

The mediational role of self-control strategies, motivational factors and behavioral resistance in the relationship between trait self-control and goal progress

Masterthesis: Social, Health and Organisational Psychology, Utrecht University

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Date: 21-06-2019

Word count: 8.440

This manuscript should be made publicly accessible after August 1st, 2019

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Abstract

Background: Previous research suggests that people high in trait self-control are successful in resisting impulses because they are better at *effortful* inhibition than people lower in trait self-control. However, recent insights reveal that people higher in trait self-control exert self-control quite effortlessly. One explanation for this latter finding is that people higher in trait self-control experience less behavioral resistance compared to people lower in trait self-control.

Objective: The current study looks at the underlying processes of effortless self-control by examining the mediating role of self-control strategies, motivational factors, and behavioral resistance in the relationship between trait self-control and goal progress.

Method: Data was collected from 39 students from Utrecht University (92,3 % female, $M_{\text{age}} = 20.54$ years) regarding their trait self-control, behavioral resistance, self-control strategies (i.e., situation selection, situation modification, cognitive reappraisal), motivational factors (i.e. intrinsic motivation), and goal progress.

Results: Mediation analyses demonstrate that the effect of trait self-control on behavioral resistance is mediated by intrinsic motivation, and not by situation selection, situation modification, or cognitive reappraisal. The effect of trait self-control on goal progress through intrinsic motivation and behavioral resistance was not assessed due to a small indirect effect of intrinsic motivation and the small sample size.

Conclusion: The results indicate that motivational factors (i.e. intrinsic motivation), rather than self-control strategies are a process underlying effortless self-control in the academic domain. These findings are relevant for the development of intervention programs that target student's self-control.

Key words: trait self-control; self-control strategies; intrinsic motivation; behavioral resistance; goal progress; effortless self-control

Introduction

People often fail to act in line with their intentions. For example, people eat unhealthy snacks despite their intention to eat healthy and people smoke cigarettes despite their intention to quit (Muraven & Slessareva, 2003). Whether people act in accordance with their plans seems to depend in part on individual differences in levels of trait self-control.

Trait self-control is “the ability to override or change one’s inner responses, as well as to interrupt undesired behavioral tendencies and refrain from acting on them” (Tangney, Boone, & Baumeister, 2004, p 275). The role of trait self-control in inhibiting impulses fits into the dual-system framework, which states that there are two separate, but interacting systems that jointly guide behavior. The impulsive system accounts for generating impulsive behavior, and the reflective system is responsible for making deliberate judgments and evaluations, forming action plans for goal pursuit, and allows the control of impulsive processes (Hofmann, Friese, & Strack, 2009). While the reflective system (versus impulsive system) does not lead to healthier/better outcomes per se, it is believed that most of the time self-control failures are driven by impulse rather than reflection (Hofmann, Friese, & Wiers, 2008).

It is of vital importance to understand why we often seem to fail at self-control, but also why we succeed. This is because trait self-control predicts various critical life outcomes, including health (Will Crescion et al., 2011), well-being (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014), better interpersonal relationships, and less pathology (Tangley, Baumeister & Boone, 2004). Moreover, trait self-control is of importance from a very young age as childhood trait self-control predicts physical health, substance dependence, personal finance and criminal offending in later life (Moffit et al., 2011).

From the definition of trait self-control, it seems that exerting self-control is effortful as one must have the ability to override inner responses and to interrupt undesired behavioral tendencies. Accordingly, The Strength Model of Self-control considers self-control to be a deliberate, conscious, and effortful part of self-regulation that depends upon one and the same limited resource (Baumeister, Vohs, & Tice, 2007). As a consequence, engaging in acts that require self-control depletes this inner capacity leaving people in a state of ego-depletion which impairs subsequent attempts at control (Inzlicht, Schmeichel, & Macrae, 2014; Muraven & Baumeister, 2000; Vohs & Baumeister, 2016). However, if any instance requiring self-control would be effortful one would never make it to that long-term goal (Gillebaart & Kroese, in prep.). Luckily, this is not the case as people, especially those high in trait self-control, *are* often successful in exerting self-control and achieving their long term goals

(Gillebaart & Kroese). This implies that there might be another side of self-control apart from *effortful* control.

Indeed, recent findings suggest that people high in trait self-control exert self-control quite effortlessly. For example, a study conducted by de Ridder and Lensvelt-Mulders (2018) found a stronger relationship between trait self-control and automatic behaviors (e.g., habits), compared to controlled behavior. From the perspective of the Strength Model of Self-control it may be suggested that “individuals high in trait self-control may have a larger pool of resources at their disposal and therefore are less affected by self-control demands” (Muraven, Collins, Shiffman, & Paty, 2005, p. 145). In other words, individuals high in trait self-control may be less susceptible to the adverse effects of depletion compared to individuals low in trait self-control. However, results regarding the buffering effect of high trait self-control against depletion are inconsistent: some studies found support for the buffering effect of high trait self-control (Dvorak & Simons, 2009; McEwan, Ginis, & Bray, 2013), whereas others did not (Stillman, Tice, Fincham, & Lambert, 2009), or even demonstrated the opposite (Imhoff, Schmidt, & Gerstenberg, 2013). Therefore, it is essential to look at other explanations that provide insight into the underlying mechanisms of effortless self-control.

One explanation is based on the finding that people low in trait self-control experience more conflict, or competing behavioral tendencies, compared to people high in trait self-control (Gillebaart & De Ridder, 2015; Hofmann, Baumeister, Förster, & Vohs, 2012). It is assumed that a person that experiences more conflict is more likely to experience behavioral resistance as well (Hofmann et al.). Behavioral resistance refers to the extent to which people perceive the behaviors or actions they need to perform in order to reach their goal as unpleasant (Gillebaart & Kroese, in prep). Accordingly, it has been demonstrated that people lower in trait self-control experience *more behavioral resistance* compared to people higher in trait self-control (Gillebaart & Kroese). This implies that people lower in trait self-control have to exert more effortful self-regulation when performing goal-related behaviors, whereas people with higher levels of trait self-control simply do not seem to mind to carry out goal related activities in order to reach long-term goals. As a result, it becomes easier for them to perform behaviors that are advantageous in the long run – without depleting any resources.

