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Self-Control Success Revealed: Greater Approach Motivation Towards Healthy versus Unhealthy Food

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Summary: Deviating from existing literature on self-control failure the current research examines self-control success and the role of motivation. Functional research suggests people visually perceive objects to be bigger when they are motivated to approach them. Using the size perception task, participants estimated the size of a healthy and an unhealthy food object that were identical in size. In the current research we simulated a reflective state vs. impulsive state using an ego-depletion manipulation in Study 1 and a cognitive load manipulation in Study 2. Results from both studies revealed that participants in a reflective state (vs. impulsive state) assigned increased size estimations to the healthy food item compared to the unhealthy food item. Current findings demonstrate greater approach motivation towards a 'virtue' (i.e., healthy food) as a mechanism that underlies self-control success, suggesting that successful self-control involves initiating approach towards a virtue rather than inhibiting a vice. Copyright © 2016 John Wiley & Sons, Ltd.

Self-control, the capacity to inhibit undesired behaviours and initiate desired behaviours, is vital to the achievement of long-term goals (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Indeed, while individuals who manage to successfully exercise self-control redeem desirable outcomes such as higher academic achievement, better interpersonal relationships, more optimal emotional responses, those who fail are more prone to maladaptive behaviours such as overeating and substance abuse, as well as poorer psychological adjustments (Tangney, Baumeister, & Boone, 2004). So what is the recipe for self-control success? On one hand, recent research reveals that higher *trait* self-control, which is a rather stable disposition across the lifespan, facilitates more adaptive lifestyles that may ultimately foster more successes, and even happiness, in life (Hofmann, Luhmann, Fisher, Vohs, & Baumeister (2013); Cheung, Gillebaart, Kroese & De Ridder, 2014). In contrast, *state* self-control is not static, and being prone to fluctuations may therefore be accountable for the triumphs or defeat in overcoming temptations or impulses that people experience on a day-to-day basis. Motivation influences one's capacity to exercise self-control at any given time (Muraven, Gagné, & Rosman, 2008), and although it has generally been accepted that motivation supports self-control performance (Vohs, Baumeister, & Schmeichel, 2012), few studies have actually examined how it facilitates the workings of state self-control (Inzlicht & Schmeichel, 2012). Aiming to fill this research gap, the current research focuses on state self-control and sheds insight on how motivation as an underlying mechanism contributes to the success in people's resolution of a self-control conflict. Specifically in two studies the current research employs the size perception task (van Koningsbruggen, Stroebe, & Aarts, 2011; Veltkamp, Aarts, & Custers, 2008), an established paradigm to examine individual's approach motivation towards perceived objects, in order to investigate participants' approach motivation towards a healthy food versus an unhealthy food, two options typically encountered in a self-control conflict.

Revisiting the definition of self-control, it is apparent that it involves not only an inhibitory component, but also an initiatory counterpart (de Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011). To illustrate, maintaining a healthy diet requires not only self-control to resist the temptations to eat sugary and fatty foods, but also self-control to initiate more attempts to eat healthy greens. Coming back to our original research question then, if an individual were successful at resolving a self-control conflict by opting out for an apple over the chocolate bar, what is their winning strategy behind their pursuit of a long-term health goal, and how is motivation devised between these two conflicting stimuli in order to support the pursuit of a long-term health goal? The current research aims to answer these questions, and while there is only scarce existing self-control research that has examined the underpinnings of self-control success on a state level, we draw inspiration to form our predictions based on the literature on state self-control failure as well as indirect evidence from the novel effortless self-control account.

