cannot be avoided anymore and the conflict is already taking place.

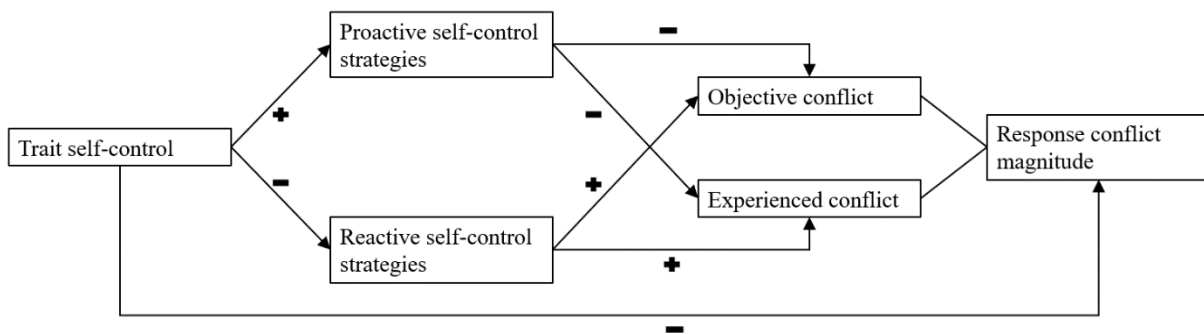
The division between proactive (avoiding, situation selection, situation modification) and reactive (attentional deployment, cognitive change, downregulating response conflict, response modulation) self-control strategies is relatively new. Therefore, it is important to further investigate proactive and reactive self-control strategies. The most effective way of employing self-control is by preliminary acting on a conflict, as it is the earliest in the impulse generation cycle as possible (Duckworth et al., 2016). This would mean that proactive self-control strategies are more effective than reactive self-control strategies. Proactive self-control strategies might sound effortful, but it could be that people with high trait self-control automatized these favourable choices (Gillebaart & De Ridder, 2015). This automatization would make the use of proactive strategies effortless. Also, if people with high trait self-control make choices that help them avoid or minimize conflicting situations, this might be an explanation of why people with high trait self-control experience fewer conflicts (Ent et al., 2015). Since people with high trait self-control are quicker in identifying a self-control conflict, seem to have effortless strategies, and seem to experience fewer conflicts, this might mean that they tend to use more proactive than reactive self-control strategies. Altogether, it is interesting to find out whether people with high trait self-control indeed use more proactive than reactive self-control strategies.

### **Research question**

The main research question is: How are (proactive and reactive) self-control strategies associated with response conflict magnitude? It is expected that proactive self-control strategies are negatively associated with response conflict magnitude (H1). That means that less conflict is reported. It is expected that reactive self-control strategies are positively associated with

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response conflict magnitude (H2). That means that more conflict is reported. Furthermore, trait self-control will be researched. It is expected to replicate previous research findings demonstrating a negative association between high trait self-control and response conflict magnitude (Gillebaart et al., 2016) (H3). Lastly, research will be done to analyse the link between trait self-control and proactive and reactive self-control strategies. It is expected that trait self-control has a positive association with proactive self-control strategies (H4) and a negative association with negative self-control strategies (H5). See Figure 1 for the research model.



*Figure 1.* Research model. A positive association between trait self-control and proactive self-control strategies, and a negative association between trait self-control and reactive self-control strategies. A negative association between trait self-control and response conflict magnitude. A negative association between proactive self-control strategies and response conflict magnitude, a positive association between reactive self-control strategies and response conflict magnitude. Response conflict magnitude consists of objective conflict and experienced conflict.

### Current study

This study will take a closer look at proactive and reactive self-control strategies and response conflict magnitude in order to further investigate the mechanisms of self-control. A new self-control scale will be introduced to have a more precise measurement of the tendency to use proactive or reactive self-control strategies. Stimuli from self-control domains, such as food choice (Adriaanse et al., 2014) and social media (Du, Van Koningsbruggen, & Kerkhof, 2018) will be presented to participants to evoke conflict. To be able to measure response conflict: objective conflict and subjective experienced conflict will be assessed via self-reports. Objective conflict is the incongruence between the positive and negative evaluation of the conflict. Subjective experienced conflict is the actual feeling, the experience of the conflict. Both aspects together give a more precise insight in the level of conflict that participants report.

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Trait self-control will be measured to replicate previous findings of the association between trait self-control with response conflict magnitude, and to investigate the link between trait self-control and proactive and reactive self-control strategies.