Given the vital role of trait self-control in predicting various life outcomes, more in-depth knowledge in the concept of trait self-control is desirable (Galla & Duckworth, 2015). In addition to the suggestion that individuals higher in trait self-control may experience less behavioral resistance due to lower levels of experienced conflict, it may also be the case that people with higher trait self-control experience less behavioral resistance because they

make more use of self-control strategies. Insight into these strategies can be drawn from the Process Model of Self-control, a recently introduced framework that describes both the stages by which impulses are generated and the concurrent self-control strategies people can use to handle competing behavioral tendencies (Duckworth, Gendler, & Gross, 2016; Gillebaart & De Ridder, 2015).

The Process Model of Self-control proposes that impulses develop in an iterative cycle, starting with the situation and ending with a response tendency (Duckworth, Gendler, & Gross, 2016). Each cycle begins with an individual facing a particular situation (e.g., a piece of cake at a birthday party), then deciding whether to modify it (e.g., not asking the birthday boy or girl to keep the cake out of sight), next paying attention to particular characteristics of the situation (e.g., looking at the cake) followed by evaluating the situation as good or bad (e.g., that cake looks tasty), and, depending on this valuation, finally experiencing a response tendency or impulse (e.g., eat cake). Vivaly, response tendencies for most temptations tend to be in control over those for competing long-term goals. As a result, people's default response is to do things that feel good now, even though they know from their own experience that they will regret it afterwards (Duckworth et al.). Thus, when facing temptations, individuals seem to be more likely to use the impulsive (versus reflective) system.

Fortunately, people can use self-control strategies at each stage in the situation-attention-appraisal-response cycle to deal with competing behavioral tendencies (Duckworth, Gendler, & Gross, 2016; Gillebaart & De Ridder, 2015). At the earliest stage of impulse generation, there are two *situational strategies* that describe how we can select and modify our circumstances, respectively, to favor actions that make us better off in the long run. First, situation selection strategies which refer to intentionally choosing situations that make it more likely that a person can successfully act in line with one's intention (e.g., not eating a birthday cake is easier when not visiting a birthday party) (Duckworth et al.). However, often we are not free to select our situations but, still, are able to make changes where in the world we find ourselves. In this case, situation-modification strategies can be used in which a person purposefully changes a situation to his/her advantage. (e.g., asking the birthday boy or girl to hide the birthday cake) (Duckworth et al.).

Apart from situational strategies, we can make use of attentional deployment, cognitive reappraisal, and response modulation, respectively (Duckworth, Gendler, & Gross, 2016). These *intrapsychic strategies* can be used to advantage. For example, when we find ourselves in situations that we cannot change, attention can be focused on characteristics of a

situation that make it easier rather than harder to exert self-control (e.g., not looking at the birthday cake on the table) (Duckworth et al.). This strategy is called attentional deployment. However, when attending to temptations is unavoidable, we can use cognitive reappraisal to reduce our unwanted impulses and to encourage our desired ones (e.g., thinking of a birthday cake as an unhealthy snack full of fat and sugar instead of a tasty treat). The final strategy is response modulation in which, in the heat of the moment, we can voluntarily control undesirable impulses or strengthen desirable ones (e.g., resisting a birthday cake when hungry) (Duckworth et al.).

An interesting cross-sectional study, conducted by Gillebaart and Kroese (in prep.) looked at the mediating role of self-control strategies and motivational factors in the relationship between trait self-control and behavioral resistance. The findings demonstrated that people higher in trait self-control used more situation selection and cognitive reappraisal (but not more situation modification), and had higher levels of intrinsic motivation compared to people low in trait self-control. As a result, people with higher trait self-control experienced less behavioral resistance toward behaviors they needed to perform in order to reach their (health- or study) goals. The finding that intrinsic motivation mediated the relationship between trait self-control and behavioral resistance is in line with literature on motivational orientation. Specifically, an intrinsically motivated person is doing something because it is interesting or enjoyable, whereas an externally motivated person is moved to act because of external pressures, or rewards (Ryan & Deci, 2000). From this, it seems plausible to assume that because an intrinsically motivated person is moved to perform a behavior for pleasure or challenge instead of external reward, he or she experiences less behavioral resistance in comparison to an extrinsically motivated person.

Apart from looking at the mediating effect of self-control strategies and motivational factors in the relationship between trait self-control and behavioral resistance, Gillebaart and Kroese (in prep.) also looked at the subsequent effect on goal progress. It was demonstrated that higher trait self-control predicted more situation selection, cognitive reappraisal, and higher levels of intrinsic motivation which predicted lower levels of behavioral resistance, which in turn predicted higher goal progress.

Summarizing, individuals higher in trait self-control seem to be more inclined to use self-control strategies and have higher levels of intrinsic motivation, which results in lower feelings of behavioral resistance. Hence, they remain on route to their long-term goal compared to people lower in trait self-control (Gillebaart & Kroese, in prep). However, the results of the study conducted by Gillebaart and Kroese should be interpreted with caution as

no causal conclusions can be drawn due to the cross-sectional design. Another limitation of the study was the absence of an objective measure of goal progress, raising concerns regarding the effects of social desirability. Given these limitations, the current study will replicate the study of Gillebaart and Kroese using a prospective study design and an objective measure to assess goal progress.

The aim of the current study is to investigate whether self-control strategies, intrinsic motivation, and behavioral resistance mediate the relationship between trait self-control and goal progress in the academic domain. Based on the above findings it is hypothesized that students higher in trait self-control experience less behavioral resistance because they are more tempted to use self-control strategies and have higher levels of intrinsic motivation compared to people lower in trait self-control. Moreover, both trait self-control and behavioral resistance are expected to be related to subsequent goal progress. For the proposed (double) mediation model, see Appendix A.