The exercise of self-control is traditionally assumed to require effort and is hence considered as a relatively difficult task (Fujita, 2011). As such, it is not surprising that the self-control literature is abundant with studies describing self-control failure, as opposed to the current research topic of self-control success. However, it is nonetheless informative to understand the problem of when and why self-control fails in order to better understand self-control success. Dual process theories posit that self-control outcomes result from the interplay between reflective and impulsive processes (Hofmann, Friese, & Strack, 2009; Hofmann, Friese, & Wiers, 2008). When reflective processes responsible for higher order mental operations that serve regulatory goals are impaired, impulsive processes take over and self-control

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failure becomes imminent. Indeed, research has identified situational factors that undermine such reflective processes, thereby eroding state self-control capacity. For instance, state self-control performance tends to decline after people have already engaged in prior acts of self-control, a phenomenon referred to as ego-depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven & Baumeister, 2000). People's state self-control performance can also be hampered if they have limited cognitive capacity, for example, if they have to keep a high load of information in mind (Ward & Mann, 2000). Extending from describing *when* self-control failure occurs, the recent Process Model of self-control (Inzlicht & Schmeichel, 2012) puts forth an explanation of *why* state self-control fails, and pertinent to the current research interest, it highlights the important role of motivation. According to this account, motivation is the mechanism underlying state self-control performance, and people fail to exercise self-control because their values and priorities change – rather than being motivated to attune to goal-relevant cues, motivation is deployed towards reward-relevant cues. Indeed, there is emerging evidence that after prior attempts at self-control people's motivation changes and becomes more reward-oriented (Schmeichel, Harmon-Jones & Harmon-Jones, 2010). However, this research by Schmeichel and colleagues remains to be the only work examining motivation as an underlying mechanism of state self-control, and in particular how motivation shifts towards obtaining rewards or perceptually focusing on reward-relevant cues leading to state self-control failure. Considering how in the present research we are interested in understanding self-control success on a state level, we argue that it is equally important to investigate how motivation is directed towards goal-pursuit and goal-relevant cues in addition to reward-oriented motivation. Following the reasoning that state self-control failure might be a consequence of intensified reward-oriented motivation, we speculate that state self-control success might involve stronger goal-pursuit motivation that compensates and exceeds reward-oriented motivation. This notion resonates well with the emerging findings of effortless self-control strategies in the literature on trait self-control.

The novel perspective that the exercise of self-control could be effortless (Gillebaart & De Ridder, 2014) stems from preliminary findings showing people high in trait self-control to experience greater hedonic activation by healthy food relative to unhealthy food (Gillebaart & de Ridder, 2014). When asked to rate healthy and unhealthy food items on hedonic attributes such as 'yummy', 'tasty', and 'scrumptious', people generally reported the unhealthy food to be more hedonically pleasing than the healthy food. In fact, preliminary evidence suggests that trait self-control did not predict how people evaluated unhealthy yet palatable food, suggesting that both individuals with high and low trait self-control found unhealthy food to be attractive to a similar degree. What is interesting, however, was that trait self-control did predict how healthy foods were rated, such that people with higher levels of trait self-control rated the healthy food to be even more hedonically pleasing. Hence, it was proposed that people high in trait self-control benefit from the heightened hedonic appeal of the healthy food as it acts as an effective buffer against the temptation of the unhealthy alternative, thereby attenuating the self-control conflict and making the choice for the healthy food easier and more effortless. Although we cannot assume trait and state self-control to function through the same mechanisms considering the mixed findings regarding the (dis)similarity of how these two entities may operate (e.g., Schmeichel & Zell, 2007; Imhoff, Schmidt, & Gerstenberg, 2014), the effortless (trait) self-control account may serve as relevant indirect evidence for our current hypotheses. Particularly, it highlights the importance of motivation for approaching goal-relevant virtues as means to foster self-control success in addition to the traditional perspective that heavily focuses on the inhibition of hedonic vices.

PRESENT RESEARCH

In the present research we aim to fill a research gap by disentangling how motivation is directed towards a goal-relevant cue versus a reward-oriented cue in order to warrant the successful resolution of a self-control conflict. When encountering a self-control conflict involving a healthy food that endorses a long-term health goal versus an unhealthy food that represents short-term gratification, we expect that people in a reflective state (i.e., where state self-control is high) would exhibit a greater approach motivation towards the healthy food compared to the unhealthy alternative. In order to test this prediction, the current research employs the size perception task to compare participants' approach motivation towards a healthy food versus an unhealthy food.

