

TURNING  
*Vice*  
*into*  
*Virtue*

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WHEN LOW SELF-CONTROL STATES  
FACILITATE GOAL-ORIENTED BEHAVIOURS

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# TURNING *Vice* *into* *Virtue*

## **WHEN LOW SELF-CONTROL STATES FACILITATE GOAL-ORIENTED BEHAVIOURS**

### **VAN ONDEUGD NAAR DEUGD**

Wanneer lage zelfcontrole helpt om doelen te verwezelijken  
(met een samenvatting in het Nederlands)

## **Proefschrift**

ter verkrijging van de graad van doctor aan de Universiteit Utrecht op gezag van de rector magnificus, prof.dr. G.J. van der Zwaan, ingevolge het besluit van het college voor promoties in het openbaar te verdedigen op vrijdag 12 mei 2017 des middags te 14.30 uur

door

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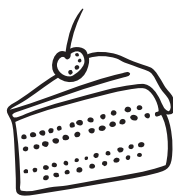
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# *General introduction*



CHAPTER 1

When there is a will, there is a way. Indeed, there is truth to this age-old proverb as research consistently shows self-control, or commonly known as willpower, as the force behind achieving success in many different walks of life. Self-control has been shown to be associated with higher academic success, more fulfilling interpersonal relationships, and more adaptive psychological adjustments (Tangney, Baumeister, & Boone, 2004). More recently research extends to suggesting that self-control even leads to more happiness in life (Cheung, Gillebaart, Kroese, & De Ridder, 2014; Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013). Considering the scientific definition that self-control is the capacity to modify predominant response tendencies to be in line with standards, morals or values (Baumeister, Vohs, & Tice, 2007), it is not difficult to understand why self-control is crucial for positive achievements. The journey towards achieving a long-term goal is inevitably bound with encounters with temptations of short-term gratifications that distract us from goal pursuit. For instance, a dieter might come across being offered a piece of cake at a party, and giving into the immediate pleasure of eating the scrumptious dessert would compromise their long-term goal for a slimmer waistline. Similarly, a student might face a choice between buying a functional laptop that is sufficient for everyday use versus a more expensive model that has an attractive design, and settling for the latter would undermine their long-term goal of saving money to pay off a student loan. In these situations the exertion of self-control helps us override impulses and forego short-term gratifications in support long-term goal pursuit.

At this point we should acknowledge that the capacity for self-control is conceptualized as both a trait and a state. As a basic temperament forming the basis of personality (Rothbart, Ahadi, & Evans, 2000), trait self-control is a dispositional capacity that remains relatively stable over a person's lifetime (Tangney et al., 2004). In contrast, state self-control is not static. The capacity for self-control on a state level waxes and wanes depending on situational and personal circumstances. Indeed, research has identified how mundane daily experiences such as having previously exercised self-control (i.e., ego-depletion; Baumeister, Bratslavsky, Muraven, & Tice, 1998), being mentally distracted (i.e., cognitive load; Shiv & Fedorikhin, 1999) and feeling viscerally aroused (e.g., feeling hungry; Loewenstein, 1996) could all impair self-control performance where people tend to act impulsively in a manner that compromises long-term goals. Referring to the previous examples, in these circumstances the dieter would probably take up the offer for the chocolate cake despite their goal to lose weight, just as the student would more likely opt out for the attractive, but more expensive laptop despite their goal to save. Besides these anecdotal examples, the negative consequences of ego-depletion, mental distraction, and visceral arousal have been widely documented by scientific research (e.g., Tal & Wansink, 2013; Vohs



& Heatherton, 2000; Ward & Mann, 2000). That said, it is not surprising these situational and personal circumstances have conventionally been negatively regarded as ill-fated for self-control failure.

However, in the current dissertation we aim to demonstrate how individuals could stay on the course of goal pursuit even when their capacity for self-control is assumedly impaired. Given that ego-depletion, mental distraction, and visceral arousal are features of the daily experience that are difficult to avoid, we propose to take advantage of these situational or personal circumstances. As opposed to suppressing the impulsive tendencies that tend to thrive in these conditions as means to circumvent self-control failure, we advocate for a different approach. We posit that individuals in low self-control states may benefit from relying on such ‘impulsive’ tendencies in these circumstances when certain conditions are met.

Research (e.g., Pocheptsova, Amir, Dhar, & Baumeister, 2007; Pohl, Erdfelder, Hilbig, Liebke, & Stahlberg, 2013) have shown that because individuals in a state of low self-control due to ego-depletion become inherently more impulsive, they are especially susceptible to following heuristics to facilitate their judgment and behaviours. Heuristics have been described as mental shortcuts or rules-of-thumb that facilitate decision-making in a low-effort manner (Cialdini, 2008). Intriguingly, there is emerging evidence that heuristics could be strategically implemented in the external environment to promote desirable behaviours. For instance, research has reported that ego-depleted individuals donated more money to a charity, especially when an authority heuristic (i.e., tendency to comply with agents perceived with high credentials; Cialdini, 2008) was implemented to endorse the cause by describing the charity as founded by a world-renowned organization (Janssen, Fennis, Pruyn, & Vohs, 2008). A recent study has also demonstrated that ego-depleted participants made more healthy food choices when a social proof heuristic (i.e., tendency to follow majority behaviour; Cialdini, 2008) was activated through the presentation of a pie chart allegedly depicting the majority of previous participants favouring the healthy options (Salmon, Fennis, De Ridder, Adriaanse, De Vet, 2014). Building on these research insights, the main objective of this dissertation is to provide more supporting evidence that individuals could exhibit effective self-control performance in low states of self-control, not only when they are experiencing ego-depletion, but also when they are experiencing the visceral state of hunger given that there are heuristics available to steer their behaviours toward goal-oriented outcomes. Through lab studies and a field experiment the current dissertation aims to demonstrate how contextual cues such as heuristics could be strategically installed in the environment to steer impulsive tendencies towards more desirable behavioural outcomes in line with long-term goals. In addition to this

main objective, we also take an attempt to dive deeper in understanding the role of motivation as an underlying mechanism of self-control performance by assessing how motivational forces toward immediate desires vs. outcomes that are beneficial in the long run are different in low vs. high states of self-control. Before elaborating on the specific studies in our research agenda, we first discuss the theoretical underpinnings that inform our understanding of self-control, and justify the rationale for our research questions.

## **Dual-processing theories and self-control performance**

To understand self-control performance we turn to dual-process models of behaviour, which posit that behaviours arise from the interaction between two modes of processing: an unconscious, fast, and automatic mode (System I), and a slow, conscious, and deliberative mode (System II; e.g., Evans, 2008; Kahneman, 2011). System I processing operates automatically by default through associations, heuristics and intuition, as it is also heavily influenced by external cues in the environment. The majority of behaviours, as research suggests, arise from such underlying non-conscious automatic processing (e.g., Bargh & Morsella, 2008; Cialdini, 2008; Dijksterhuis, Smith, Van Baaren, & Wigboldus, 2005). Nevertheless, while System I processing suffices for getting by day-to-day activities, it is prone to cognitive biases and judgement errors. On the other hand, the operations of System II are guided by goals, explicit beliefs and intentions, and with sufficient effort and volition System II processing can intervene, override, and modify the automatic tendencies of System I. The moderation by System II is especially important when there is incompatibility between the automatic responses generated by System I and the goals or intentions endorsed by System II. For instance, the sight and smell of a freshly baked chocolate cake might automatically trigger strong impulses for consumption, yet the act of indulgence would contradict a conscious dieting goal. In this scenario, if System II processing can effectively manage the impulse in line with the dieting goal, then the behavioural outcome (e.g., restraint) ensued would be a successful act of self-control.

However, System II does not always take an active stance in managing the automatic response tendencies of System I, in which case the ‘problematic’ impulses tend to prevail and long-term goals are compromised. As mentioned before, research has identified circumstantial factors that undermine System II processing and in the current dissertation we focus on ego-depletion, cognitive load and the visceral experience of hunger. As we will explain in the following section, while ego-depletion, cogni-

tive load, and hunger are different circumstances with different situational demands, they all engender similar behaviours and responses that typically do not support long-term goals. As such, in the current dissertation we conceptualize these situations as states of low self-control because the ability for self-control to inhibit impulses is generally impaired in these scenarios. There are of course other situational factors (e.g., alcohol intoxication, fatigue) besides ego-depletion, cognitive load, and the visceral experience of hunger that could influence the interplay between System I and System II processing to affect self-control; however, we have chosen to discuss these three particular states because they are situations that people commonly encounter in everyday life.

Critically, as one of the three main objectives of the current dissertation we investigate how ego-depletion, cognitive load, and the visceral experience of hunger inhibit System II processing while heightening the propensity to rely on System I processing. In this regard we specifically investigate how motivational processes toward immediate desires vs. outcomes with long-term benefits may manifest differently when their System II processing is assumedly impaired under states of low self-control (i.e., ego-depletion and cognitive load).