This study will provide a further understanding into why people higher in trait self-control experience less behavioral resistance compared to people lower in trait-self-control and the effect on subsequent study-goal progress. Moreover, as interventions aimed at improving self-control (e.g., self-control training) show mixed results (Friese, Frankenbach, Job, & Loschelder, 2017; Hagger, Wood, Stiff, & Chatzisarantis, 2010a), insights into the secrets of effortless self-control can make promising improvements in interventions targeting self-control.

Method

Participants and Design

A total of 58 participants from Utrecht University took part in this study and were required from two courses. The study had a prospective design. A number of 19 participants were excluded from all analyses, due to missing data on more than two constructs. In the final data-analysis 39 participants were included, two males, 36 females and one person who indicated 'other'. The age of the participants ranged between 19 and 24 years old ($M = 20.54$, $SD = 1.21$). The participants were recruited through an announcement on Blackboard and by short lecture talks in which the study was explained and in which they were invited to participate in the study. The participants did not get compensation for their participation.

Materials

In the current study trait self-control, situation selection, situation modification, cognitive reappraisal, intrinsic motivation, behavioral resistance, and goal progress were rated on five-point Likert scales, ranging from 1 (Not at all like me) to 5 (Very much like me). All scales were the same as those scales that were used or constructed by Gillebaart and Kroese (in prep.).

Trait Self-Control. The Brief Self-Control Scale (BSCS) (Tangney, Baumeister, & Boone, 2004) was used to assess dispositional self-regulatory behaviors. The scale contains 13 items (e.g., “I often act without thinking through all the alternatives” (reversed coded), “I am good at resisting temptations”). Higher scores indicated higher trait self-control. The scale included nine counter-indicative items. The internal consistency of this scale was good, $\alpha = .80$

Behavioral resistance. This scale assessed the degree to which participants perceive the behaviors or actions they need to perform in order to reach their study goals as unpleasant. The scale consisted of three items: “doing academic activities is something I’d rather not do”, “I enjoy doing academic activities” (reversed coded), and “doing academic activities is something I find pleasurable” (reversed coded). Higher scores reflected higher levels of behavioral resistance. The scale contained two counter-indicative items. The internal consistency of this scale was good, $\alpha = .80$

Situation selection. This scale was used to assess the extent to which participants use situation selection to pursue their study goals, and consisted of seven items. Example items include “I avoid temptations” and “I put myself in situations that make it easier for me to pursue my goals”. Higher scores indicated higher use of situation selection. The internal consistency of this scale was reasonable, $\alpha = .68$

Situation modification. This scale was used to assess the extent to which participants use situation modification to pursue their study goals. The scale consisted of three items: “I change my immediate surroundings so that I can better achieve my goals”, “If there is a tempting object around, then I remove it from the area”, and “If there is a distracting object around, then I remove it from the area”. Higher scores reflected higher use of situation modification. The internal consistency of this scale was reasonable, $\alpha = .69$

Cognitive reappraisal. The scale was used to assess the extent to which participants use cognitive reappraisal to support study goals pursuit. The scale consisted of five items (e.g., “When I’m faced with an unpleasant task, I try to think about it in a way that helps me see the bigger picture”, “When I’m feeling unmotivated, I change the way that I’m thinking

about the situation”). Higher scores indicated higher use of cognitive reappraisal. The internal consistency of this scale was reasonable, $\alpha = .69$

Intrinsic motivation. This scale was used to assess the degree to which participants were motivated to pursue their study goals due to internally generated interest, value, and satisfaction. The scale consisted of three items including “I pursue my goals because doing so is something I truly value from within”, “I pursue my goals because doing so is inherently satisfying to me”, and “I pursue my goals because doing so is inherently satisfying to me”). Higher scores reflected a higher level of intrinsic motivation. The internal consistency of this scale was good, $\alpha = .76$

Goal progress. The current study used a self-report measure as well as an objective measure to assess the extent to which participants stay on route toward their study goals. The self-report measure was the goal progress scale which contained three items, including “I have made a lot of progress toward my academic goals”, “I am on track with my academic goal”, and “I achieve my academic goals” (Werner, Milyavskaya, Foxen-Craft, & Koestner, 2016). Higher scores indicated a higher level of study goals progress. The internal consistency of this scale was good, $\alpha = .79$.

The objective measure included final course grade as this measure is not affected by social desirability and will, therefore, provide more valid insights into the amount of goal progress. The final course grade was calculated for each participant. With regard to the course “Topical Issues in Health Psychology”, the final course grade was calculated on two, equally-weighted components, namely an essay and a final exam. However, for participants that took part in the course “Interpersonal Processes”, these two components were not equally-weighted (40% and 60 %, respectively). By calculating the final course grade of this latter course, the relative weight of these grades has been taken into account.

Demographics. Demographics were assessed by participants self-reported gender, age, level of completed education (high school, vocational, bachelor’s, master’s, and “other”), student number, target overall grade for the course the participant was in and the participant’s (estimated) average grade for the university education up until now.

Procedure

At time one, at the start of the bachelor courses “Interpersonal Processes” and “Topical Issues in Health Psychology”, participants received an information letter in which they were informed about the general purpose of the study. Then, after providing informed consent, participants continued to a questionnaire which contained the Self-Control Scale

(Tangney, Baumeister, & Boone, 2004) and scales assessing behavioral resistance, situation selection, situation modification, intrinsic motivation, and cognitive reappraisal, respectively. At the end of the survey, participants filled in a demographic questionnaire. Then, at time two, at the end of both courses, participants were asked to fill in the goal process scale. Furthermore, the lists that contained the grades of both courses were assessed. The questionnaires and the grade with the student number were matched. After this, the participant's student numbers were deleted in order to analyze the data anonymously.