The size perception task is an established procedure to examine individuals' approach motivation towards perceived objects by requiring participants to provide size estimations (i.e., height) of objects as they appear on the computer screen (e.g., Van Koningsbruggen et al., 2011; Veltkamp et al., 2008). Functional perception research suggests that visual perception is biassed according to the individual's internal motivation (Bruner, 1957), such that an object of value would appear greater in size to its perceiver to enhance its detection likelihood in the environment in order to facilitate its attainment. Previous research using the size perception task has indeed demonstrated that participants assigned increased size estimations to objects that they are more motivated to acquire (De Ridder, Kroese, Adriaanse, & Evers, 2014).

For the objective of the current research, the size perception task lends itself as a convenient tool as it allows us to compare the size estimations of a healthy food object that would support a long-term goal to the size estimations of a more tasty, yet unhealthy alternative representing an immediate gratification as means to decipher how approach motivation is devised between such a virtue and a vice. In the current research we predict that in a reflective state, individuals would correspondingly exhibit greater approach motivation towards the healthy food as reflected by an increased size estimation of the healthy food object compared to the unhealthy alternative.

In the current research we use two different methods to manipulate the interplay between reflective and impulsive precursors on behaviour by using an ego-depletion manipulation (e.g., Hofmann, Rauch, & Gawronski, 2007) and a cognitive load manipulation (e.g., Friese, Hofmann, & Wänke, 2008). We predict that when individuals do not have their reflective processes disrupted by depletion effects (i.e., a prior act of self-control; Study 1) or a high cognitive load (Study 2), they would show greater approach motivation towards the healthy food compared to the unhealthy food, thereby supporting successful self-control.

STUDY 1

In Study 1 we predicted that non-depleted participants (but not ego-depleted participants) would show greater approach motivation towards the healthy food compared to the unhealthy food. We manipulated ego-depletion using the established E-cross task (Baumeister et al., 1998). We measured approach motivation using the size perception task, where the size estimations (i.e., height) that participants assigned to a healthy food and an unhealthy food that were in fact identical in size, were used as measures of approach motivation towards the two food products respectively.

Method

Participants

Eight-six participants were recruited from a large university in the Netherlands for this experiment. The average age of this sample was 21.35 years ($SD = 3.16$), with 44 males and 42 females. Participants were reimbursed with money (€3) or course credit.

Design and procedure

This experiment used a 2 (self-control: non-depletion vs. ego-depletion) × 2 (food: healthy vs. unhealthy) mixed design, with self-control as a between-subjects factor and food as a within-subjects factor. The dependent variables were the size estimations of healthy versus unhealthy food.

Upon arrival at the laboratory, participants were assigned to individual cubicles where the experiment took place. First, they read an information letter on the experiment described as two separate studies about written media and cognitive abilities respectively, then signed an informed consent for their participation. Participants were randomly assigned to the non-depletion or the ego-depletion condition, and completed the E-cross task, an established ego-depletion manipulation (adapted from Baumeister et al., 1998). Subsequently, participants performed the size perception task, where they estimated the height of a series of objects. The size perception task has been used in other studies similarly to implicitly measure people's approach motivations (e.g., Van Koningsbruggen et al., 2011; Veltkamp et al., 2008). Finally, participants answered a few demographic questions including their gender, age, as well as their height and weight, and were thanked and debriefed.