This study is mostly a replication of a study done by Gillebaart et al. (2016). However, this study is adjusted and expanded, and innovative because of the new idea of proactive and reactive self-control and its association with self-control conflict. It is of societal relevance to further investigate the mechanisms of self-control because of all the positive life-outcomes that self-control is related to. If proactive self-control strategies indeed lead to a smaller response conflict magnitude, this will be useful for future interventions for people with low trait self-control. The current study will give us more insight in the poorly understood mechanisms of self-control that have a big impact on the society. Another innovation of this study is the use of pictured settings with or without mobile phones as stimuli to evoke self-control conflict. Many self-control studies use food stimuli in their research (Adriaanse et al., 2014; Gillebaart et al., 2016; Van Dillen, Papies, & Hofmann, 2013). It is of academic relevance to investigate the influence of self-control on response conflict with other constructs to be more comprehensive about self-control on various life domains. By using different stimuli than the regular food stimuli, like settings with mobile phone stimuli in this study, the dynamics of self-control with other constructs can be disentangled.

### Method

#### Participants and design

Participants were recruited through Prolific Academic, an online internet panel. A power analysis was performed to estimate the required sample size. The analysis showed that for a medium effect size, to achieve a power of .80 (Cohen, 1992) a sample size of 55 participants was recommended for a linear multiple regression analysis. A total of 76 participants filled in the questionnaire. The data of participants that did not finish the study were removed. The remaining final sample consisted of 69 respondents (72.5% female), the ages ranged from 18 to 61 years ( $M = 31.87$ ,  $SD = 1.70$ ). All participants were Dutch.

The design of this study is cross-sectional, with a single moment of online data collection. Proactive, reactive, and trait self-control were measured, as well as objective and subjective conflict. This study is part of a research line that is approved by the faculty's ethical review committee. There was no reward for participation of this study.



### **Procedure**

An online survey and test were distributed via a link. Participants were informed about the study and signed informed consent for participation in the study. Subsequently, the participants were informed about the tasks they had to fulfil and started the test and questionnaire. Participants firstly filled in the Brief Self-Control Scale (Tangney, Baumeister and Boone, 2004), and the newly developed Proactive/Reactive Self-Control Scale. The order of presenting all proactive or all reactive items in the survey was randomized. Next, participants were presented with stimuli which consisted of pictures of healthy or unhealthy foods, and pictures of settings with or without a mobile phone. The order of the food or phone stimuli was also randomly presented in the survey. After each stimulus, measurements of response conflict magnitude was administered. At the end, after the stimuli tasks, the participants were asked about their demographic variables and were thanked for their participation.

### **Materials**

*Proactive/Reactive self-control.* The newly developed Proactive/Reactive Self-Control Scale is proposed to measure proactive and reactive self-control. This scale is being developed as a self-report instrument that measures how high participants score on proactive and reactive self-control. In each question, a situation is described and participants had to indicate to what extent each situation is ‘typically them’ on a 5-point Likert scale ranging from 1 (*not at all like me*) to 5 (*very much like me*). Examples of the seven proactive items are: “When I shop for groceries, I usually make a grocery list in advance” and “When I want to concentrate, I look for a quiet spot”. Examples of the eight reactive items are: “When I am sitting behind my computer, I usually keep websites or programs open that are not directly relevant” and “If I have a deadline, I usually finish close to the deadline”. The reliability analyses revealed a low reliability for the Proactive Self-Control Scale (Chronbach’s  $\alpha = .59$ ) and a moderate reliability for the Reactive Self-Control Scale (Chronbach’s  $\alpha = .65$ ).

*Response conflict stimuli.* Response conflict was evoked by pictorial stimuli. The stimuli consisted of six pictures of foods and six pictures of settings with or without a mobile phone (see appendix). The pictures of foods were selected from a validated set of stimuli (Van Dillen et al., 2013). These pictures consisted unhealthy foods (brownie, pizza, French fries) to evoke more conflict, and healthy foods (bread, tomato, broccoli) which should evoke less conflict. The pictures of settings with or without a mobile phone were selected from Unsplash.com, a website with free photos without copyright. A pilot was held with ten pictures to see which ones evoked unambiguously most or least conflict, and were therefore useful for the current study.

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After statistical analysis of the pilot data, a selection of six pictures was made. These pictures consisted settings with a mobile phone (dark setting with a man in bed looking at a lit mobile phone screen, dark setting with a woman in bed looking at a lit mobile phone screen, dark setting with a ringing mobile phone at a nightstand) to evoke more conflict, and without a mobile phone (dark setting with a woman in bed reading a book, light setting with an alarm clock on a nightstand, light setting with a magazine and an alarm clock on a nightstand) which should evoke less conflict.