Analyses

Data were analyzed by using SPSS statistics, version 25. First, descriptive statistics and correlations were computed. Afterwards, a mediation-analysis (Hayes, 2013) was completed to assess the mediating effect of self-control strategies and motivational factors between trait self-control and behavioral resistance. No double mediation analysis was conducted to test the relationship between trait self-control and final course grade through intrinsic motivation, and behavioral resistance because the indirect effect of intrinsic motivation was small. Moreover, the current study had a restricted sample size, thereby further limiting the power to find a significant result. Instead, exploratory analyses were conducted to examine the effect of self-control strategies, motivational factors, and trait self-control on final course grade, including the mediating effect of behavioral resistance. Finally, a mediation analysis was completed to assess the mediating role of situation modification between trait self-control and final course grade.

Results

Descriptive statistics

Participants had a mean trait self-control score of 3.25 ($SD = .56$) and a mean behavioral resistance score of 2.57 ($SD = .70$). In general, participants recorded performing situation selection ($M = 3.45$, $SD = .55$), situation modification ($M = 3.57$, $SD = .75$), and cognitive reappraisal ($M = 3.35$, $SD = .60$) to a modest extent. Furthermore, participants reported intrinsic motivation to a moderate to high extent ($M = 4.01$, $SD = .63$). With regard to goal progress, only final course grade has been used in the data-analysis, because responses on the goal progress scale were insufficient ($N=9$). Participants scored a more than sufficient grade ($M = 7.42$, $SD = .82$).

Correlations

Correlations between the key variables showed that trait self-control was not significantly negatively related to behavioral resistance ($r = -0.29, p > 0.05$). Trait self-control was not significantly positively related to cognitive reappraisal ($r = .09, p > 0.05$), or final course grade ($r = .26, p > 0.05$). However, trait self-control was significantly positively related to situation selection ($r = 0.52, p < 0.01$), situation modification ($r = 0.32, p < 0.05$), and intrinsic motivation ($r = 0.37, p < .05$). Specifically, higher trait self-control is related to more situation selection and situation modification, and to higher levels of intrinsic motivation. Moreover, behavioral resistance was significantly negatively related to intrinsic motivation ($r = -0.55, p < 0.01$). That is, higher levels of behavioral resistance are associated with lower levels of intrinsic motivation. Finally, situation modification was significantly positively related to final course grades ($r = .36, p < 0.05$). This latter finding indicates that more use of situation modification is related to higher final course grades. For an overview of the correlations between the key variables see Table 1.

Table 1 outlines an overview of correlations ($N = 39$) between trait self-control, behavioral resistance, situation selection, situation modification, cognitive reappraisal, and intrinsic motivation. The table also outlines an overview of correlations between these variables (e.g., trait self-control, behavioral resistance) and final course grade ($N = 36$).

Table 1

Correlations between key variables

	1	2	3	4	5	6	7
Trait Self-Control (1)	1	-.29	.52 **	.32*	.09	.37*	.26
Behavioral resistance (2)	-.29	1	-.15	-.25	.07	-.55**	.13
Situation selection (3)	.52**	-.15	1	.42 **	.35*	.21	.20
Situation modification (4)	.32 *	-.25	.42 **	1	.25	-.01	.36*
Cognitive reappraisal (5)	.09	.07	.35 *	.25	1	.01	.15
Intrinsic motivation (6)	.37 *	-.55**	.21	-.0	.01	1	-.05
Final course grade (7)	.26	.13	.20	.36*	.15	-.05	1

Note. Double asteriks indicates $p < .01$ and a single asterisk indicates $p < .05$.

Main analyses

In order to test the hypotheses, mediation analyses were carried out. Model 4 in the PROCESS macro (Hayes, 2013) was used to conduct these mediation analyses, using a bootstrap estimation approach with 5000 samples, because of the small sample size in the current study. First, the total effect of trait self-control on behavioral resistance was calculated. After that, indirect effects were calculated for each mediator (i.e. situation selection, situation modification, cognitive reappraisal, intrinsic motivation) separately. The total effect, the effect of trait self-control on behavioral resistance when no mediator was present in the model, was not significant, $b = -.37$, 95% CI $[-.77; -.03]$, $t = -1.87$, $p = .069$. There was no significant indirect effect of trait self-control on behavioral resistance through situation selection, $b = .003$, 95% BCa CI $[-.340; .246]$. This was concluded because the bootstrap confidence interval included the value zero. There was no significant indirect effect of trait self-control on behavioral resistance through situation modification, $b = -.069$, 95% BCa CI $[-.261; .061]$, as the bootstrap confidence interval included the value zero. The indirect effect of trait self-control on behavior resistance through cognitive reappraisal was estimated at $b = .010$, 95% BCa CI $[-.101; .096]$. This indicated an absence of mediation by cognitive reappraisal as the bootstrap confidence interval does include the value zero. At last, there was a significant indirect effect of trait self-control on behavioral resistance through intrinsic motivation, $b = -.239$, 95% BCa CI $[-.552; -.013]$. This was concluded because the bootstrap confidence interval did not include the value zero. Moreover, the size of the mediation effect is small to medium $b = -.189$, 95 BCa CI $[-.442; -.011]$. However, as the bootstrap interval had a broad reach, no firm conclusions can be drawn.

In sum, the relationship between trait self-control and behavioral resistance was not mediated by situation selection, situation modification, or cognitive reappraisal. However, there was mediation by intrinsic motivation indicating that higher levels of trait self-control predicted more intrinsic motivation (but not more situation selection, situation modification or cognitive reappraisal) which in turn predicted lower behavioral resistance. See *Figure 1* for an overview of the bootstrapped unstandardized regression coefficients regarding the mediating role of self-control strategies and motivational factors on the relationship between trait self-control and behavioral resistance.