E-cross task. The E-crossing task (adapted from Baumeister et al., 1998) was presented with the cover story that it was about written media. Participants read an article about a girl who decided to attend an art academy. In the non-depletion condition, participants were instructed to cross out every instance of the letter 'e' they come across in the article. In the ego-depletion condition, the article was divided into two pages. On the first page, participants were instructed to cross out all the letters 'e'. But on the second page participants were instructed to only cross out the letters 'e's if they applied to certain complex rules (e.g., the letter 'e' is two spaces away from a consonant). Having participants to constantly exert self-control to refrain from crossing out any letter 'e' was assumed to trigger ego-depletion (Baumeister et al., 1998). Moreover, in the ego-depletion condition, the second page of article was printed in lighter grey ink. In both conditions, after participants had crossed out all the letters 'e' in the article according to instructions, they answered some filler questions about article, such as in which magazine the article could have been published, and who the targeted audience could have been. The E-crossing task has been used by previous studies and has been demonstrated as a reliable ego depletion manipulation (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

Size perception task. Participants were informed that they would see a series of objects on the computer screen, and that their task was to give an estimate of the size (i.e., height) of each object as they appeared on the 15-inch computer screen in centimetres with two decimal places. The presented objects were not specified beforehand. After participants had completed four practice trials, the first experimental trial began with the presentation of a healthy food item (i.e., a box of whole wheat cereal), followed by the next experimental trial presenting an unhealthy food item (i.e., a bag of party snacks) on the screen. An initial pretest had indicated that the cereal was more healthy ($t(39) = 9.95$. $p < .001$), but less tasty ($t(39) = -2.68$, $p = .011$) than the bag of party snacks. Pretest results also indicated that participants were familiar with both products to a similar degree, $t(39) = -1.56$, $p = .13$. The presentation order of the healthy and unhealthy food was counterbalanced between participants. Critically both the healthy and unhealthy food items had the same dimensions (width: 169 pixel by height: 260 pixel). Following the first two experimental trials of the healthy and unhealthy food were 12 more trials of neutral objects (e.g., air freshener, washing detergent, crayons, etc.) and 8 additional filler trials of food items that were not analysed.

Results

Randomization check

A chi-square test indicated that there were no significant differences in the distribution of gender between conditions, χ^2 (1, $N = 84$) = .00, $p = 1.00$. Additionally, an analysis of variance (ANOVA) with BMI as dependent variable revealed no significant differences between the two self-control conditions, F (1,82) = .12, $p = .73$. These results indicate the random distribution of participants based on gender and BMI over the two self-control conditions was successful.

Effects of self-control and food type on size estimations
A mixed between-within subjects analysis of covariance (ANCOVA) was conducted to examine the impact of self-control and food type, as well as their interaction, on the size estimations of healthy versus unhealthy food. The size estimation of neutral products was included as a covariate. Self-control (non-depletion vs. ego-depletion) was a between-subjects factor, and food type (healthy vs. unhealthy) was a within-subjects factor. Moreover, presentation order was controlled for as a between-subjects factor. Size estimation, as the dependent variable, was given in centimetres (cm) with 2 decimal places. Four participants had missing data and three additional participants were excluded from the analysis because of their size estimations exceeding 3 *SD*'s above or below the mean size estimations for both healthy, unhealthy food, and neutral objects. The final sample size consisted of 79 participants.

Results indicated that there was no significant main effect of self-control on size estimations, $F(1,74) = .13$, $p = .72$. However, there was a significant main effect of food, $F(1,74) = 8.94$, $p = .004$, $\eta^2 = .11$, which was qualified by a significant self-control × food type interaction, $F(1, 74) = 4.17$, $p = .04$, $\eta^2 = .05$ (see Figure 1). Simple main effects revealed that in the non-depletion condition, the size estimation of the healthy food ($M = 16.56$, $SE = .39$) was marginally significantly greater than of the unhealthy food ($M = 15.61$ $SE = .50$), $p = .06$. However, this difference between the size estimations of the healthy food ($M = 15.65$, $SE = .39$) and unhealthy food ($M = 16.15$, $SE = .50$) was no longer significant in the ego-depletion condition, $p = .33$. On the other hand, although the size estimation of the healthy food was greater in the non-depletion condition ($M = 16.56$, $SE = .39$) than the ego-depletion condition ($M = 15.65$, $SE = .39$), this difference was not significant, $p = .10$. The increase in size estimation of the unhealthy food from the non-depletion condition ($M = 15.61$, $SE = .50$) to the ego-depletion condition ($M = 16.15$, $SE = .50$) was also not significant, $p = .45$. The size estimation of neutral objects served as a significant covariate, $F(1, 74) = 170.12$, $p < .001$, $\eta^2 = .70$. Last, presentation order interaction effect did not influence the observed results, $F(1, 74) = .41$, $p = .52$.