## **Situational factors affecting self-control performance**

**Ego Depletion.** According to the strength model of self-control (Baumeister et al., 2007), self-control is a limited resource that becomes diminished over repeated use. Every volitional act of self-control draws from this finite resource such that prior exertions of self-control leave less available resources to support performance in subsequent self-control tasks. Accordingly, the term ego-depletion refers to the state of diminished resources resulting from previous engagements of self-control. Numerous studies have demonstrated and reported the ego-depletion effect using a dual-task paradigm that engages participant in an initial self-control task at Time 1 and a subsequent unrelated self-control task at Time 2 where their performance is measured. For instance, using the dual-task paradigm where it has been shown that dieters who had to exercise self-control in order to refrain from displaying emotions during a sad film ate much more ice cream in a subsequent bogus taste test (Vohs & Heatherton, 2000); individuals who had to eat unappetizing radishes while resisting the temptation of eating cookies subsequently gave up faster on solving puzzles (Baumeister et al., 1998); and individuals who had to watch a boring film while stifling emotional and physical

reactions exhibited more aggressive responses later on (Stucke & Baumeister, 2006). Self-control is necessary for overriding automatic impulses, suppressing thoughts, enduring a difficult task, making a succession of high-involvement choices, and other tasks that typically require System II processing (Kahneman, 2011). However, as ego-depletion impairs the ability to exert self-control, this undermines System II processing and enhances the role of System I processing in influencing overt behaviours. One of the main objectives of the current dissertation is to extend on the research by Salmon and colleagues (2014), by generating more supporting evidence that under ego-depletion the prominent influence of fast, automatic and heuristic-based processing of System I could lead to goal-oriented behaviours. Nonetheless, before expanding on this research agenda, it is necessary to first address the topical scientific discussions over the ego-depletion effect.

**Topical debates on ego-depletion.** The ego-depletion effect is an intriguing and curious case to researchers for a variety of reasons. Most people can probably relate to the lapses of self-control in their daily experience, and the resource model of self-control (Baumeister et al., 2007) that conceptualizes self-control as a limited resource offers a parsimonious explanation for the fluctuations in people's self-control performance. A meta-analysis by Hagger, Wood, Stiff and Chatzisarantis (2010) analysed 83 studies that had employed the dual-task paradigm to study the ego-depletion effect of an initial self-control task on participants' performance in a second self-control task, and reported the overall effect ego-depletion effect to be moderate and significant ( $d = .62$ ). This meta-analysis also acknowledged studies that found motivational incentives to significantly mitigate the ego-depletion effect (Muraven & Slessareva, 2003) and accordingly recommended research initiatives to further assess the role of motivation in accounting for self-control performance. Interestingly, there is also evidence showing that lay beliefs could redirect the course of self-control outcomes. The research by Job, Dweck and Walton (2010) demonstrated that participants who held beliefs of non-limited willpower (compared to participants who believed in finite willpower) were able to overcome the ego-depletion effect. These findings not only offer implications for enhancing self-control performance, but also highlight the involvement of motivation in accounting for the ego-depletion effect.

The process model (Inzlicht & Schmeichel, 2012) of self-control has been put forth as an alternative to the resource model in understanding why ego-depletion occurs. The process model posits that after already engaging in a prior act of self-control, people fail to execute self-control on a subsequent task because their priorities change. It is not necessarily because a 'resource' has been depleted, but that motivation and attention have been reoriented towards engaging in rewards (e.g., giving into pleas-

urable short-term gratifications) as opposed to long-term goal-oriented behaviours. Put differently, self-control performance is contingent on motivation and focus rather than a depleting resource. Correspondingly, the process model could accommodate the findings that beliefs and incentives can counter ego-depletion effects (i.e., given appropriate and sufficient incentives, people would remain motivated to commit to self-controlling over multiple tasks). In light of the debates that have pitted self-control as a limited capacity against motivational and attentional processes as two incompatible sources responsible for self-control performance, it is worth acknowledging that recently a more integrative view of self-control capacity and motivation has been put forth. Specifically, the integrative self-control theory (Kotabe & Hofmann, 2015) considers self-control resource (i.e., cognitive resources such as executive attention) and motivation as two integrative components working in parallel to direct potential effort for self-control performance. Furthermore, both resource and motivational components are prone to depletion effects from prior self-control engagements.

While it has been generally accepted that motivation plays a role in supporting self-control performance (Vohs, Baumeister, & Schmeichel, 2012), the floor is still opened for interpreting how motivation might underlie self-control performance. In one particular study by Schmeichel, Harmon-Jones, and Harmon-Jones (2010), it was observed that after initial exertions of self-control participants were much quicker to identify the presence of reward-related cues (vs. neutral cues). This observation was interpreted as a shift in motivation towards rewards (after a previous self-control task) that set the precedence for self-control failure. To our knowledge the work by Schmeichel and colleagues is the only study up-to-date that has directly examined approach motivation towards rewards as an underlying mechanism of self-control performance. In response, in the current dissertation we aim to contribute to the literature by taking an attempt to assess how motivation underlies self-control performance on a state level. Studying the role of motivation in supporting self-control performance not only addresses a research gap, but is also timely considering the emerging findings from trait self-control research – people with higher trait self-control have more advantageous strategies in facilitating their success in resolving self-control conflicts, such that they find virtues (e.g., healthy food) to be inherently more rewarding than vices (e.g., unhealthy food; Gillebaart & Ridder, 2015). Although there is no clear consensus on how trait and state self-control may be related, we take these novel findings as indirect evidence in support of the prediction that people may have different motivation-orientations towards immediate desires vs. outcomes with long-term benefits when they are in a state of high vs. low self-control. To test our hypothesis (Chapter 2), we examine how approach motivation is manifested towards a reward-related cue (i.e., a tasty but unhealthy food product) vs. a goal-related cue (i.e., a less tasty but healthy

food product).

Besides the theoretical discussion over how self-control performance may be dependent on a limited resource as posited by the resource model or attributable to motivation orientation as posited by the process model, more recent scientific debates have questioned the effect size and simply the existence of the ego-depletion effect. Researchers Carter and McCullough (2013) have raised concerns over the possibility of an inflated ego-depletion effect size reported in the initial meta-analysis by Hagger and colleagues (2010). Their concerns derive from the main criticism that that original meta-analysis (Hagger et al., 2010) included only published studies, thereby subjecting the data to favour positive results (i.e., publication bias). In two subsequent published papers, Carter and McCullough reanalyzed the initial meta-analysis data using statistical methods to estimate and correct for this shortcoming, and found that the ego-depletion effect size was overestimated due to publication bias (Carter & McCullough, 2014); and that the inclusion of data from 48 unpublished experiments in the meta-analysis yielded little evidence of a significant ego-depletion effect (Carter, Kofler, Forster, & McCullough, 2015).

In light of these findings, a large-scale registered replication project (2016) led by Martin Hagger, who was the author of the original 2010 meta-analysis, was conducted to resolve some of this uncertainty. As the topic of ego-depletion forms an integral part of the current dissertation, we have also participated in this replication project. This replication project employed the dual-task paradigm using tasks employed in study by Sripada, Kessler, & Jonides (2014) to study the ego-depletion effect. Specifically, the first task was a modified version of the ‘Letter E’ task (Baumeister et al., 1998) that involved effortful regulation, where participants had to react to the words shown on the computer screen (i.e., in the control condition, participants simply had to respond if they see a letter ‘e’ appearing on the screen; whereas in the depletion condition, participants had to respond when the letter ‘e’ was displayed but refrain from reacting if the letter ‘e’ was next to or one letter away from a vowel). The second task was the Multi-Source Interference Task (MSIT; Bush, Shin, Holmes, Rosen, & Vogt, 2003) that assessed regulatory control. In the MSIT, a string of 3 digit numbers was displayed on the computer screen and participants were required to respond with the keyboard using their index, middle and ring fingers. On each trial, one digit (the target digit) would be different from the other two (matching distractor) digits, and participants had to respond to the ‘identity’ of the target digit as opposed to its ‘position’. On the congruent trials, the identity (e.g., 1) of the target digit was the same as its position (e.g., 100), but on the incongruent trials there was a discrepancy between the identity and position of the target digit (e.g., 010). The in-

congruent trials prompted for regulatory control to override the impulse for pressing for position, and performance on the MSIT was assessed as the dependent measure of self-control performance. The decision to include the Letter E task and the MSIT in the dual-task paradigm was based on the fact that these two tasks were standardized computer tasks that could be adopted by the 23 different participating labs around the world, and this experimental paradigm had been approved after consultation with Roy Baumeister. Analyzing the results from the 23 participating labs, the meta-analysis of the replication project revealed that only two labs generated significant results, with one lab acquiring significance in the opposite direction. Contrasting the effect size ( $d = .62$ ) reported in the meta-analysis published in 2010, the size of the ego-depletion effect from the replication project was small ( $d = .04$ ) and statistically non-significant. The findings of the replication project are arguably alarming, and have prompted scholarly responses that ranged from critiquing the design and shortcomings of the experimental protocol of the dual-task paradigm as a contributing factor for the null finding (Baumeister & Vohs, 2016), to an explicit declaration of a non-existent ego-depletion effect (Otgaar, 2016). As one of the participating labs of the replication project, we recognize that this is a seismic challenge to the field of self-control research and to the numerous studies published on the ego-depletion effect. On one hand, we recognize that findings of replication project critically raise questions about our understanding of ego-depletion, on the other we also approach this situation as an opportunity for taking different approaches to assess and conceptualize self-control failure. For instance, the measurement of self-control performance does not necessarily have to be confined within the context of the dual-task paradigm. Alternatively, research could invest in more ecologically valid alternatives outside the lab to assess people's self-control performance. Fundamentally people's self-control can lapse, but it still remains questionable when and why this happens. The findings from the replication project only serve as a reminder of such unanswered research questions. While the research activities of the current dissertation coincided with the debate regarding the causes of ego-depletion as well as the revelations of the replication project, the goal of the current dissertation is not to provide direct answers or establish a position in the debate. Instead, in the current dissertation we investigate other situational factors besides ego-depletion that undermine people's self-control performance in order to gain a more rounded understanding of state self-control. Additionally, we investigate strategies that may curb the negative consequences that are typically associated with states of low self-control.