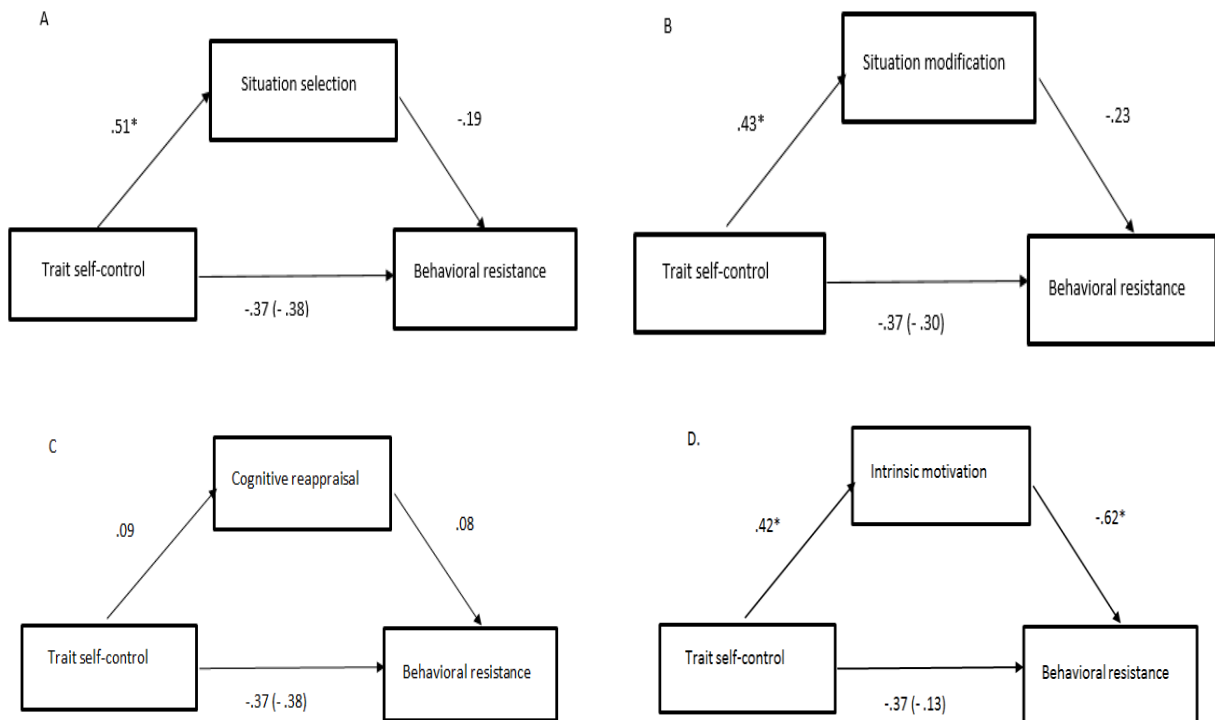


Figure 1. Bootstrapped unstandardized regression coefficients for the relationship between trait self-control and behavioral resistance as mediated by situation selection (A), situation modification (B), cognitive reappraisal (C), and intrinsic motivation (D). The bootstrapped unstandardized regression coefficients in parenthesis contain the relationship between trait self-control and behavioral resistance when controlled for the mediator. * $p < .05$.

Explorative analyses

After consultation with the statistical department at Utrecht University, it was decided not to conduct a double mediation analysis to test the relationship between trait self-control and final course grade through intrinsic motivation, and behavioral resistance. The reason for this was the small indirect effect of trait self-control on behavioral resistance through intrinsic motivation, and the small sample size ($N=39$). Instead, bootstrapped unstandardized regression coefficients were calculated to examine whether behavioral resistance mediates the relationship between self-control strategies (i.e., situation selection, situation modification, cognitive reappraisal) and final course grade, and whether behavioral resistance mediates between motivational factors (i.e., intrinsic motivation) and final course grade (see Figure 2). Furthermore, the effect of trait self-control on final course grade mediated by behavioral

resistance was assessed (see *Figure 2*). Results showed that more situation modification predicted higher final course grade ($b = .43, t(37) = 2.28, p < .05$), accounting for 13.3% of the variance in final course grade. However, a higher final course grade was not predicted by more situation selection ($b = .29, t(37) = 1.20, p > .05$), more cognitive reappraisal ($b = .20, t(37) = .86, p > .05$), or higher levels of intrinsic motivation ($b = -.07, t(37) = -.26, p > .05$). A higher final course grade was also not predicted by higher levels of trait self-control ($b = .40, t(37) = 1.57, p > .05$), or lower feelings of behavioral resistance ($b = .15, t(37) = .75, p > .05$). The absence of a significant effect of behavioral resistance on the outcome variable final course grade indicates that there is no mediation effect of behavioral resistance in the relationship between self-control strategies (i.e., situation selection, situation modification, cognitive reappraisal) and final course grade, motivational factors (i.e., intrinsic motivation) and final course grade, or trait self-control and final course grade.

As aforementioned, the explorative analyses showed that situation modification had a positive effect on final course grade, suggesting that students that are more tempted to use situation modification are more likely to achieve higher final course grades. In addition, bootstrapped unstandardized regression coefficients from the main-analyses indicated that trait self-control had a positive effect on situation modification, indicating that students with higher levels of trait self-control are more likely to use situation modification. Therefore, a mediation analysis was conducted to examine whether situation modification mediates the relationship between trait self-control and final course grade. The results showed that there was no significant indirect effect of trait self-control on final course grade through situation modification, $b = .170, 95\% \text{ BCa CI } [-.091; .405]$, as the bootstrap confidence interval did include the value zero.