*Experienced conflict.* To assess the experienced conflict of participants regarding certain objects or settings, the validated scale of Priester and Petty (1996) was used. This scale is a self-reported measurement where participants have to reflect on how conflicted they feel on a 5-point Likert scale ranging from 1 (*No conflict at all*) to 5 (*Maximum conflict*). After each stimulus, the statement was: “Towards the pictured food/setting, I feel...”. The reliability analyses revealed a good reliability for this scale (Chronbach’s  $\alpha = .74$ ).

*Objective conflict.* To have a better understanding of this experienced conflict, the objective conflict was measured as well. This was done using another self-report measurement scale (Kaplan, 1972). This scale measures the positive and negative evaluations regarding certain objects or settings, to what extent these evaluations are opposing each other, and their relative strength on a 4-point Likert scale ranging from *Not at all positive (or negative)* to *Very positive (or negative)*. After each stimulus, the statement was: “How positive (or negative) are your thoughts about the pictured food/setting? Please rate each statement based solely on your positive (or negative) thoughts, while ignoring or setting aside for the moment any negative (or positive) thoughts you may have about the pictured food/setting.”. The positive (P) and negative (N) ratings per construct (healthy foods, unhealthy foods, phone settings, no phone settings) were subjected to the formula  $((P+N)/2)-|P-N|$  (cf. Thompson, Zanna, & Griffin, 1995). This way, the contrasting evaluations and their relative strength could be calculated. For easier interpretation, 1.5 was added to each score, so that the scores ranged from 1 (low conflict) to 5.5 (high conflict).

*Trait self-control.* The Brief Self-Control Scale (BSCS) of Tangney et al. (2004) was used to measure the trait self-control of participants. The BSCS is a validated instrument and consists of statements. Participants had to reflect how much they agree on each statement on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*). Of the 13 items, 9 items are reversed. Example statements are: “People would describe me as impulsive”, “I am good at resisting temptation”, and “I’m not easily discouraged”. The reliability analyses revealed a high reliability for this scale (Chronbach’s  $\alpha = .80$ ).

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*Demographic variables.* Demographic variables were indicated to control for as possible confounding factors. Data of four variables were collected: gender (female, male, other), age, highest completed education level (high school, vocational, bachelor's, master's, other), and ethnicity.

### **Statistical analysis**

With the aid of the *IBM Statistical Program for Social Sciences 24 (SPSS)* the data was analysed. Firstly, the data was cleaned. Participants that did not finish the study were removed, and the data was checked on outliers and normal distributions of all variables. Second, reversed items were recoded, scales were constructed for all constructs, and reliability for each scale was calculated. Paired samples t-tests were performed to test whether the opposing constructs of the pictorial stimuli (healthy foods versus unhealthy foods, no phone settings versus phone settings) were significantly contrasting. Third, Pearson correlations and Spearman's rho were used to identify the correlations between all variables. The correlations were analysed to check for possible confounding factors. It was decided to control for gender and age in all linear regressions. Fourth, linear multiple regressions were performed to analyse the relation of trait self-control with proactive and reactive self-control. Before each linear regression, the assumptions of linearity, multicollinearity, heteroscedasticity, outliers, and normality of the residuals were checked.

## **Results**

### **Descriptive statistics**

Table 1 shows that the mean of trait self-control is 3.26 ( $SD = .57$ ) which indicates that the participants have a moderately high trait self-control. The mean of proactive self-control was 3.91 ( $SD = .62$ ) and the mean of reactive self-control was 2.65 ( $SD = .66$ ), which indicates that participants tend to use more proactive self-control strategies than reactive self-control strategies.

Paired samples t-tests showed that overall, objective conflict for healthy foods ( $M = 2.11$ ,  $SD = .65$ ) was lower than for unhealthy foods ( $M = 3.15$ ,  $SD = .78$ ),  $t(68) = -9.37$ ,  $p < .000$ ,  $d = 1.46$ , 95% CI [-1.26, -.82]. Also, objective conflict for no phone settings ( $M = 2.00$ ,  $SD = .65$ ) was lower than phone settings ( $M = 2.36$ ,  $SD = .69$ ),  $t(68) = -3.24$ ,  $p < .05$ ,  $d = .54$ , 95% CI [-.58, -.14]. Experienced conflict for healthy foods ( $M = 1.38$ ,  $SD = .51$ ) was lower than for unhealthy foods ( $M = 2.47$ ,  $SD = .94$ ),  $t(68) = -9.37$ ,  $p < .000$ ,  $d = 1.50$ , 95% CI [-1.32, -