**Cognitive load.** A second factor that hampers state self-control is cognitive load. Cognitively demanding tasks could also hamper System II processing, thereby giving more leverage to System I to steer behaviour. Having to engage in a cognitive task requires attention, which makes it more difficult to monitor temptations that arise and accordingly moderate behavioural responses. Hence, the simultaneous participation in a mentally effortful task and regulation of behaviour in line with standards effectively is difficult. Studies have consistently shown that being cognitively busy could affect self-control outcomes. For example, people who had to make a choice between a chocolate cake vs. a fruit salad were much more likely to choose the former when they had to keep a seven-digit number in mind (Shiv & Fedorikhin, 1999); and dieters who had their attention distracted from a memory-recognition task were less likely to monitor their consumption of unhealthy snacks (Ward & Mann, 2000). Thus, cognitive load leads people to being more reliant on their impulses rather than on their rational goals.

**Visceral states.** A third factor that hampers state self-control is the experience of visceral urges. Visceral urges such as hunger, thirst, pain, fatigue and sexual arousal can result in suboptimal choice and behaviours even when their detrimental consequences are predictable. The experience of a visceral reaction impels people to myopically focus on satisfying their immediate urges, thereby inhibiting System II processing from directing more rational choice or behaviour. The visceral experience of hunger has consistently been documented as an influencing factor that impacts self-control outcomes. Hunger is a daily experience and it is not difficult to imagine how the urge to respond would violate a health-related goal – as the sensation of an empty stomach heightens the automatic response for consumption, the tempting properties of unhealthy food also intensify. Indeed, hunger induces impulsive behaviour (Loewenstein, 1996), such that hungry (vs. satiated) shoppers buy a higher proportion of high-caloric food than low-caloric food (Tal & Wansink, 2013), dieters weaken their dieting intentions in the heat of the moment (Nordgren, van der Pligt, & van Harreveld, 2008), and people irrationally select more junk food for future consumption (Read & Van Leeuwen, 1998). These examples illustrate how in the face of hunger System I processing gains more leverage than System II processing, thereby leading to behavioural outcomes more likely to satisfy an immediate gratification at the expense of a higher-order goal.



## **The influence of heuristics and environmental influences in states of low self-control**

We have described how ego-depletion, cognitive load, and the visceral experience of hunger inhibit System 2 processing, thereby leading individuals to rely more on System 1 to make decisions and to guide behaviours. The subsequent part of our investigation in the current dissertation is to examine how the reliance on System 1 processing heightens people's susceptibility to the influence of heuristics and environmental influences. Importantly, the second objective of the current dissertation is to test the hypothesis that when individuals in states of low self-control become increasingly dependent on System 1 processing, they could benefit from following heuristics and environmental influences that steer their choices and behaviours towards more advantageous outcomes favouring long-term goals. In following section, we discuss the literature that has contributed to the rationale of our research question.

The research by Pocheptsova and colleagues (2009) examined the consequences of ego-depletion on the interplay between System I and System II processing on choice. The researchers demonstrated that ego-depletion inhibited one's ability to engage in effortful and deliberative System II processing, thereby leaving the decision-maker to rely more on System I processing that is prone to contextual effects. They observed that predominant System I processing led ego-depleted individuals to exhibit more biases arising from contextual influences (i.e., reference-dependent choice, the attraction effect), whereas biases that derive from careful trade-off evaluations directed by System II decreased (i.e., the compromise effect). They also found that participants who were depleted were more inclined to avoid engagement in effortful processing, as reflected by their increased likelihood for choice deferral. These findings are dovetailed by the research by Pohl and colleagues (2013) who observed that ego depleted participants were more impelled to use a recognition heuristic (i.e., the inference that the recognizable option has higher value) to facilitate decision-making.

Together, the findings from the research by Pocheptsova et al., (2009) and Pohl et al. (2013) corroborate the notion that a state of low self-control due to ego depletion leave individuals to resort to low effort processing (System I) that fosters the reliance on heuristics and contextual cues. Based on the premise that states of low self-control dispose individuals to more reliance on System I processing, we propose to take advantage of such decision-processing characteristics by strategically employing heuristics to promote goal-oriented behaviours. That said, we predict that even individuals in a state where their self-control capacity is assumed to be impaired (e.g.,

due to ego-depletion, or hunger) would be able to resolve self-control conflicts successfully when they follow the suggestions of a heuristic to strive for outcomes in line with long-term interests and forego immediate desires. Salmon and colleagues (2014) were the first to provide supporting evidence for this view. The researchers showed that the choice outcome of a food choice between a healthy vs. a more palatable, but unhealthy food in a self-control conflict could be influenced by the presence of a social proof heuristic in the choice setting. A heuristic is a decisional shortcut or a mental rule of thumb that facilitates decision-making by reducing cognitive effort and the amount of information to be processed (Shah & Oppenheimer, 2008). The rationale is that ego-depleted participants would be more impulsive to rely on using heuristics to help them expedite their decision-making when having to make trade-offs choices in self-control conflicts. Accordingly, the study by Salmon and colleagues found that when a social proof heuristic (i.e., a pie chart conveying that the majority of previous participants had made a healthy choice) was presented to promote the healthy option in the self-control conflicts, participants who were depleted indeed made significantly more healthy choices than when no heuristic was available.

The research by Salmon and colleagues (2014) produced innovative findings with implications for designing strategies to promote healthy eating, especially for individuals under states of low self-control. On one hand these findings demonstrate the external environment is influential on people's self-control behaviour and could be tailored to promote successful self-control. On the other hand, it appears that states of low self-control are not necessarily detrimental and that heuristic-based decision-making that lack careful deliberation (i.e., more dominant System I processing over System II processing) could facilitate self-control success. Nonetheless these novel results also raise new research questions to be considered. Critically, in light of the debate surrounding the existence of the ego depletion effect, it would be crucial to demonstrate that the findings by Salmon and colleagues are replicable.

Reiterating the second objective of the current dissertation, we aim to demonstrate that individuals in states of low self-control, who are increasingly reliant on System I processing, would particularly benefit from following heuristics that steer their choices and behaviours towards more advantageous outcomes favouring long-term goals. To this end, we build on Salmon and colleagues' research by first conducting a conceptual replication (Chapter 3) in which we test the influence of a scarcity heuristic, as an alternative to the social proof heuristic in conditions of low self-control resulted from ego-depletion. Furthermore, as we examine other situational factors besides ego-depletion that may result in lapses in self-control, we assess the consequence of hunger on choice behaviour (Chapter 4). Specifically, we are inter-

ested in whether the social proof heuristic would be effective in promoting healthy food choices for hungry individuals. Based on the same rationale, we predict that the visceral experience of hunger would dispose people to rely more on heuristic-based processing, and that hungry individuals were be more likely to enact the suggestions of a social proof heuristic promoting healthy food choices.

Deviating from traditional notion that low states of self-control set the stage for self-control failure, the current dissertation aims to portray low states of self-control in a more positive light, such that they provide favourable circumstances for heuristics and contextual influences in general to steer people's choices and behaviour towards outcomes in line with long-term goals. That said, the final part of the current dissertation is concerned with assessing the effectiveness of heuristics, as well as other contextual cues, implemented in real-life settings to promote goal-oriented behaviours in situations where people are not inclined to exert self-control. Accordingly, this brings us to the topic of nudging.

## —— Nudging strategies

The term nudging was coined by Thaler and Sunstein (2008) to describe strategies that involve changing aspects of the physical environment to steer people's behaviour predictably towards outcomes that align with their interests, but without imposing restrictions or significantly changing economic incentives. Importantly, rather than requiring people to engage in deliberative and reflective thinking (i.e., System II processing), nudging strategies accommodate people's default reliance on System I processing by working with their predominant automatic tendencies to promote desirable behavioural outcomes in the interest of individuals or society at large. The use of social proof heuristics to promote healthy eating is an example of nudging because it relies on changing the presentation of choices by showcasing a descriptive norm (that promotes healthy food products) to facilitate the decision for a healthy food choice. Other examples of nudging include placing healthy food items in more convenient locations that are highly accessible (e.g., accessibility nudge: relocating healthy snacks check-out cashiers to improve grab and go appeal), or presenting them more attractively with decorations (e.g., salience nudge: displaying fruit in attractive bowls or tier stands rather than plastic tubs; Hanks, Just, & Wansink, 2013). These specific nudging examples described above work by increasing the convenience, attractiveness, and perceived normality of making a healthy choice.