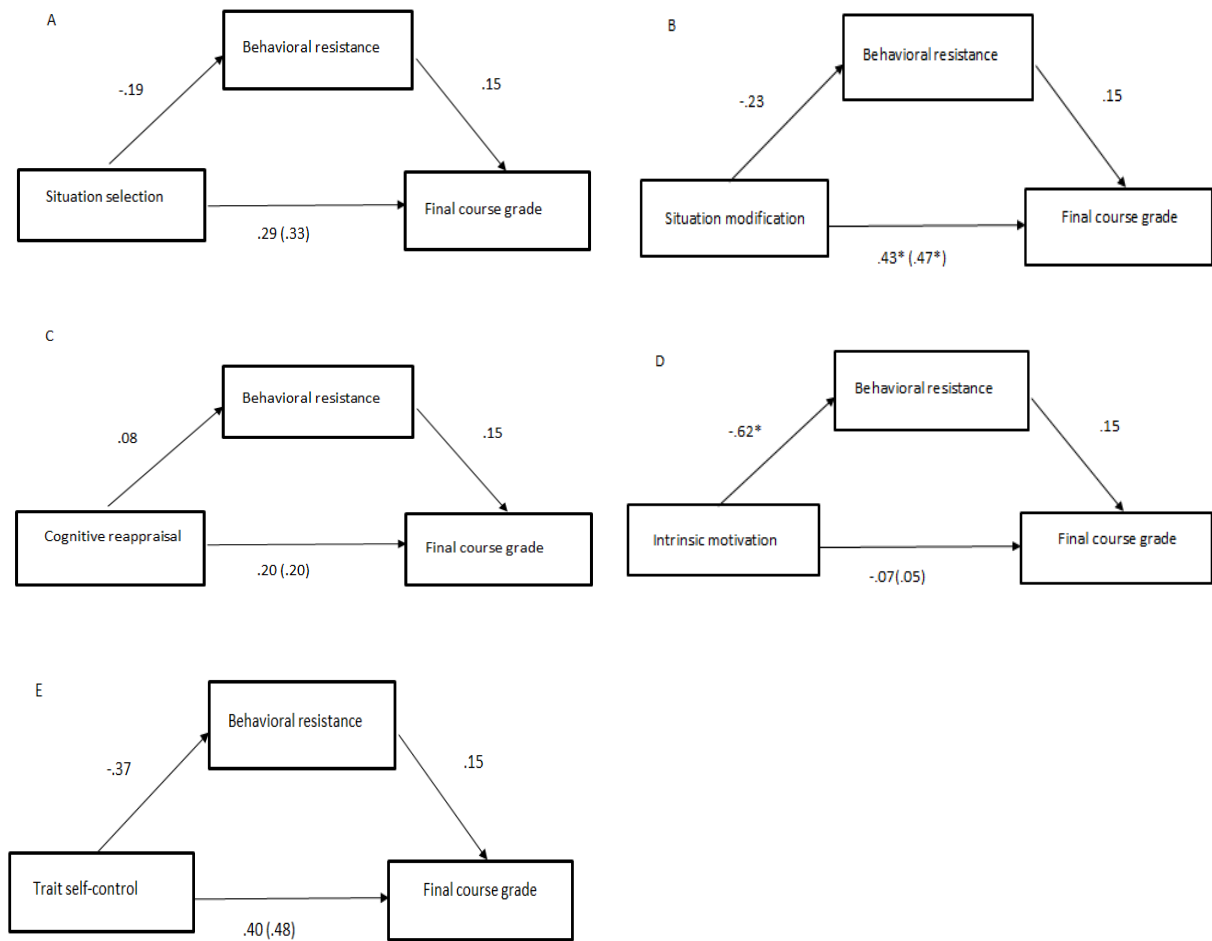


Figure 2. Bootstrapped unstandardized regression coefficients for the relationship between situation selection (A), situation modification (B), cognitive reappraisal (C), intrinsic motivation (D), trait self-control (E) and final course grade mediated by behavioral resistance. The bootstrapped unstandardized regression coefficients in parenthesis contain the relationship between the situational and motivational strategies and goal progress when controlled for the mediator. * $p < .05$.

Discussion

The current study aimed to get more insight into the underlying processes of effortless self-control in the academic domain. The current study replicated the study from Gillebaart and Kroese (in prep.) and examined whether self-control strategies (i.e., situation selection, situation modification, cognitive reappraisal) and motivational factors (i.e., intrinsic motivation) mediate the relationship between trait self-control and behavioral resistance. Furthermore, it was examined whether self-control strategies and motivational factors predict goal progress, including the mediating role of behavioral resistance.

Results showed, contrary to the expectation, that there was no direct association

between trait self-control and behavioral resistance. However, in line with findings by Gillebaart and Kroese (in prep.), the relationship between trait self-control and behavioral resistance was mediated by intrinsic motivation. Therefore, the absence of the direct effect between trait self-control and behavioral resistance does not mean that students higher in trait self-control experience levels of behavioral resistance to the same extent as students lower in trait self-control. Specifically, students higher in trait self-control were more likely to experience lower feelings of behavioral resistance, because they were more intrinsically motivated to pursue their study goals, compared to students lower in trait self-control. However, as the effect of trait self-control on final course grades through intrinsic motivation and behavioral resistance was not assessed, no conclusions can be drawn regarding the subsequent effect on goal progress (i.e. final course grade).

Concerning self-control strategies, there was no mediation effect of situation modification in the association between trait self-control and behavioral resistance. This finding is in line with previous research (Gillebaart & Kroese, in prep), but contrary to the prediction. Furthermore, contrary to expectations and findings by Gillebaart and Kroese, no mediation effect was found for situation selection and cognitive reappraisal. Finally, contrary to the prediction, there was no effect of trait self-control or behavioral resistance on goal progress.

With regard to the exploratory analyses, there was no mediating effect of behavioral resistance on the relationship between self-control strategies/motivational factors and goal progress. Behavioral resistance did also not mediate the relationship between trait self-control and goal progress. Furthermore, there was no effect of situation selection, cognitive reappraisal, or intrinsic motivation on goal progress. However, there was an effect of situation modification on goal progress. This last finding suggests that students that use more situation modification (e.g., turning the phone off while studying) in order to act in line with their study goals, are more likely to stay on track with their academic goals compared to students that do not change their immediate surroundings. Finally, no mediation effect of situation modification was found in the relationship between trait self-control and goal progress.