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.86]. Also, experienced conflict for no phone settings ( $M = 1.35$ ,  $SD = .49$ ) was lower than for phone settings ( $M = 2.27$ ,  $SD = .81$ ),  $t(68) = 13.06$ ,  $p < .000$ ,  $d = 2.09$ , 95% CI [1.15, 1.57]. This shows that the pictorial stimuli that should evoke more conflict (unhealthy foods and phone settings) were indeed considered as more conflicting and caused a larger response conflict magnitude than the pictorial stimuli that should evoke less conflict (healthy foods and no phone settings). Thus, the pictorial stimuli were approved to be usable for this study.

### Correlations

Table 1 shows, for the main research question, that reactive self-control was only positively significantly correlated with objective conflict of healthy foods ( $r = .24$ ,  $p = < .05$ ): more reactive self-control was associated with more objective conflict of healthy foods. Reactive self-control was not correlated with any other objective or experienced conflict. This is not in line with the expectations of H1. Proactive self-control was not significantly correlated with any objective or experienced conflict at all. This is not in line with the expectations of H2. Objective and experienced conflict of healthy foods ( $r = .72$ ,  $p = < .001$ ), unhealthy foods ( $r = .28$ ,  $p = < .05$ ), and no phone settings ( $r = .71$ ,  $p = < .001$ ) were positively correlated. Objective and experienced conflict of phone settings were negatively correlated ( $r = -.39$ ,  $p = < .001$ ). Proactive self-control was not significantly correlated with reactive self-control.

For trait self-control, Table 1 shows that trait self-control was significantly negatively correlated with objective conflict of phone settings ( $r = -.28$ ,  $p = < .001$ ): higher self-control was associated with lower objective conflict of phone settings. Trait self-control was not correlated with any other objective or experienced conflict. This is not in line with the expectations of H3. Trait self-control was positively correlated with proactive self-control ( $r = .27$ ,  $p = < .05$ ) and negatively correlated with reactive self-control ( $r = -.54$ ,  $p = < .001$ ), which means that people with high trait self-control tend to use more proactive self-control strategies and less reactive self-control strategies. This is in line with the expectations of H4 and H5.

For the demographic variables, Table 1 shows that proactive self-control was positively correlated with gender ( $r = .41$ ,  $p = < .001$ ) and age ( $r = .32$ ,  $p = < .01$ ), trait self-control was positively correlated with age ( $r = .32$ ,  $p = < .01$ ), and reactive self-control was not significantly correlated with any demographic variable.

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Table 1

*Correlation matrix of trait self-control, proactive and reactive self-control, objective and experienced conflict, gender, age and education level.*

<i>Variables</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Trait self-control	-	.27*	-.54**	-.22	-.10	.05	-.28*	-.14	.06	-.02	.12	.07	.32**	.22
2. Proactive self-control		-	-.12	-.03	-.09	-.09	-.06	.05	.10	.09	.09	.41**	.32**	.07
3. Reactive self-control			-	.24*	.17	.12	.15	.10	-.06	.23	.01	-.01	-.23	.58
4. Obj. conflict healthy				-	.19	.45**	.11	.72**	.10	.36**	.09	.05	-.52*	-.17
5. Obj. conflict unhealthy					-	.26*	.15	.16	.28*	.26*	.12	.08	-.16	-.10
6. Obj. conflict no phone						-	.05	.50**	.14	.71**	-.04	-.10	-.12	-.07
7. Obj. conflict phone							-	.16	.16	.13	-.39**	-.05	-.29*	-.29*
8. Exp. conflict healthy								-	.22	.49**	.12	.18	-.16	-.15
9. Exp. conflict unhealthy									-	.34**	.31**	.32**	-.06	.05
10. Exp. conflict no phone										-	.19	.18	-.18	-.13
11. Exp. conflict phone											-	.15	.10	.13
<i>Demographic variables</i>														
12. Gender												-	-.09	.08
13. Age													-	.45**
14. Education level														-
<i>M</i>	3.26	3.91	2.65	2.11	3.15	2.00	2.36	1.38	2.47	1.35	2.27	1.72	31.87	3.19
<i>SD</i>	0.57	0.62	0.66	0.65	0.78	0.65	0.69	0.51	0.94	0.49	0.81	0.45	14.09	1.02

*Note.* \* $p < .05$ . \*\* $p < .01$ . Correlations of variables 1-11 and 13 are determined on *Pearson's r*. Correlations of 12 and 14 are determined on *Spearman's rho*.