Nudging interventions have increasingly gained interests from governments

around the world and have been adopted to promote a wide range of behaviours including, but not limited to, the promotion of healthy eating, financial savings, and organ donations (Ly & Soman, 2013; Sunstein, 2016). Despite of their growing popularity, nudging strategies have also encountered criticisms. In essence, nudging involves implementing changes to physical environment, choice context, or task presentation in a manner that works with people's propensity for automatic processing in order to encourage more optimal outcomes. However, this approach of working with System I processing has generated criticisms that nudging may only be effective if people are not cognizant of being influenced (Bovens, 2009). For instance, if students were informed that the display of the food in the school cafeteria were intentionally arranged to promote healthy products, the nudging intervention might consequentially backfire. The reasoning is that disclosing the intended purpose of nudges may trigger psychological reactance (Wortman & Brehm, 1975), in which people deliberately resist their influence in reaction to feeling manipulated or having their freedom of choice threatened. Furthermore, there have also been ethical concerns raised over the implementation of interventions (i.e., nudges) that are assumed to influence individuals outside of their awareness (Hansen & Jespersen, 2013; House of Lords, 2011).

In response, the final objective of the current dissertation in examining the effectiveness of nudging in real-life settings is three-fold. First, we conduct our research on nudging in the domain of healthy eating promotion. Specifically, we assess the impact of three types of nudges (i.e., accessibility nudge, salience nudge, and social proof nudge) in promoting healthy food choices in a field study (Chapter 5). Second, we investigate whether the impact of nudging is dependent on consumers' unawareness of their influence. To this end, we test how using a simple message to disclose the purpose of a nudge might affect its impact – whether such disclosure measure could be a viable solution for enhancing transparency of a nudge or on the contrary, undermine its influence. Third and finally, in addition to testing whether nudging is an effective strategy, in the current dissertation we also make an attempt to explore how consumers, whom one could argue as the most important group of stakeholders, perceive the implementation of nudging strategies targeting their behaviours (Chapter 6). Together results from these investigations not only increase the understanding of how nudges operate but offer relevant implications for ongoing debates surrounding the ethics of nudging. In the section below we discuss why the domain of healthy eating promotion is particularly relevant for testing the effectiveness of nudging interventions.

**Nudging and the promotion of healthy food choices.** Having a healthy diet is often considered as a form of self-control success. Indeed, according to tradi-

tional models of health behaviour self-control is necessary to make informed decisions and to mobilize goal-directed behaviours (Hofmann, Friese, & Wiers, 2008). Considering that most people want to be healthy and active agents while many also place an importance on dieting (De Ridder, Adriaanse, Evers, & Verhoeven, 2014), one would assume that people would make conscious and informed decisions to guide their food choices and exercise self-control over their eating practices in pursuit of such health goals. Nevertheless, it appears that in reality food choices occur in conditions of low, rather than high self-control as research suggests that consumers often make food decisions mindlessly (Wansink & Sobal, 2007) as the result of habit, affect, impulse, or even spontaneous reactions to the environment as opposed to conscious and careful deliberation (Cohen & Babey, 2012; Wansink, 2004). Furthermore, global statistics also indicate the high prevalence of unhealthy eating. According to the World Health Organization (2014), obesity has been increasing globally. The worldwide prevalence of obesity nearly doubled between 1980 and 2014 – it has been estimated that in 2014 11% of men and 15% of women around the world experienced obesity. The downstream consequences of unhealthy eating are concerning on both the individual and societal level. Obesity increases the likelihood of non-communicable diseases (e.g., diabetes, hypertension, cardiovascular diseases), which in turn are not only placing increasing financial strains on healthcare systems (Muka et al., 2015), but even more worryingly have become the leading cause of deaths worldwide (WHO, 2014).

Needless to say there is an utmost urgency to design and implement effective interventions to tackle the issue of unhealthy eating. In recent years there has been increasing recognition from the fields of psychology, behavioural economics as well as public policy that traditional information-based interventions for healthy eating promotion are not sufficiently effective in achieving actual behaviour change (Capacci et al., 2012; Hollands, Marteau, & Fletcher, 2016; Marteau, Hollands, & Fletcher, 2012). A plausible explanation for the limited success of such information-based approach for health promotion is that it requires consumers to engage in deliberate and rational information processing, which is at odds with the majority of how food decisions naturally occur (Marteau et al., 2012). Nudging, on the other hand, does not require deliberate processing or the investment of substantial effort from the part of the individual. Instead, it promotes behaviours via changing the physical environment to target automatic processing, which, as said before, underlie the majority of food decisions. Hence, as an alternative to traditional information-based interventions, nudging presents itself as a particularly suitable and promising strategy for promoting healthy food choices.

While shaping the environment to better support healthful decisions has the potential to be a successful intervention in combating the obesity epidemic (Lake & Townshend, 2006), systematic reviews on nudging in the domain of healthy eating promotion has nevertheless called for more research to examine the impact of nudges in real-life settings before drawing confident conclusions about their effectiveness (Skov, Lourenco, Hansen, Mikkelsen, & Schofield, 2013). The third objective of the current dissertation in examining the effectiveness of nudging in healthy eating promotion directly answers this call for research. On a practical level, findings will offer relevant implications for designing more effective healthy eating promotion interventions, which are much needed in light of public health concerns over obesity worldwide. Meanwhile on a theoretical level, findings also contribute to a broader theme in understanding how goal-oriented behaviours, such as healthy eating, could be achieved even in real-life situations where people are not inclined to exert self-control.

## —— **Aims and Overview of Chapters**

In our research endeavour in deepening our understanding self-control, we begin by investigating the underlying mechanisms that support self-control performance. Drawing insights from recent theorizing by the process model (Inzlicht & Schmeichel, 2012) as well as the effortless self-control account which we will discuss more elaborately later, in Chapter 2 we examined the role of motivation as an underlying mechanism in facilitating people's choice behaviour in favour of healthy food options. Accordingly, we investigated people's approach motivation towards a healthy vs. more palatable but unhealthy food product. In particular, we were interested in how the pattern of motivation directed towards a healthy vs. unhealthy product might be different when people are in a state of high self-control compared to state of low self-control. To this end, we used two different types of manipulation (i.e., ego depletion and cognitive load) to simulate different states of low self-control, and employed a size perception task to assess approach motivation.

The second part of the dissertation is based on the view that states of low self-control do not invariantly lead to suboptimal outcomes that compromise long-term goals. On the contrary, our aim was to demonstrate that self-control success (e.g., making healthy choices) could be scaffolded by contextual cues in the choice setting. We posit that an 'impulsive' choice made in a state of low self-control could be a healthy choice given that there are appropriate cues in the environment promoting the healthy options. Extending on Salmon and colleagues' (2014) research that examined the influence of the social proof heuristic on ego-depleted participants, Chapter

3 first tested the scarcity heuristic as an alternative to the social proof heuristic in promoting healthy food choices for participants with low self-control capacity. Subsequently, it investigated whether the hypothesized effects of the scarcity heuristic would generalize to promoting a utilitarian consumer good in a trade-off with a more attractive hedonic alternative for individuals under ego-depletion; and whether its effectiveness might hinge on its endorsement of a social proof component. In Chapter 4 we subjected the social proof heuristic in a more stringent test. We assessed whether the impact of a social proof heuristic to promote healthy food choices would be robust in a state of low self-control resulting from the visceral experience of hunger, where the temptation of the unhealthy options would be even stronger.

The final component of this dissertation consists of two chapters concerned with applying heuristics and other contextual cues, strategies generally known as nudging, in the real world to promote healthy choice outcomes. In Chapter 5 we conducted a field study to test the effectiveness of three nudging strategies including an accessibility nudge, a salience nudge, and a social proof nudge to promote the purchases of three different healthy food products. Although we did not employ any experimental manipulations to induce low self-control in this study, we believe that the setting of the field experiment, which was a take-away food vendor where consumers bought snacks and meals on the go, represent a prototypical situation where impulse purchases are made and food decisions are made with little deliberation. Additionally, this field experiment pursued a secondary objective in investigating whether the disclosure of the intended purpose of a nudge would interfere with its impact. Finally, Chapter 6 reported the findings from a qualitative study in which we conducted semi-structured interviews to explore consumers' perceptions and acceptance towards nudging strategies, especially when applied in the realm of health promotion. The results from this study offer important and practical implications for topical debates on the ethics of applying nudging strategies. Together, the aims of Chapter 5 and Chapter 6 were two-fold – to demonstrate that nudging, which capitalizes on people's automatic processing and impulsive tendencies, as a low-cost and effective tactic to promoting healthy choices in a real-world setting, and to explore potential solutions (i.e., disclosure) to enhance the transparency of nudging in light of ethical concerns.

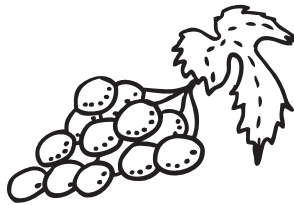
We would like to note that that the chapters could be read independently and in any order because they share an overarching research theme. As a consequence, the theoretical background of each chapter may contain overlapping content.





# *Self-control success revealed*

**GREATER APPROACH MOTIVATION TOWARDS  
HEALTHY VERSUS UNHEALTHY FOOD**



## CHAPTER 2

Cheung, T., Gillebaart, M., Kroese, F., & De Ridder, D. (2016).  
Self-Control Success Revealed: Greater Approach Motivation Towards Healthy versus  
Unhealthy Food. *Applied Cognitive Psychology*, 030(6), 846-853.

## **ABSTRACT**

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.