The results regarding the mediating role of self-control strategies and motivational factors (i.e., intrinsic motivation) on the relationship between trait self-control and behavioral resistance, suggest that not self-control strategies, but motivational factors (i.e., intrinsic motivation) are processes underlying effortless self-control. That is, students with higher levels of trait self-control seem to work effortlessly towards their study goals because they are intrinsically motivated to pursue these goals. This means that students higher in trait self-control value their study goals from within, and care very deeply about these goals. As a

result, they enjoy performing the activities in order to reach their study goals, which explain why these students experience lower levels of behavioral resistance. In contrast, students lower in trait self-control, would rather not perform actions in order to reach their study goals because pursuing these goals is not something that they value from within. The finding that students lower in trait self-control experience more behavioral resistance due to lower levels of intrinsic motivation indicates that they have to exert more effortful control to pursue their goals in contrast to students higher in trait self-control. This suggests that it is worth trying to increase intrinsic motivation in students with lower levels of trait self-control in order to reduce their levels of behavioral resistance, thereby helping them to work on their study goals more effortlessly.

The Self-Determination Theory (Deci & Ryan, 1985) suggests that a way to promote intrinsic motivation is to support in the other person (or in oneself) an experience of psychological need satisfaction. This might be achieved by creating environmental opportunities in which people feel more autonomous, competent, and related to others (Reeve, 2014). Indeed, research has shown that an intervention targeting psychological need satisfaction in students resulted in positive outcomes. Specifically, a study conducted by Deci and colleagues (1981) showed that in classrooms in which teachers were autonomy supportive (versus controlled), students were more intrinsically motivated and had more excellent performance outcomes.

Although there was, in line with the expectation, a mediation effect of intrinsic motivation in the relationship between trait self-control and behavioral resistance, there were also a couple of surprising findings. Firstly, there was no effect of behavioral resistance on goal progress in the present sample. This suggests that students who enjoy performing the activities in order to reach their study goals are not more likely to stay on route towards their study goals compared to students that would rather not perform activities in order to reach their study goals. One explanation for the lack of effect of behavioral resistance on goal progress may be the restricted sample size in the current study, which could have hindered the detection of an important existing effect.

Another explanation for not finding an effect of behavioral resistance on goal progress might be that, in the current study, only final course grade was used to assess goal progress because data regarding the goal progress scale were excluded from data analyses. The reason for this was the insufficient response rate on the goal progress scale, which may be due to the fact that participants did not get compensation for their participation. Goal progress, however, might better be operationalized by responses on the goal progress scale instead of the final

course grade. As students get their final course grade at the end of the course, final course grade might be a better operationalization of goal attainment rather than goal progress. The distinction between goal attainment and goal progress with regard to behavioral resistance is important because the literature on procrastination states that when feelings of resistance accompany certain behaviors, there is a lower chance that the action will be successfully performed (Steele, 2007). This suggests that feelings of resistance accompany *behaviors* and not outcomes (i.e., grade) per se. As a result, this may in part explain why there was no association between behavioral resistance and goal progress (i.e. final course grade). Therefore, future research should replicate this study by using a self-report measure of goal progress in combination with a better objective measure of goal progress. According to previous research, goal progress can be assessed by the monitoring of (academic) behavior (Harkin et al., 2016). For example, attendance to lectures might be assessed by letting students that attend the lecture, sign an attendance form after they have visited said lecture. Moreover, in previous research, assessment of student progress was conducted by testing students repeatedly at different stages in their training (Pugh, Touchie, Wood, & Humphrey-Murto, 2014). Thus, grades on an interim test might be a better objective measure to assess goal progress compared to final course grades.

A second unexpected finding was that there was no effect of trait self-control on goal progress, which indicates that students higher in trait self-control stay on track towards their study goals to the same extent as students low in trait self-control. However, based on previous research, there seems to be sufficient evidence that trait self-control is positively related to goal progress (Duckworth & Seligman, 2006; Tangney, Baumeister, & Boone, 2004). As a result, the absence of an effect between trait self-control and final course grade in the current study might be explained by the restricted number of participants.

With regard to the results from the explorative analyses, there was no predictive effect of situation selection, cognitive reappraisal, or intrinsic motivation on goal progress. This suggests that students who are more tempted to use situation selection or cognitive reappraisal are not more likely to make more progress towards their study goals compared to students who are less likely to use situation selection, or cognitive reappraisal. Neither do students with more intrinsic motivation to pursue their study goals have a higher likelihood to stay on track towards their study goals compared to students that are less intrinsically motivated. Nonetheless, results showed that the use of situation modification strategies did predict goal progress. In other words, students that are more tempted to change situations to their advantage in order to act in line with their study goals are more likely to stay en route towards

their goals. This latter finding is in accordance with previous research (Marcus, 1988; Zimmerman, 1989). More specifically, it has been shown that more successful students deliberately manipulate their surroundings in ways that make concentrating on their studies easier (Zimmerman).

The finding that situational modification has a positive effect on goal progress in combination with the outcome that students higher in trait self-control are more tempted to use situation modification strategies suggest that situation modification strategies may mediate the relationship between trait self-control and goal progress. However, this study found no evidence that students with higher levels of trait self-control were more likely to remove a distracting or tempting object from the area (e.g., turning the phone off while studying), which in turn led to better goal progress. However, as aforementioned, the current study had a restricted sample size, therefore future research should examine the mediating role of situation modification in the relationship between trait self-control and goal progress in a larger sample. This would be interesting as it may provide further insights into the underlying processes of effortless self-control. That is, if future research demonstrates that students higher in trait self-control remain better on track towards their study goals because they make more use of situation modification strategies compared to students lower in trait self-control, this would indicate that the use of situation modification strategies is an underlying process of effortless self-control. Moreover, it would confirm that better self-regulation lies not in increasing self-control but in removing temptations available in our environments. As a result, interventions may be designed in order to improve goal progress among students.

The current study has several strengths. Firstly, by replicating the study of Gillebaart and Kroese (in prep.), additional support is provided for the mediating effect of intrinsic motivation on the relationship between trait self-control and behavioral resistance. As a result, this study contributes to the limited literature on the underlying processes of effortless self-control.

Secondly, the current study used an objective measure (i.e., final course grade) to assess goal progress in addition to a self-report measure of goal progress. Therefore, both perceived progress and actual progress were measured in order to exclude social desirability effects. This is important as perceptions of progress can be potentially quite different from real progress (Powers, Koestner, & Topciu, 2005) due to, for example, self-enhancing biases (Osbaldiston & Sheldon, 2003). However, as mentioned previously, future research should use a better objective measure of goal progress (e.g., grades on an interim test).