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Additionally, to increase power, analyses were performed where healthy foods and no phone settings were taken together (which should evoke less conflict), and unhealthy foods and phone settings were taken together (which should evoke more conflict) for both objective and experienced conflict. Correlations were again analysed: a significant negative correlations was found for reactive self-control with objective conflict of healthy foods and no phone settings ( $r = .31, p = .01$ ), and a significant positive correlation was found for trait self-control with objective conflict of healthy foods and no phone settings ( $r = -.29, p = <.01$ ). Still, these correlations showed no mayor improvement of the results. Because of too few significant correlations of proactive, reactive and trait self-control with objective and experienced conflict, no additional (linear regression) analyses were performed.

### Trait self-control, proactive self-control and reactive self-control

Linear regressions were performed to test whether trait self-control has a significant association with proactive self-control and reactive self-control. After controlling for the demographic variables gender and age, the influence of trait self-control did not show a significant association with proactive self-control (see Table 2), but did show a negative significant association with reactive self-control (see Table 3). To test a bidirectional relationship, a linear regression was performed to test the association of reactive self-control with trait self-control. After controlling for the demographic variables gender and age, a negative significant association on trait self-control was shown ( $\beta = -.49, t = -4.73, p = .000, 95\% \text{ CI } [-.60, -.25]$ ).

Table 2

*Linear regression with proactive self-control as dependent variable*

	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>B (const.)</i>	<i>R<sup>2</sup> change</i>
<b><i>Model 1: Control variables</i></b>				7.69**	2.34	.30
Gender	.61	.14	.45	4.30**		
Age	.02	.01	.36	3.50**		
<b><i>Model 2: Predictor</i></b>				4.23**	1.45	.02
Trait self-control	.17	.12	.16	.15		

*Note.* \* $p < .05$ . \*\* $p < .01$ .

Table 3

*Linear regression with reactive self-control as dependent variable*

	<i>B</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>B (const.)</i>	<i>R<sup>2</sup> change</i>
<b><i>Model 1: Control variables</i></b>				8.28**	3.09	.05
Gender	-.06	.18	-.04	-.31		
Age	-.01	.01	-.23	-1.90		
<b><i>Model 2: Predictor</i></b>				9.96**	4.73	.24
Trait self-control	-.60	.13	-.52	-4.73**		

Note. \* $p < .05$ . \*\* $p < .01$ .

### Discussion

The aim of this study was to examine how proactive and reactive self-control strategies are associated with response conflict magnitude. It was expected that proactive self-control strategies would be negatively associated with response conflict magnitude (objective and experienced conflict) (H1). No correlations between proactive self-control and objective or experienced conflict were found to support this hypothesis, hence the hypothesis was rejected. Furthermore, it was expected that reactive self-control strategies would be positively associated with response conflict magnitude (objective conflict and experienced conflict) (H2). A positive correlation was only found for reactive self-control with objective conflict of healthy foods and not between reactive self-control and another objective conflict (unhealthy foods, phone settings and no phone settings) or any experienced conflict. This means that a higher level of reactive self-control strategies leads to more objective conflict about healthy foods. However, since no other correlations were found for reactive self-control with objective or experienced conflict to support this hypothesis, the hypothesis was rejected.

The lack of significant results of proactive and reactive self-control strategies with response conflict magnitude is not in line with recent research on self-control and conflict, where significant associations were found between trait self-control and conflict (Gillebaart et al., 2016). Possibly the idea that trait self-control can be divided in proactive and reactive self-control strategies is not sound, and the posited division of the self-control strategies in this study as raised by Duckworth et al. (2016) should be revised.

### **Trait self-control**

The association between trait self-control and response conflict magnitude was examined. It was expected that trait self-control would be negatively associated with response conflict magnitude (H3). However, only a significant negative correlation was found for trait self-control with objective conflict of phone settings was found. Since no other correlations were found between trait self-control with another objective conflict (healthy foods, unhealthy foods, and no phone settings) or any experienced conflict (healthy foods, unhealthy foods, phone settings, and no phone settings) to support this hypothesis, the hypothesis was rejected. This is not in line with recent research, where a negative association between high trait self-control and response conflict magnitude was demonstrated (Gillebaart et al., 2016). It is unclear why this outcome was not replicated. Future research should perform more replication studies to determine whether this association is robust or not.