**S**elf-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 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., Imhoff, Schmidt, & Gerstenberg, 2013; Schmeichel & Zell, 2007), 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 biased 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.** Eighty-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)  $\times$  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-crossing 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' 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 cross-

ing 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,  $\chi^2(1, N = 84) = .00, p = 1.00$ . 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 standard deviations 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  $\times$  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,  $F(1, 74) = 170.12$ ,  $p < .001$ ,  $\eta^2 = .70$ . Lastly, presentation order interaction effect did not influence the observed results,  $F(1, 74) = .41$ ,  $p = .52$ .

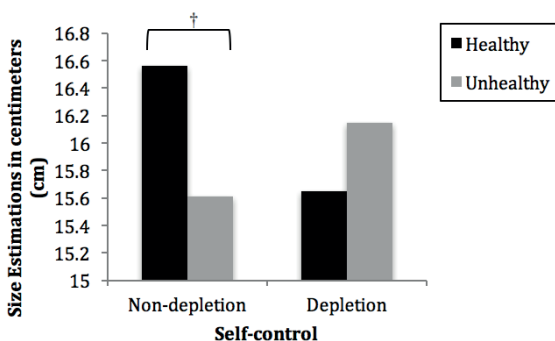


Figure 1. Size estimations of the healthy food object vs. the unhealthy food object as a function of high vs. low self-control. Size estimations of neutral objects are included as a covariate in the model. †  $p = .06$

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## 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.

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## Method

**Participants.** One-hundred and nine participants (40 males, 69 females) were recruited from an online testing platform ([www.prolificacademic.co.uk](http://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)  $\times$  2 (food: healthy vs. unhealthy) 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.

**Working memory capacity manipulation.** We employed a classic procedure to manipulate attentional capacity (Shiv & Fedorikhin, 1999). Having participants to keep in mind a 7-digit vs. a 2-digit number results in a state of high vs. low working memory capacity respectively. This manipulation was chosen because previ-

ous 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).

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## Results

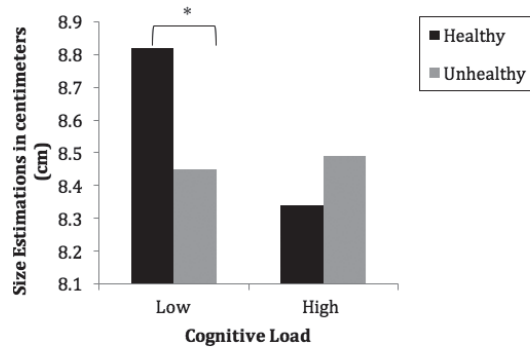
**Descriptives and randomization check.** Participants reported having positive affect ( $M = 3.40$ ,  $SD = .78$ ), a moderate level of stress ( $M = 2.57$ ,  $SD = 1.20$ ), and a moderate level of hunger ( $M = 2.50$ ,  $SD = 1.20$ ). On average participants had a mean BMI of 25.81 ( $SD = 7.30$ ), 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,  $\chi^2(1, N = 109) = .00$ ,  $p = 1.00$ . 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, and the 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 standard deviations 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  $\times$  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,  $F(1, 98) = .25, p = .62$ .

*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. \*  $p < .05$



## 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.

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. Con-

sidering 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 biased 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 & de 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.



## **ACKNOWLEDGEMENTS**

We would like to thank Marieke Adriaanse and Bob Fennis for their insightful ideas and input to the current research. The current research has been funded by the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement no. 290255.



# *Put a limit on it*

**THE PROTECTIVE EFFECTS OF SCARCITY  
HEURISTICS WHEN SELF-CONTROL IS LOW**



CHAPTER 3

Cheung, T. T., Kroese, F. M., Fennis, B. M., & De Ridder, D. T. (2015). Put a limit on it: The protective effects of scarcity heuristics when self-control is low. *Health Psychology Open*, 02(2), 2055102915615046.

## **ABSTRACT**

Low self-control is a state in which consumers are assumed to be vulnerable to making impulsive choices that hurt long-term goals. Rather than increasing self-control, the current research exploits the tendency for heuristic-based thinking in low self-control by employing scarcity heuristics to promote better consumption choices. Results indicate that consumers low in self-control especially benefited and selected more healthy choices when marketed as “scarce” (Study 1), and that a demand (vs. supply) scarcity heuristic was most effective in promoting utilitarian products (Study 2) suggests low self-control involves both an enhanced reward orientation and increased tendency to conform to descriptive norms.

**S**elf-control is important for a wide variety of consumer behaviours and decisions. Consumers have to exercise their capacity for self-control in order to make optimal choices, whether it is choosing a healthy, lean green salad instead of a scrumptious, double-layered chocolate cake; or prioritizing practicality over luxury when shopping for a product, self-control is required in order to override impulses, overcome temptations, and forego short-term gratifications in favour of the more beneficial long-term goals (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). However, consumers often do not exercise self-control to warrant well-considered choices and thoroughly processed decisions (Bargh, 2002; Wansink & Sobal, 2007). In a state of low self-control, consumers make choices that offer immediate gratification that may undermine their long-term interests. For instance, they make more unplanned purchases (Vohs & Faber, 2007) and buy more unhealthy snacks impulsively (Honkanen, Olsen, Verplanken, & Tuu, 2012). Furthermore, while consumers' decision-making process involves both cognition and affect, such that a virtuous choice like a healthy choice might not always be the product of "cold" cognition and exclusively void of affect (and vice versa for an unhealthy choice), research appears to converge that under low self-control consumers are typically more swayed by affective features of a product than by cognitive considerations (Bruyneel, Dewitte, Vohs, & Warlop, 2006). Accordingly, in order to circumvent such negative outcomes, an important undertaking would be to mitigate low self-control in order to facilitate better consumption choices that are in line with long-term interests. However, deviating from traditional approaches, the current research proposes to work with, rather than against, consumer's low self-control. Earlier work by (Fennis, Janssen, & Vohs, 2009) has suggested that consumers in states of low self-control become more susceptible to complying with marketing strategies based on influence principles (i.e. reciprocity, liking, and consistency). In light of this, in the current research, we investigate whether the influence principle of scarcity, a classic "weapon of influence" (Cialdini, 2008) that has yet to be tested in conditions of low self-control, can be used to guide consumers in low self-control states toward choices that foster their long-term interests. That is, we question whether scarcity endorsed by marketing appeals would invariantly lead to negative choices when self-control is low (i.e. choices that favour immediate gratification over long-term goals). Instead, the current research argues the opposite and aims to showcase scarcity as a strategic tool, rather than a lethal weapon, used in low self-control conditions to promote choices (e.g. healthy food choices and utilitarian products with long-term value) that would benefit consumers' long-term interests. Through two studies, the current research first demonstrates the influence of the general scarcity principle in low self-control and subsequently compares the effectiveness of two specific types of scarcity—supply scarcity versus demand scarcity—on consumers low in self-control.

## Low self-control and heuristics

A state of low self-control is proposed to occur because of previous volitional acts of self-control (or “willpower”) depleting a single, common limited resource, and ego depletion has been termed to describe the phenomenon of self-control failure due to previous exertion (Baumeister, Bratslavsky, & Muraven, 1998). Although this conceptualization of self-control is not undisputed (Carter & McCullough, 2013; Inzlicht & Schmeichel, 2012; Schmeichel, Harmon-Jones, & Harmon-Jones, 2010), there is considerable experimental support that exercising self-control in an initial task results in impaired subsequent self-control performance in a second, seemingly unrelated task (for a review, see Hagger, Wood, Stiff, & Chatzisarantis, 2010). When individuals are depleted and low in self-control, they tend to respond in a more acquiescent and passive manner (Wheeler, Briñol, & Hermann, 2007), as they are also more likely to resort to easier courses of action that are low-effort, habitual, and automatic (Janssen, Fennis, Pruyn, & Vohs, 2008). Considering that heuristics act as rules-of-thumb and mental shortcuts that facilitate decision-making by reducing time, cognitive effort, and the quantity of information to be processed (Shah & Oppenheimer, 2008), it is not difficult to imagine why heuristics are highly attractive in states of low self-control.

While previous research has shown people to increasingly rely on heuristics during decision-making under low self-control conditions (Pocheptsova, Amir, Dhar, & Baumeister, 2007; Pohl, Erdfelder, Hilbig, Liebke, & Stahlberg, 2013), the current research is the first to examine whether these findings generalize to the influence principle of scarcity. The influence principle of scarcity is frequently endorsed by marketers for product promotions (e.g. “Limited Time Offer!”, “Selling out fast! Get yours now while supplies last!”), because consumers often perceive scarce products as more valuable than products that are abundant (Cialdini, 2008; Verhallen & Robben, 1994). As the limited availability of a product is considered as a cue to the quality of the product, scarcity accordingly operates as a heuristic (Cialdini, 2008). The current research predicts consumers low in self-control to be increasingly prone to the effects of the scarcity heuristic. Furthermore, the current research proposes that by working with consumers’ susceptibility to heuristic-based thinking in low self-control conditions, a scarcity heuristic could be used to promote better (i.e. long-term oriented) consumption choices. Accordingly, in Study 1, the goal is to first demonstrate that the effect of scarcity would be especially enhanced in states of low self-control by testing the hypothesis that consumers low in self-control would select more healthy food choices if they were promoted by a scarcity heuristic emphasizing limited availability.