Furthermore, as the current study did not use the data from the goal progress scale due to insufficient responses, ways to increase data response rate should be considered. It has been shown that cash rewards at any amount increase the response rate (Linksky, 1975). Another effective method is to contact the participants before they receive the questionnaire by telephone (Linksky). Future research should combine these methods to increase the response rate regarding the goal progress scale in order to heighten the reliability of the results.

Finally, the current study used a prospective design, which as a result, provides more insight into the predictive effects of trait self-control, behavioral resistance, self-control strategies, and motivational factors on goal progress than a cross-sectional design.

Nonetheless, the limitations of the study should also be addressed. Firstly, there was a lack of power to detect results due to small sample size. Based on a power analysis, at least 58 participants should have been included in the data analysis. However, in the current study, only 39 participants were included, and this amount was reduced to 36 in the explorative analyses. This small sample size might in part explain the absence of significant effects. Therefore, future studies should use a larger sample in order to attain sufficient statistical power. For example, the upcoming years, this study could be replicated, and then, the data could be merged to attain sufficient statistical power.

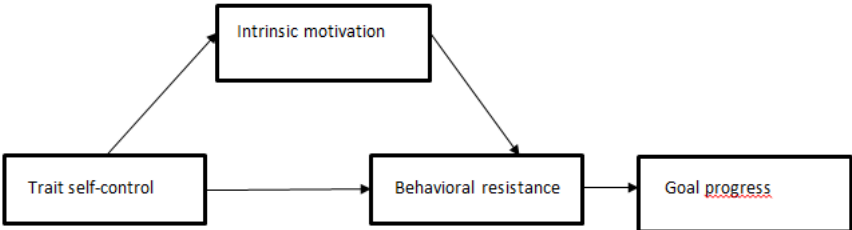
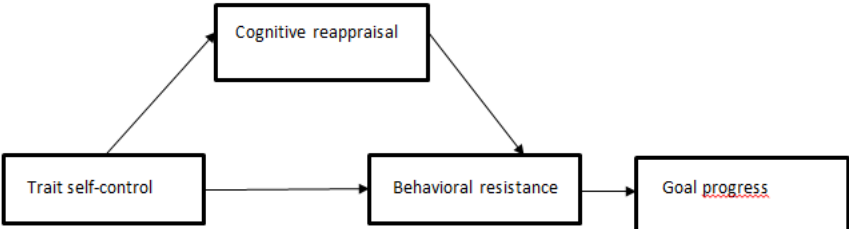
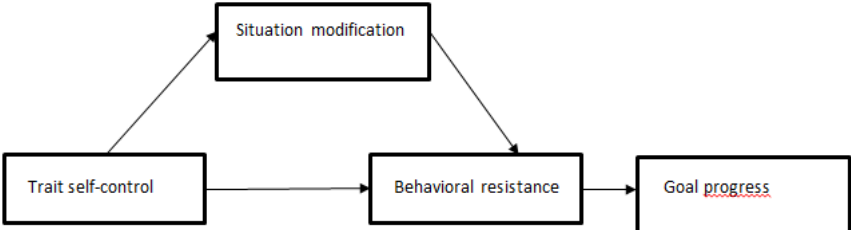
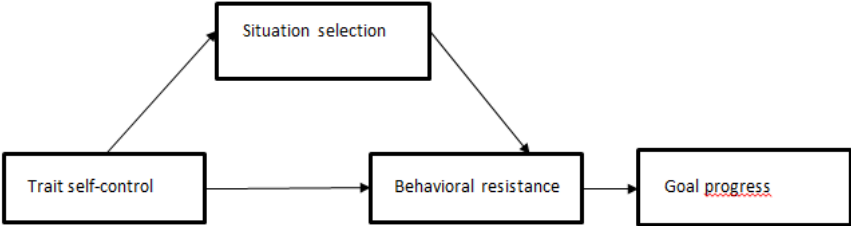
Secondly, the prospective design does not allow causal conclusions. Although our findings suggest that students higher in trait self-control experience less behavioral resistance, through higher levels of intrinsic motivation, this must be further confirmed by future studies with a longitudinal design. For example, a longitudinal design could be used where students have to complete the Brief Self-Control Scale at the start of the academic year. Then, two subgroups can be constructed from students high in trait self-control, and students low in trait self-control (e.g., using a cut-off score). Then levels of intrinsic motivation and behavioral resistance can be measured at three time-points, for example, at the start of block two and three, and at the beginning of block four from the academic year.

Finally, all constructs, except goal progress, were assessed by self-report measures. Hence, social desirability might have biased the responses regarding the assessed constructs. For example, participants could have over-reported their levels of trait self-control as it is considered to be desirable construct (Tangley, Baumeister, & Boone, 2004). Therefore, future research is welcome to back up and verify self-reports by using other measurement methods. For example, behavioral observation could be used to measure trait self-control by using The Self-Control Behavior Inventory (Tangley et al.).

In conclusion, the current study provides insight into the underlying mechanisms of

effortless self-control in the academic domain. In line with previous research (Gillebaart & Kroese, in prep.), this study indicated that motivational factors (i.e. intrinsic motivation), rather than self-control strategies mediate the relationship between trait self-control and behavioral resistance. Furthermore, situation modification strategies had a predictive effect on goal progress. Therefore, we encourage future research to examine whether the relationship between trait self-control and goal progress is mediated by the use of situation modification strategies in a bigger sample. Moreover, it would be interesting to assess whether increasing intrinsic motivation in students low in trait self-control, by targeting psychological need satisfaction, has an effect on behavioral resistance, and in turn on goal progress. The current study raised a corner of the veil into the secret of effortless self-control and suggests that effective self-regulation does not rely on effortful inhibition, but on having intrinsic motivation to pursue our (study) goals.

Appendix A



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