Additionally, it was tested whether trait self-control was positively associated with proactive self-control strategies and negatively associated with reactive self-control strategies. It was expected that trait self-control would have a positive association with proactive self-control strategies (H4) and a negative association with reactive self-control strategies (H5). A positive correlation with proactive self-control and a negative correlation with reactive self-control was found. However, only a significant negative relation of trait self-control on reactive self-control was shown after controlling for age and gender in a linear regression. The positive correlation of trait self-control with proactive self-control was not significant anymore after controlling for age and gender in a linear regression, hence H4 is rejected while H5 is confirmed. It remains unclear why this positive association disappears. Future research should find out whether there are more confounding factors like age and gender that influence the link between trait self-control and proactive self-control, such as determination to reach personal goals. For now, since the correlations between trait self-control and proactive and reactive self-control strategies are promising, these findings will be elaborated on.

The positive correlation of trait self-control with proactive self-control and the negative correlation of trait self-control with reactive self-control are in line with the recent developments in self-control research. The studies of Duckworth et al. (2016), Ent et al. (2015), and Gillebaart and De Ridder (2015) show a division in proactive and reactive self-control strategies. Since people with trait self-control are faster in resolving self-control conflicts and seem to experience less conflicts, it seems logical that people with high trait self-control use more proactive strategies, because these strategies are applied at the beginning of the impulse generation cycle (Duckworth et al., 2016), causing smaller response conflict (Hofmann et al.,



2012) which makes the conflict easier to resolve. This might explain the positive correlation with proactive self-control strategies (people with high trait self-control probably use more proactive strategies than reactive strategies) and the negative correlation with reactive self-control strategies (people with low trait self-control probably use more reactive strategies than proactive strategies). Further development of the Proactive/Reactive Self-Control Scale could make future research on the topic of proactive and reactive self-control more robust.

### **Strengths and limitations**

A notable strength of the current research, is the addition of phone stimuli to the food stimuli that most studies (Adriaanse et al., 2014; Gillebaart et al., 2016; Van Dillen et al., 2013) are restricted to. The phone stimuli showed a significant difference in evoked conflict for the no mobile phone settings and the mobile phone settings (see results). The mobile phone settings were (as intended) considered more conflicting, thus these pictorial stimuli are usable for future research. Nowadays, phone use causes increasing conflict with other goals and obligations, and requires an increasing amount of self-control (Du et al., 2018). The constant availability of social media on mobile phones causes situations that are in conflict with a variety of (long term) goals that people may have, like study, work, not delaying things, and using time efficiently (Du et al., 2018). Among the whole population social media seems to cause the most self-control failures among all desires that people experience on a typical day. The phone setting pictures were used to imitate these conflict situations. This way, the dynamics of self-control and habits with other constructs than food can be disentangled (Adriaanse et al., 2014). Comparative results with the studies using food stimuli could be shown with the mobile phone stimuli, since comparable means of experienced conflict were found in this study for healthy foods and no phone settings, and for unhealthy foods and phone settings. Also, comparable means of objective conflict healthy foods and no phone settings were found. Another strength of this study is that self-control is stated as a personality trait (Gillebaart et al., 2016). Trait self-control is considered to be fairly stable over life (De Ridder et al., 2012; Tangney et al., 2004), and is a vast predictor of wide range of positive life outcomes (Adriaanse et al., 2014; De Ridder et al., 2010; Gillebaart & De Ridder, 2015; Gillebaart et al., 2016). Therefore, trait self-control is of more significance in studies than state self-control.

This study also carries some limitations, which could possibly explain the lack of significant results too. First of all, this study relies on self-report only. This might have an impact on the social reliability of the answers participants might have given and the reliability of their responses. For instance, participants may have tended to overestimate themselves in

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their practise of proactive self-control strategies (as the positive self-control items may have looked like more positive habits) and underestimate themselves in their practise of reactive self-control strategies (as the negative self-control items may have looked like more negative habits). Secondly, the participants were all Dutch, mostly young females. This is not necessarily a problem since the mechanisms of self-control are the same for males as for females. However, in this study gender turned out to be a confounding factor in the linear regression with trait self-control and proactive self-control and should therefore be closely monitored in future studies.