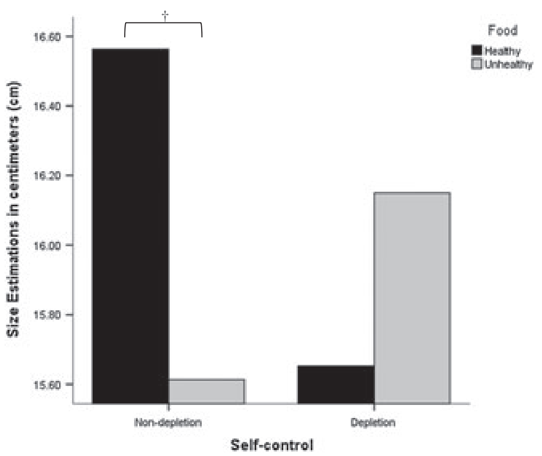

Figure 1. Size estimations of the healthy food object vs. the unhealthy food object as a function of high vs. low self-control. Size estimations of neutral objects are included as a covariate in the model. † $p = .06$

Discussion

Based on functional research, perception is a constructive process that is influenced by the individuals' motivations (Bruner, 1957). The results of Study 1 supported our hypothesis that when participants are in non-depleted state they would have a greater approach motivation towards the healthy food item, as reflected by greater size estimations of the healthy food compared to the unhealthy food. We posit that this enhanced approach motivation towards the healthy food relative to the unhealthy food serves as the mechanism underlying self-control success. In contrast, this advantage where greater approach motivation is deployed towards the healthy food was no longer apparent when participants were in an impulsive state because of depleting effects of prior acts of self-control.

As another manipulation of reflective versus impulsive state, previous research has shown that taxing working memory induces an impulsive state where self-control performance typically fails (e.g., Ward & Mann, 2000), and in Study 2 we apply a cognitive load manipulation to influence people's cognitive capacity in order to simulate a reflective versus an impulsive state. Accordingly, in Study 2 we aim to test the robustness of the pattern of results found in Study 1, by examining whether greater approach motivation towards the healthy food object would also be exhibited by individuals in a reflective state when their cognitive capacity is not taxed by a cognitive load. Furthermore, Study 2 controls for potential confounds (e.g., extent of healthy eating) that may influence approach motivation towards healthy food.

STUDY 2

Similar to Study 1, Study 2 measures approach motivation with the size perception task where greater size estimations reflect greater approach motivation; and in place of a depletion manipulation, Study 2 employs a cognitive load manipulation. In effect, we predict that individuals under a low cognitive load would perceive the healthy food to be significantly larger in size than the unhealthy food, but that individuals under a high cognitive load would not exhibit this size perception difference. Furthermore, Study 2 takes into account of situational factors (i.e., affect, stress, hunger) as well as participant characteristics (i.e., extent of healthy eating) that may have influenced the size estimations of the healthy and unhealthy food.

Method

Participants and design
One-hundred and nine participants (40 males, 69 females) were recruited from an online testing platform (www.prolificacademic.co.uk). The sample consisted of males and females, with a mean age of 30.95 years ($SD = 10.07$). In exchange for their participation, participants received £2.