Nonetheless, while scarcity in general emphasizes the limited availability of a certain product, it could be driven by different circumstances such as supply or demand (Gierl, Plantsch, & Schweidler, 2008). It is important to draw the distinction between these two types of scarcity because while both supply and demand scarcity enhance product desirability, they operate through different inference processes. Supply scarcity is primarily due to short supply, for example, when a vendor is restricting the time period that a product is available (e.g. “Limited time offer!”). When the scarcity of a product is conveyed through supply, consumers use this as a heuristic inferring that the product is valuable due to its exclusivity. In contrast, demand scarcity occurs when there is a high amount of prior product purchases. By emphasizing that scarcity of a product is caused by demand (e.g. “Selling out fast! Get yours now while supplies last!”), consumers use this as a heuristic cueing a product is particularly popular among many others (van Herpen, Pieters, & Zeelenberg, 2014). Study 2 specifically compares the effects of supply scarcity versus demand scarcity in the context of low self-control conditions. Intuitively, one may predict supply scarcity to be more potent than demand scarcity due to its presumed impact on perceived product exclusivity (Van Herpen et al., 2014), but the reverse might actually be the case. More specifically, while the impact of supply scarcity on product desirability seems straightforward, an early meta-analysis (Lynn, 1991) has only shown a fair effect size ( $r = .12$ ); thus suggesting that while effective, the extent to which supply scarcity might trigger and satisfy the increased reward sensitivity that has been shown to be associated with conditions of low self-control (Inzlicht & Schmeichel, 2012; Schmeichel, Harmon-Jones, Harmon-Jones, 2010) might be modest. Demand scarcity, in contrast, might prove to be particularly effective under low self-control conditions. That is, as a heuristic, demand scarcity suggests that the limited availability of a product is due to its popularity among many others. This inference may resonate well with individuals low in self-control. Evidently, many people have chosen this product previously, and while this may convey a high-quality product, it might also signal something else—a descriptive norm (Cialdini, Kallgren, & Reno, 1991). The observation that a product is unavailable due to popular demand suggests what is the typical and prevalent behaviour in that specific context and critically functions as a cue to convey what is probably attractive or immediately advantageous for the individual (Jacobson, Mortensen, & Cialdini, 2011). Corroborating the impact of descriptive norms in a different context, in a series of studies Jacobson et al. (2011) have indeed found compelling evidence that descriptive (but not injunctive) norms proved particularly effective in fostering conformity when people were low in self-control. Extrapolating from these findings to the current context, the current research therefore posits that scarcity cues that imply a descriptive norm (i.e. demand scarcity) should prove to be more effective than scarcity cues without such normative information (i.e. supply scarcity) in low self-control conditions.

Hence, Study 2 tests the hypothesis that in low self-control conditions, both a supply scarcity heuristic and a demand scarcity heuristic would be effective in promoting utilitarian products with more long-term value, but that a demand scarcity heuristic would work even better.

In summary, the current research examines the effects of scarcity in low self-control conditions. The current research expects consumers low in self-control to be susceptible to the effects of scarcity in general, but that a demand scarcity heuristic would be particularly more potent compared to a supply scarcity heuristic. Furthermore, in light of the existing literature that typically portrays low self-control in a negative light, in which under such a state consumers easily succumb to “bad” temptations, the current research aims to take advantage of low self-control conditions by employing scarcity heuristics to facilitate “better” consumption choices that are typically not the default choice in low self-control conditions (i.e. healthy food choices in Study 1 and utilitarian consumer goods in Study 2). Foreshadowing our results, the two studies in the current research reveal that interventions could be designed to work with low self-control, and that the principle of scarcity would be a promising and convenient strategy to promote better choices that are in line with long-term benefits.

### **STUDY 1**

Extending on the existing literature that consumers are generally sensitive to the influence of heuristics, Study 1 aims to show that low levels of self-control would accentuate the influence of scarcity even more. Accordingly, as a first step, Study 1 tests the effectiveness of using scarcity as a heuristic in promoting healthy food products in low self-control conditions. Specifically, Study 1 employs a food choice task where consumers make a choice between two products (e.g. healthy vs. unhealthy food) over a series of product pairs. The main hypothesis is that when no heuristic is present to promote the healthy food choices, participants low in self-control would favor the tasty, but unhealthy food options (i.e. opting for immediate gratification). However, a scarcity heuristic might counter this typical low self-control effect. In order to be more confident in attributing the effectiveness of the scarcity heuristic exclusively to the conditions of low self-control, Study 1 included a number of potential covariates. Specifically, Study 1 included Need for Cognition (NFC), which refers to the motivation for deliberate and thoughtful thinking on a chronic level, as it has been shown to be related to consumers’ susceptibility to peripheral cues such as heuristics in the formation of product preferences (Haugtvedt, Petty, & Cacioppo, 1992). In addition, Study 1 also took into account of consumer characteristics (i.e. frequency of



purchasing food products on offer, extent to eat healthily, and frequency of purchasing healthy food products) that may influence participants' food choices.

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## Method

**Participants.** Participants were 67 individuals living in the United States recruited through Amazon's Mechanical Turk. Three participants did not indicate demographic information including age, gender, level of education, and current employment status. The mean age of the remaining participants was 38.02 years ( $SD = 13.30$ ), and females made up 43.8% of the sample. Furthermore, 1.6% of the sample received no formal schooling, 17.2% were educated up to high school level, 67.2% completed a college or university degree, and 14% received post-bachelor's education. When reporting current employment status, 56.3% of participants were employed for wages, 10.9% were self-employed, 9.4% were out of work and currently looking for work, 1.6% were out of work and currently not looking for work, 6.3% were homemakers, 7.8% were students, 4.7% were retired, and 3.1% were unable to work.

**Design and procedure.** The design of Study 1 consisted of two independent variables, where scarcity (scarcity heuristic vs. no heuristic) was a within-subjects factor manipulated in the food choice task, and self-control was a between-subjects continuous predictor. The dependent variable was the number of healthy choices made in the food choice task.

Participants were informed that they would complete three unrelated questionnaires related to consumer preferences, but there was no explicit mentioning that they would be first filling out the State Self-Control Capacity Scale (SSCCS) (Ciarocco, Twenge, Muraven, & Tice, 2012), followed by the food choice task, and finally the NFC Scale (Cacioppo, Petty, & Feng Kao, 1984) in addition to four questions that assessed consumer characteristics. Upon completion of all questionnaires, participants were thanked and received a code to confirm their participation for monetary compensation.

*Food choice task.* The food choice task was presented as a marketing survey that assessed consumer preferences. Participants were informed that they had to evaluate a series of products presented in pairs by indicating their preferred choice of product from each pair. In total, participants evaluated 24 product pairs. Of interest were 12 food product pairs that presented a self-control dilemma, in which a healthy food product was paired with a tastier but relatively unhealthy food product. To illus-

trate, the food pairs included examples such as ice-cream versus Greek yogurt, salad versus pizza, cereal bar versus Oreo cookie, and donuts versus rice crackers. Finally, the remaining 12 product pairs acted as filler pairs that were not further analyzed.

### **Independent variables.**

*Scarcity.* The scarcity heuristic was conveyed with the promotion tagline “Value of the week, while supplies last!” The scarcity heuristic was presented in six of the food product pairs in the food choice task, and it was always associated with the healthy food option. In the remaining six food product pairs, there was no heuristic, and no information was provided about the food products.

*State self-control.* State self-control was measured using the State Self-Control Capacity Scale (SSCCS; Ciarocco et al., 2012), which was presented as a questionnaire on mood. Participants were asked to indicate the degree to which they agreed (1 = not true, 7 = very true) with 25 statements that described their current state such as “I feel motivated” and “I feel like my willpower is gone” (reverse coded) on the SSCCS. A final standardized state self-control score was calculated by averaging the scores from all the statements, where a higher score reflected a higher level of state self-control. Cronbach’s alpha ( $\alpha$ ) of .96 reported good internal consistency for the SSCCS in this study.

**Dependent variable.** The dependent variable was the average number of healthy choices made from the food pairs that had a scarcity heuristic and the food pairs that had no heuristic in the food choice task, both ranging from zero to six.

**Control variables.** Study 1 controlled for the potential influence that the NFC, as well as the other consumer characteristics, that might have on the dependent variable of healthy choices.

*Need For Cognition Scale.* The Need For Cognition Scale (NFC; Cacioppo et al., 1984) consisted of 18 statements in which participants had to indicate the degree to which each statement described them (1 = extremely uncharacteristic of me, 4 = extremely characteristic of me). Statements on the scale included examples such as “I prefer complex to simple problems” and “I would rather do something that requires little thought than something that is sure to challenge my thinking abilities” (reverse coded). A final standardized NFC score was calculated by averaging the scores from all the statements, where a higher score reflected a greater NFC. Cronbach’s  $\alpha$  of .94 reported good internal consistency for the NFC Scale in this study.

*Consumer characteristics.* Additional questions including (1) “How often do you purchase food products on offer or promotion?”, (2) “To what extent do you try to eat healthily?”, and (3) “How often do you purchase healthy food products?” were included to control for individual differences that may affect consumers’ food choices. Participants responded to these four one-time questions on a 7-point scale ranging from 1 (never) to 7 (always). The scores to each of the three questions were standardized.