Next to these participant limitations, the materials of this study also had some shortages. First, the reliability of the Proactive/Reactive Self-Control Scale was relatively low. Further development of this scale is needed. Second, the self-control strategies of Duckworth et al. (2016) are difficult to strictly divide between proactive and reactive self-control, and may not be comprehensive of all possible self-control strategies which makes it an ambiguous theory to use for creating a scale. Taking a closer look at the items of the Proactive/Reactive Self-Control Scale, it appears that not all self-control strategies of Duckworth et al. (2016) are used in the items, and not all items can be assigned to a self-control strategy, causing that the strategies cannot all be explored and the scale cannot be fully based on the Process Model of Duckworth et al. (2016). For instance, the first reactive item “When I am occupied with something, I sometimes forget about an appointment” contains no form of any reactive self-control strategy (attentional deployment, cognitive change, downregulating of response conflict, or response modulation). Arguably, the division of self-control strategies as mentioned by Duckworth et al. (2016) cannot be made that strictly, or are not comprehensive of all possible self-control strategies. Future research should future investigate the division of self-control strategies. Third, there was one single moment of data collection, which makes this study cross-sectional and the data correlational. Therefore, no causal conclusions could be drawn. Fourth, to limit the length of the study, the amount of the pictorial stimuli was shortened. In the original study, ten pictorial food stimuli were used, in this study six pictorial food stimuli and six pictorial phone stimuli. That might have caused loss of robustness of the set of stimuli and an ambiguous normal distribution.

### **Recommendations for future research**

This study supports recent developments in self-control research, since a positive correlation of trait self-control with proactive self-control and a negative correlation with reactive self-control were found. These correlations are promising as the Proactive/Reactive

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Self-Control Scale is not yet fully developed. Further development of this scale by future research is desirable to provide unambiguous results.

More automatized proactive self-control strategies could enhance reaching personal valued long-term goals, and thereby improve personal health, well-being and many other positive life outcomes. If high trait self-control indeed has a link with proactive self-control, it would be interesting to research whether proactive self-control strategies mediate the link of high trait self-control with conflict magnitude.

Another recommendation for future research is to further examine other settings and other stimuli that might evoke self-control conflict. Currently, research predominantly investigated self-control conflicts with food stimuli. In this study, settings with and without a mobile phone were used to evoke self-control conflict. These settings proved to be adequate for self-control conflict research. To broaden the research of self-control, not only the eating domain, but also other self-control dilemmas like mobile phone use could be investigated (for example smoking or sporting) to gain more insight in self-control strategies, automatized behaviors, and the formation of habits.

To overcome the above mentioned possible limitations, first of all, a larger number of participants should be recruited. This might enhance the power and external validity of the study. To minimize the study's shortages, the Proactive/Reactive Self-Control Scale should be further developed. Different ways of questioning should be piloted to amplify the reliability of this scale. To be able to draw causal conclusions, follow up data collection moments should be done, to create a longitudinal study.

### **Conclusion and possible implications**

It appears that proactive and reactive self-control strategies and trait self-control are not associated with response conflict magnitude. This is not in line with the conflict magnitude hypothesis, therefore possible limitations were explored. The examination of trait self-control gives some interesting correlations with proactive and reactive self-control strategies, which are in line with recent developments of self-control studies. However, because of methodological limitations, no hard conclusions could be drawn, therefore future research is needed to further explore this possible link.

The outcomes of this study have possible implications for future research and practice. High self-control is a main predictor of a large range of positive life outcomes and accounts for a lot of beneficial effects in life, therefore research on this topic is of great societal and scientific importance. The Proactive/Reactive Self-Control Scale should be further developed to be usable

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to test whether self-control indeed has a proactive and reactive component, what kind of self-control strategies are linked to those two constructs, and how much conflict is experienced by either component. This way, the mechanisms of self-control can be further explored.

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**Appendix**

**Survey Master Thesis Juul Verheij**

Research: Study on perceptions of behavior

Researchers: Marleen Gillebaart, m. gillebaart@uu.nl

Research Assistant: Juul Verheij, j.verheij2@students.uu.nl

**Information letter**

Dear participant,

Thank you for choosing to take part in this study. With this letter, we would like to inform you about this study. In this study, you will be presented with a number of questions. A few questions will be asked about the goals you pursue in your daily life, and how you experience situations surrounding these goals. Also, you will be presented with some pictures and asked to rate these pictures. Lastly, we will ask you about your demographics.

The study takes around 15 minutes to complete. Your answers to these questions will be processed anonymously and will not be traced back to you. Please reflect on the questions before answering them to help us further our knowledge on how people pursue their goals.

On the next page you will be asked to provide consent, and then you can start the survey.

Before participation you must agree to the following statements.