Design and procedure
The design was a 2 (cognitive load: high vs. low) × 2 (food: healthy vs. healthy) mixed design, with cognitive load as a

between-subjects factor and food as a within-subjects factor. The dependent variable was the size estimations of healthy versus unhealthy food. The procedure of Study 2 was similar to Study 1 except for the fact that the entire experiment was conducted online where a cognitive load manipulation instead of a depletion manipulation was employed, and that additional variables including affect, stress, hunger, as well as participants' extent of healthy eating were assessed.

Participants first read a brief description of the experiment, and then gave their informed consent for their participation. The size perception task commenced with two practice trials to familiarize the participants with the task. Participants were then randomly assigned into either the high or low cognitive load condition where working memory capacity was manipulated. In the high cognitive load condition, participants were asked to remember a seven-digit number, whereas in the low cognitive load condition participants had to remember a two-digit number. In both conditions, participants were informed that they would be asked to report this number at the end of the experiment. Participants spent as much time as they wished to remember the number before proceeding to the size perception task. Similar to Study 1, participants gave a height estimate to a series of objects, including a healthy and an unhealthy food which were measured as the dependent variables. At the end of the size perception task, participants were asked to report the number that they had to keep in mind. Subsequently, they filled out two personality questionnaires that were not relevant for the current study, and answered demographic questions including gender, age, height, and weight. Participants also indicated their extent of healthy eating, and their levels of affect, stress, and hunger that they were experiencing at the moment. Finally, participants were thanked and debriefed.

Materials

Cognitive load manipulation

We employed a classic procedure to manipulate attentional capacity (Shiv & Fedorikhin, 1999). Having participants to keep in mind a seven-digit versus a two-digit number results in a state of high versus low working memory capacity respectively. This manipulation was chosen because previous studies have shown that when working memory capacity is low, people are more impulsive and also less able to exert self-control (e.g., Ward & Mann, 2000).

Size perception task

The instructions and stimuli used in the size perception task in this experiment were identical to that in Experiment 1. The only exception was that only two practice trials were included in this version.

Control variables

Affect, stress, hunger, and extent of healthy eating were assessed to determine whether there were any differences between the conditions that may have influenced the size estimations.

Affect

The extent to which participants were feeling negative versus positive affect was measured with one item, 'How are you feeling at the moment?' on a 5-point Likert-scale ranging from 1 (*very negative*) to 5 (*very positive*).

Stress

Stress was assessed with one item, 'How stressed are you feeling at the moment?' on a 5-point scale ranging from 1 (*not stressed at all*) to 5 (*very stressed*).

Hunger

Hunger was measured with one item, 'How hungry are you feeling at the moment?' on a 5-point Likert-scale ranging from 1 (*not hungry at all*) to 5 (*very hungry*).

Extent of healthy eating

Participants indicated the degree to which they agreed with the statement 'I try to eat healthily' on a 5-point Likert-scale ranging from 1 (*not at all*) to 5 (*very much*).

Results

Descriptives and randomization check

Participants reported having positive affect ($M = 3.40$, $SD = .78$), a moderate level of stress ($M = 2.57$, $SD = 1.20$), and a moderate level of hunger ($M = 2.50$, $SD = 1.27$). On average participants had a mean BMI of 25.81 ($SD = 7.30$), and tried to eat healthily to a large extent ($M = 3.61$, $SD = .98$). A chi-square test indicated no significant differences in the distribution of gender between conditions, χ^2 $(1, N = 109) = .00$, $p = 1.00$. There were no significant differences between the conditions on affect, F $(1,107) = .09$, $p = .77$; stress, F $(1,107) = .56$, $p = .46$; hunger, F $(1,107) = .17$, $p = .68$; or BMI, F $(1,107) = .56$, $p = .466$. However, because on average participants in one of the cognitive load conditions reported a higher extent of healthy eating, F $(1,107) = 6.59$, $p = .01$, and that this variable was also significantly correlated with the size perceptions of the healthy ($r = .22$, $p = .02$) and unhealthy food ($r = .21$, $p = .03$), extent of healthy eating was subsequently included as a covariate in the main analysis.