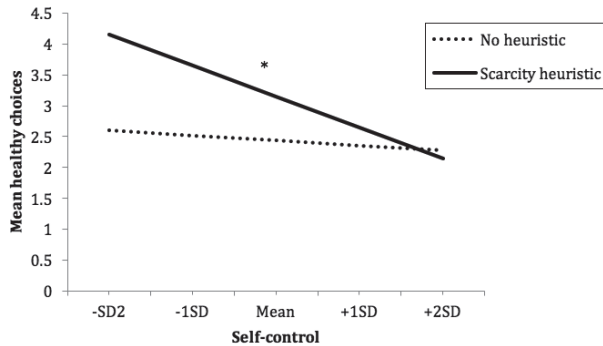
## Results

**Descriptives.** Participants reported to purchase food products on offer or promotion ( $M = 5.14$ ,  $SD = 1.40$ ) relatively frequently. Moreover, they also reported eating healthily to a moderate extent ( $M = 5.11$ ,  $SD = 1.53$ ), and purchasing healthy food products on a relatively frequent basis ( $M = 4.98$ ,  $SD = 1.43$ ). Finally, participants selected an average of 5.46 healthy food products ( $SD = 2.97$ ) out of the twelve food choice pairs.

**The effects of a scarcity heuristic on healthy food choices.** A repeated-measures analysis of covariance (ANCOVA) was employed to examine the effects of a general scarcity heuristic on participants’ healthy food choices, in which scarcity (no heuristic vs. scarcity heuristic) was a within-subjects factor and state self-control was a continuous predictor. Furthermore, in addition to controlling for the potential influence of NFC, consumer characteristics including participants’ extent of healthy eating ( $r = .57$ ,  $p < .001$ ) and frequency of purchasing healthy food ( $r = .45$ ,  $p < .001$ ) products were included as covariates since they were significantly correlated with the dependent variable.

There was a significant main effect of scarcity, where more healthy choices were made in food pairs that had a scarcity heuristic ( $M = 3.14$ ,  $SD = 1.61$ ), compared to when there was no heuristic ( $M = 2.43$ ,  $SD = 1.64$ ),  $F(1,58) = 18.42$ ,  $p < .001$ ,  $\eta^2 = .24$ . Self-control was also a marginally significant predictor,  $F(1,58) = 3.62$ ,  $p = .06$ ,  $\eta^2 = .06$ . Results also indicated that NFC was not a significant covariate,  $F(1, 58) = .46$ ,  $p = .50$ . Moreover, the extent to which participants try to eat healthily,  $F(1, 58) = 13.75$ ,  $p < .001$ ,  $\eta^2 = .19$ , had an influence on the number of healthy choices, but not the frequency to which participants purchase healthy food products,  $F(1, 58) = .47$ ,  $p = .50$ . Finally, as expected there was a significant interaction between scarcity and self-control,  $F(1, 58) = 6.19$ ,  $p = .016$ ,  $\eta^2 = .1$  (Figure 1). Parameter estimates indicate that when there was a scarcity heuristic, the number of healthy food choices increased as self-control levels decreased,  $b = -.50$ ,  $t(58) = -3.11$ ,  $p = .003$ . However, self-control had no influence on the

outcome of healthy choices made when there was no heuristic present,  $b = -.08$ ,  $t(58) = -.44$ ,  $p = .67$ .



*Figure 1.* Healthy food choices made as a function of scarcity heuristic and self-control. \*  $p < .$

## Discussion

The predicted interaction with the scarcity heuristic proved to be significant—when there was a scarcity heuristic promoting the healthy food options, low self-control levels facilitated the number of healthy choices made while controlling for the effects of consumers' reported extent to which they try to eat healthily. On the other hand, when the scarcity heuristic was not present, results did not show evidence of a negative trend between self-control and healthy food choices. Additionally, as NFC was not a significant covariate in our analysis, Study 1 could more confidently rule out that the increased use of heuristic was dependent on NFC, and that the use of the scarcity heuristic could be attributed to low self-control.

These findings serve as first evidence that consumers low in self-control would especially benefit from having the installation of a scarcity in the environment to market healthier food choices. Nonetheless, the scarcity heuristic used in Study 1 was ambiguous with regard to whether the scarcity was driven by high demand or low supply (or both). As such, while Study 1 demonstrated the influence of scarcity (in general) in promoting healthy food choices especially in low levels of self-control, it does not inform whether supply or demand scarcity was driving this effect. Another shortcoming of Study 1 is that due to its within-subjects design, each food pair was only presented once with (or without) a scarcity heuristic and not counterbalanced. Moreover, Study 1 assessed self-control using self-report measures.

Overcoming the limitations of Study 1, Study 2 pits the two variants of scarcity directly against each other: supply versus demand scarcity and compares their effectiveness in the context of low self-control. Moreover, Study 2 experimentally manipulates self-control and adopts a between-subjects design that includes a control condition where all product pairs are presented without a heuristic adjunct to two other experimental heuristic conditions. If the reasoning for predictions was correct, then both supply and demand scarcity heuristics would be effective under low self-control conditions, but we expect the demand scarcity heuristic to exceed the effects of a supply scarcity heuristic.

## **STUDY 2**

Study 2 compares the effectiveness of the supply scarcity and demand scarcity in promoting utilitarian products over hedonic products, testing the hypothesis that demand scarcity would be more effective in low self-control conditions considering that it not only enhances product desirability but also conveys a descriptive norm that individuals low in self-control are highly sensitive to; whereas the supply scarcity only infers product desirability information without conferring the behaviour of other people. Additionally, Study 2 examines whether the use of scarcity heuristics could extend to promoting utilitarian products that offer long-term practical value over hedonic products that bestow short-term indulgence (Dhar & Wertenbroch, 2000). Generally, it is expected that participants in low self-control conditions would prefer the attractive hedonic products with indulgent properties unless they are accompanied by a scarcity heuristic. More importantly, Study 2 aims to demonstrate that a demand scarcity heuristic works better than a supply scarcity heuristic.

### **Method**

**Participants and design.** A total of 165 participants were recruited from a large university in The Netherlands. The mean age of the participants was 21.11 years (SD = 3.26). The sample consisted exclusively of females to minimize the potential influence of gender on product preferences. The study used a 2 (self-control: low vs. high) × 3 (heuristics: no heuristic vs. supply scarcity heuristic vs. demand scarcity heuristic) between-subjects design.

**Procedure.** The study was presented as two separate tasks, the first being the Stroop Task employed as a self-control manipulation and the second being a

product choice task presented as a marketing study that assessed participants' choice between utilitarian versus hedonic products. Upon arrival in the laboratory, participants provided informed consent for their participation and were assigned to a cubicle where they completed both tasks on the computer. At the end of the experiment, participants were thanked, debriefed, and compensated with course credit of €4 for participation.

### **Manipulations**

*Supply scarcity heuristic and demand scarcity heuristic.* The scarcity heuristics were always associated with the utilitarian products in the product choice task. The supply scarcity heuristic was depicted by the slogan "Available only this week!" In the demand scarcity heuristic condition, participants were told that some products were particularly popular with participants and were therefore low in stock. It was then presented with the slogan "Popular item, while supplies last!" Finally, in the no heuristic condition, participants were solely presented with product pairs without any accompanying heuristics.

*Self-control.* Unlike Study 1 that measured self-control based on self-report, Study 2 experimentally manipulated participants' self-control levels. The Stroop Task was employed in this study to manipulate self-control levels following previous research (e.g., Govorun & Payne, 2006; Halali, Bereby-Meyer, & Meiran, 2014) that has also used this paradigm to deplete participants. Participants were presented with a series of color words (i.e. red, blue, yellow, and green) on the computer screen; each of which was displayed in a font color that either matched (congruent trial) or did not match its semantic meaning (incongruent trial). Every trial began with a fixation cross at the center of the screen (500ms), followed by the presentation of the color word (200ms), and participants had 800 ms to indicate the font color of the word by pressing the designated key on the keyboard.

All participants completed 12 practice trials in order to familiarize themselves with the task and were then equally distributed to either the high or low self-control condition by randomization. In the high self-control condition, participants performed a total of 30 congruent trials that lasted for approximately 5 minutes. In the low self-control condition, however, participants performed a total of 300 trials divided over three blocks, where two-thirds of the trials were incongruent trials dispersed randomly throughout the task. In order to correctly identify the font color of the word, participants would have to exercise self-control to suppress the automatic and predominant response of reading (i.e. Stroop effect). The length of the low self-control condition was approximately 15 minutes.

**Product choice task.** The product choice task was presented as an online marketing study that assessed consumer preferences. The product choice task consisted of eight product pairs presented in a randomized order, and five out of the eight product pairs were hedonic–utilitarian trade-off pairs. The hedonic–utilitarian product trade-off pairs represented a self-control dilemma, as participants would have to exercise self-control in order to forego the indulging properties of the hedonic product (e.g. make-up set) and select the more practical but less attractive utilitarian product (e.g. first-aid kit; Mishra and Mishra, 2011). These product trade-off pairs were pretested, and the mean values and standard deviations are presented in Tables 1 and 2. The remaining three product pairs were filler pairs that were not further analyzed.