- I am well informed about the goal and procedure of this research.
- My participation in this study is completely voluntary. I can quit the study any time and this will have no negative consequences.
- Data will be analyzed anonymously and when data is shared or published it is made sure that the data cannot be linked to a particular participant.
- I will fill in the questionnaires accurately and seriously.

If you have any questions or complaints regarding this research, you can contact the research assistants mentioned at the top.

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### **Brief Self-Control Scale (Tangney, Baumeister & Boone, 2004)**

Answers on a 5 point Likert scale.

Using the scale provided, please indicate how much each of the following statements reflects how you typically are.

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits. (R)
3. I am lazy. (R)
4. I say inappropriate things. (R)
5. I do certain things that are bad for me, if they are fun. (R)
6. I refuse things that are bad for me.
7. I wish I had more self-discipline. (R)
8. People would say that I have iron self- discipline.
9. Pleasure and fun sometimes keep me from getting work done. (R)
10. I have trouble concentrating. (R)
11. I am able to work effectively toward long-term goals.
12. Sometimes I can't stop myself from doing something, even if I know it is wrong. (R)
13. I often act without thinking through all the alternatives. (R)

(R) Reversed items.



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### **Proactive/Reactive Self-Control Scale**

Answers on a 5 point Likert scale (Not at all like me – 2 – 3 – 4 - Very much like me).

This questionnaire is about how people usually react to certain situations.

In each question, a situation is described.

*Please indicate to what extent each scenario is 'typically you' on a scale from 1 (not at all like me) to 5 (very much like me).*

### PROACTIVE ITEMS

1. When I shop for groceries, I usually make a grocery list in advance.
2. When I prepare a meal, most of the time, I already have all the necessary ingredients.
3. When I have to have a difficult conversation, I think about what I will say in advance.
4. If I have an important meeting the next morning, I usually go to bed on time.
5. If I want to be more physically active, I plan ahead of time when I want to be active.
6. If I have a lot of different things to do, I make to-do lists.
10. If I have to apply for a job, I prepare very well.

### REACTIVE ITEMS

1. When I am occupied with something, I sometimes forget about an appointment.
2. When I am sitting behind my computer, I usually keep websites or programs open that are not directly relevant.
3. When I am going somewhere, buying a snack often crosses my mind.
5. If I have a deadline, I usually finish close to the deadline.
6. If I have a meeting, I usually have to prepare it just before it starts.
8. When I am shopping for groceries, I usually walk by the candy or cookie section, even if I don't need anything from there.
9. When it comes to household chores, I often get overwhelmed by all the things that need to be done.
10. When I have things to recycle, they are lying all around the house.

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### **Response conflict magnitude**

We are interested in your evaluation of different types of food. Therefore, we would like to present you with a number of pictures of different food items, and ask you to rate each food product. If you click on the "->" button the first food item will appear.

*(Pictured foods, see below.)*

We are interested in your evaluation of different situations. Therefore, we would like to present you with a number of settings, and ask you to rate each setting. If you click on the "->" button the first setting will appear.

*(Pictured settings, see below.)*

### **Experienced conflict scale (Priester & Petty, 1996)**

Answers on a 4 point Likert scale.

How positive are your thoughts about the pictured food/setting? Please rate each statement based solely on your positive thoughts, while ignoring or setting aside for the moment any negative thoughts you may have about the pictured food/setting.

Not at all positive - A little positive - Positive - Very positive

How negative are your thoughts about the pictured food/setting? Please rate each statement based solely on your negative thoughts, while ignoring or setting aside for the moment any positive thoughts you may have about the pictured food/setting.

Not at all negative - A little negative – Negative - Very negative

### **Objective conflict scale (Kaplan, 1972)**

Answers on a 5 point Likert scale

Towards the pictured food/setting I feel...

No conflict at all - A little conflict - Conflict - A lot of conflict - Maximum conflict

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*Pictorial stimuli - healthy foods*



PROACTIVE AND REACTIVE SELF-CONTROL STRATEGIES

*Pictorial stimuli - unhealthy foods*



PROACTIVE AND REACTIVE SELF-CONTROL STRATEGIES

*Pictorial stimuli – no mobile phone settings*



PROACTIVE AND REACTIVE SELF-CONTROL STRATEGIES

*Pictorial stimuli – phone settings*



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### **Demographics**

What is your gender?

- Male
- Female
- Other

What is your age?

...

What is your highest level of completed education?

- High school
- Vocational
- Bachelor's
- Master's
- Other

Country:

...

Do you have any comments with regard to this study? If not, you can skip this question.

...