Effects of cognitive load and food type on size estimations

A mixed between-within subjects analysis of covariance (ANCOVA) was employed to examine the effect of cognitive load and food type, as well as their interaction on the size estimations of healthy versus unhealthy food. Cognitive load (high vs. low) was a between-subjects factor, and food type (healthy vs. unhealthy) was a within-subjects factor. The size estimation of neutral products, extent of healthy eating were included as covariates in the analysis. Moreover, presentation order was controlled for as a between-subjects factor. Size estimation, as the dependent variable, was given in centimetres (cm) with 2 decimal places. Five participants were excluded from the analysis because of their size estimations exceeding 3 *SD*'s above or below the mean size estimation for both healthy and unhealthy food and neutral products, resulting in a final sample size of 104 participants.

Results showed that there was no significant main effect of cognitive load, $F(1,98) = .44$, $p = .51$, and also no significant main effect of food, $F(1,98) = 1.40$, $p = .24$. However, there was a significant cognitive load × food interaction, $F(1, 98) = 5.30$, $p = .02$, $\eta^2 = .05$ (see Figure 2). Simple main effects revealed that when participants were under a low cognitive load (where their working memory was not constrained), the size estimation of the healthy food ($M = 8.82$, $SE = .25$) was significantly greater than the unhealthy food ($M = 8.45$, $SE = .22$), $p = .02$. In contrast, when participants were under a high cognitive load (where their attentional capacity was limited), the size estimation of the healthy food ($M = 8.34$, $SE = .26$) was similar to that of the unhealthy food ($M = 8.49$, $SE = .23$), $p = .35$. On the other hand, despite that the size estimation of the healthy food was greater in the low cognitive load condition ($M = 8.82$, $SE = .25$) relative to the high cognitive load condition ($M = 8.34$, $SE = .26$), this difference did not reach statistical significance, $p = .20$. The increase in size estimation of the unhealthy food from the low cognitive load condition ($M = 8.45$, $SE = .22$) to the high cognitive load condition ($M = 8.49$, $SE = .23$) was also not significant, $p = .92$. The size estimation of neutral objects was a significant covariate, F $(1, 98) = 102.75$, $p < .001$, $\eta^2 = 51$. Extent of healthy eating was not a significant covariate, $F(1, 98) = .001$, $p = .98$. Lastly, presentation order interaction effect did not influence the observed results, F $(1, 98) = .25$, $p = .62$.

Discussion

Taking into account the potential influence that participants' initial extent of healthy eating would have on their size estimations of healthy and unhealthy food, Study 2 was able to demonstrate the robustness of the pattern of results found in Study 1. In Study 2 it was also observed that when participants were under a low cognitive load where their working memory capacity was unconstrained, they exhibited greater approach motivation towards the healthy option as reflected by their increased size estimations of the healthy food item.

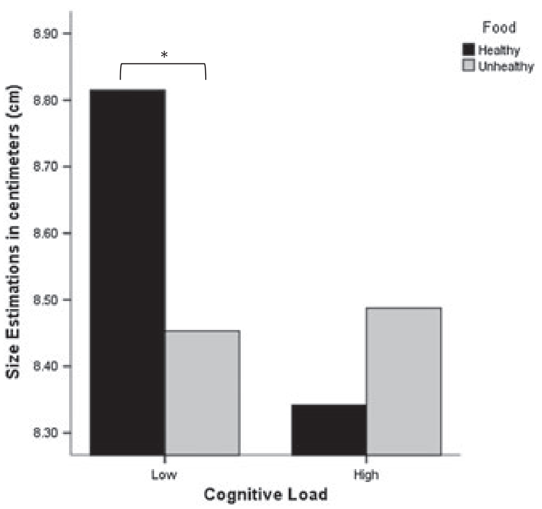

Figure 2. Size estimations of the healthy food object vs. the unhealthy food object as a function of low vs. high cognitive load. Size estimations of neutral objects and extent of healthy eating are included as covariates in the model. * $p < .05$

However, this difference in perception where the healthy food appeared greater in size than the unhealthy food was no longer apparent when participants were under high cognitive load. We interpret this finding such that when individuals have their working memory taxed by a high cognitive load, they are in an impulsive state where they are less able to keep their long-term goals (e.g., health) in mind (Ward & Mann, 2000). Consequently, when confronted with a healthy food item and an unhealthy food item, people under a high cognitive load no longer show an increased motivation towards the more virtuous option as their counterparts who do not have their working memory taxed.

GENERAL DISCUSSION

Through two studies, the aim of our current research was to understand motivation as an underlying mechanism that underlies people's self-control success on a state level. Drawing inspiration from the recent Process Model (Inzlicht & Schmeichel, 2012) that emphasizes motivation as an underlying component of self-control performance, as well as the indirect evidence from the novel perspective of effortless self-control (Gillebaart & Ridder, 2015), we predicted that the advantage of people who succeed in self-control is that they have greater approach motivation towards the healthy food than the unhealthy food. Results from both studies supported our hypothesis, as reflected by greater size estimations of the healthy food by participants who were in a reflective state where they have not been depleted by a prior act of self-control (Study 1), or were not mentally occupied by a high cognitive load (Study 2).

While numerous studies in the existing self-control literature up to date have so far focused on self-control failure and few have examined motivation as an underlying process of self-control, the current research contributes some interesting findings in filling a research gap of self-control success. Meanwhile, the findings of our research may even shed some insight on why people fail to control themselves. Conventionally low self-control is described as a situation where the overwhelming desire of the temptation takes over, leaving people prone to giving in and finally to self-control failure. Current findings may allow us to entertain the speculation that perhaps people fall into self-control failure not necessarily because they are succumbed by the overwhelming desire of temptations, but rather that they no longer have the advantage of having inherent greater motivation to approach the healthy option that ultimately makes it easier to forego the temptation.

In spite of the robustness of our findings demonstrated through two studies, we should address the fact that the current research did not measure an actual choice outcome. From existing literature, it is evident that people in an impulsive (vs. reflective) state would be more likely to opt for the more immediately gratifying option that undermines a long-term goal. Rather than being concerned with *what* happens when people are in a reflective state, the current research aimed to shed light on *how* specific mechanisms support successful self-control, in which we demonstrated that greater approach motivation towards the healthy food was especially important. Nonetheless, future research could examine both approach motivation and measure choice outcome to shed light on how approach motivation as an underlying mechanism mediates or at least partially mediates actual choice observed on a behavioural level.

While the studies in the current research are the first to expand on the topic of state self-control success by measuring approach motivation, we welcome future studies to validate and extend on our findings using other methods. For example, rather than relying on 2D images presented on computer screens in the current research, future studies could employ real life tangible objects for the size perception task. Considering studies in functional research have shown that motivation biases distance perception (e.g., Balcetis & Dunning, 2010), using a distance perception task would be a complimentary method to investigate whether self-control success is also reflected by biassed distance perception to the goal-relevant object. Finally, future studies could use different items beside food objects to examine how approach motivation is devised between other 'virtue' and 'vice' objects in order to successfully resolve a self-control dilemma.

CONCLUSION

The current research commenced by asking what underlies state self-control success, and how motivation is devised between two conflicting stimuli (i.e., a healthy food vs. an unhealthy), in order to support the pursuit a long-term goal. Our findings suggest self-control success involves an initiation of greater approach motivation towards the more virtuous option, rather than a case of inhibiting a vice. This view supports the effortless self-control perspective (Gillebaart & Ridder, 2015) that people with high self-control find the healthy food more hedonically pleasing, as our findings indeed show people who are high in self-control or in a more reflective state to exhibit greater motivation to approach the more virtuous option. Furthermore, our results are also complementary to the Process Model (Inzlicht & Schmeichel, 2012) by demonstrating motivation as an important underlying mechanism of self-control performance.

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