Participants were asked to indicate which of the two products they would prefer at that moment and were also informed that it was not necessary to deliberate over the options as the survey was only interested in consumer preferences, and that there were no objective correct answers. To increase participants' engagement in the product task, participants were told the cover story that they would receive one of the product choices that they selected at the end of the experiment. The cover story was also conveyed to increase the credibility of the scarcity heuristics—that some products are only available this week (i.e. supply scarcity) or that some products are low in stock because they are especially popular with previous participants (i.e. demand scarcity). The dependent variable was the number of utilitarian choices made from the trade-off product pairs, ranging from zero to six.

| Pair          | Practicality |           |                               | Indulgence |           |                                 | Attractiveness |           |                                |
|---------------|--------------|-----------|-------------------------------|------------|-----------|---------------------------------|----------------|-----------|--------------------------------|
|               | <i>M</i>     | <i>SD</i> | <i>t</i> test, sig.           | <i>M</i>   | <i>SD</i> | <i>t</i> test, sig.             | <i>M</i>       | <i>SD</i> | <i>t</i> test, sig.            |
| Sandals       | 5.90         | 1.79      | $t(32) = 4.45,$<br>$p < .001$ | 4.06       | 2.16      | $t(32) = -5.64,$<br>$p < .001$  | 3.12           | 2.19      | $t(32) = -8.19,$<br>$p < .001$ |
| High heels    | 3.61         | 2.00      |                               | 7.03       | 2.08      |                                 | 7.45           | 1.70      |                                |
| Sewing kit    | 7.21         | 1.78      | $t(32) = 3.26,$<br>$p = .003$ | 3.67       | 1.78      | $t(32) = -10.60,$<br>$p < .001$ | 3.70           | 1.70      | $t(32) = -9.90,$<br>$p < .001$ |
| Mascara       | 5.61         | 2.22      |                               | 7.39       | 1.22      |                                 | 7.45           | 1.28      |                                |
| First-aid kit | 8.58         | 0.83      | $t(32) = 9.10,$<br>$p < .001$ | 2.82       | 1.96      | $t(32) = -12.14,$<br>$p < .001$ | 3.76           | 1.77      | $t(32) = -9.45,$<br>$p < .001$ |
| Make-up set   | 4.82         | 2.21      |                               | 7.58       | 1.15      |                                 | 7.36           | 1.50      |                                |

*Table 1* Perceived practicality, indulgence, and attractiveness of consumer goods in utilitarian-hedonic product trade-off pairs

| Pair                   | Healthiness |           |                                | Tastiness |           |                                 |
|------------------------|-------------|-----------|--------------------------------|-----------|-----------|---------------------------------|
|                        | <i>M</i>    | <i>SD</i> | <i>t</i> test, sig.            | <i>M</i>  | <i>SD</i> | <i>t</i> test, sig.             |
| Cereal cookie          | 4.79        | 1.04      | $t(89) = 17.35,$<br>$p < .001$ | 3.91      | 1.16      | $t(32) = -5.64,$<br>$p < .001$  |
| Chocolate bar          | 2.18        | 1.07      |                                | 4.99      | 1.20      |                                 |
| Mixed nuts and raisins | 4.40        | 1.38      | $t(89) = 10.35,$<br>$p < .001$ | 2.89      | 1.40      | $t(32) = -10.60,$<br>$p < .001$ |
| Potato chips           | 2.48        | 1.37      |                                | 4.76      | 1.16      |                                 |

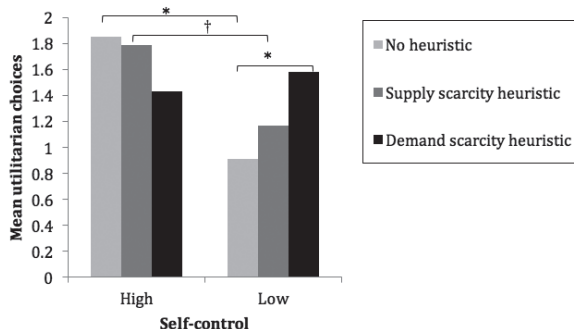
*Table 2.* Perceived healthiness and attractiveness of food products in utilitarian-hedonic product trade-off pairs.

## Results

Five participants who had missing data in the Stroop Task and five other participants who performed the Stroop Task with an accuracy of 0% were excluded in the analyses. The resulting sample in the analysis consisted of 155 participants.

In order to test the effect of self-control, heuristics, and their interaction on the number of utilitarian products chosen, a 2 (self-control: high vs. low)  $\times$  3 (heuristic: no heuristic vs. supply scarcity heuristic vs. demand scarcity heuristic) between-subjects analysis of variance (ANOVA) was performed. As expected, there was a significant main effect of self-control on the number of utilitarian products chosen, where participants in the high self-control condition chose more utilitarian products ( $M = 1.71$ ,  $SD = 1.23$ ) than participants in the low self-control condition ( $M = 1.26$ ,  $SD = 1.15$ ),  $F(1, 147) = 5.84$ ,  $p = .02$ ,  $\eta^2 = .04$ . The main effect of heuristic was not significant,  $F(2, 147) = .12$ ,  $p = .85$ . Finally, the two-way interaction between self-control and heuristics was marginally significant,  $F(2, 147) = 2.76$ ,  $p = .06$ ,  $\eta^2 = .04$  (Figure 2).





*Figure 2.* Effect of self-control and heuristic on the number of utilitarian product choices. Error bars represent 95 percent CI. \*\* $p < .01$ ; \* $p < .05$ ; † $p = .06$ .

In order to test the specific hypotheses regarding the effectiveness of different scarcity heuristics, simple main effects were examined. First, for participants high in self-control, there were no significant differences between the number of utilitarian products chosen across the three heuristic conditions: no heuristic ( $M = 1.85$ ,  $SD = 1.26$ ), supply scarcity heuristic ( $M = 1.79$ ,  $SD = 1.21$ ), and demand scarcity heuristic ( $M = 1.43$ ,  $SD = 1.25$ ), all  $p$ 's  $> .23$ . On the other hand, results revealed that participants low in self-control chose significantly more utilitarian products when there was a demand scarcity heuristic ( $M = 1.58$ ,  $SD = 1.29$ ) than when there was no heuristic present ( $M = .91$ ,  $SD = 1.08$ ),  $p = .04$ . The supply scarcity heuristic ( $M = 1.17$ ,  $SD = .94$ ) did not differ from the other two conditions, all  $p$ 's  $> .21$ .

Furthermore, the comparison of the number of utilitarian products chosen by participants in high versus low self-control demonstrated the typical effect of low self-control when no heuristic was present, in which participants low in self-control ( $M = .91$ ,  $SD = 1.08$ ) chose significantly less utilitarian products than participants high in self-control ( $M = 1.85$ ,  $SD = 1.26$ ),  $p = .007$ . However, when there was a demand scarcity, no significant difference between the number of utilitarian choices made by participants high ( $M = 1.43$ ,  $SD = 1.25$ ) or low in self-control ( $M = 1.58$ ,  $SD = 1.29$ ) was found,  $p = .65$ . Finally, a marginally significant difference suggested that despite the presence of a supply scarcity, participants low in self-control ( $M = 1.17$ ,  $SD = .94$ ) still chose less utilitarian products than participants with high self-control ( $M = 1.79$ ,  $SD = 1.21$ ),  $p = .06$ .

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## Discussion

In Study 2, we obtained support for the hypothesis that a demand scarcity heuristic would outperform a supply scarcity heuristic in promoting more practical utilitarian products over attractive hedonic products in low self-control conditions. Specifically, it was observed that in the low self-control condition, participants made more utilitarian product choices promoted by a demand scarcity heuristic, as opposed to when no heuristic was present. Moreover, the demand scarcity heuristic seemed to offer “protective effects” against the pitfalls of low self-control—in the presence of demand scarcity, participants in the low self-control condition selected just as many utilitarian choices as participants in the high self-control condition. However, participants low in self-control were not as receptive to the supply scarcity heuristic that promoted the utilitarian products, in which they still selected fewer utilitarian products in the low self-control condition compared to the high self-control condition.

The finding in Study 2 that the demand scarcity heuristic was more influential supports previous finding that individuals low in self-control tend to conform with descriptive norms (Jacobson et al., 2011). This serves as a reminder that perhaps while all heuristics generally function as decisional shortcuts, the way they operate is not the same, at least in the context of low self-control conditions. As such, the degree of the effectiveness of different heuristics should not be assumed to be equal without considering the context that they are performing in, and consumers low in self-control may ultimately benefit more from certain heuristics (e.g. demand scarcity heuristic) than from others.

## **GENERAL DISCUSSION**

This study explored the potential of using scarcity heuristics to promote healthy food choices and utilitarian products with long-term benefits for consumers lacking self-control who would generally opt out for alternatives with short-term gratification. The current research demonstrated that by measuring state levels of self-control (Study 1) and experimentally manipulating self-control (Study 2), consumers low in self-control benefited from having scarcity heuristics guide their decisions toward more optimal choices. Study 1 found that lower levels of self-control actually increased consumers’ choices for healthy food choices in the presence of scarcity. Building off this finding, Study 2 distinguishes between the demand scarcity heuristic and the supply scarcity heuristic by comparing their effectiveness in promoting utilitarian choices, in which results indicated the superiority of the former in low self-con-

trol conditions. Our finding that the demand scarcity heuristic was more influential in low self-control conditions is in line with the notion that low self-control is associated with increased reward sensitivity (Inzlicht & Schmeichel, 2012; Schmeichel, Harmon-Jones, Harmon-Jones, 2010) but also corroborates previous research that has found individuals low in self-control to favor and conform to descriptive norms (Jacobson et al., 2011). Although Experiment 1 presented food choices whereas Experiment 2 presented generic consumer goods, the similar pattern of results observed in both studies thereby reveals the robustness of the effect of low self-control leading to a “virtuous” choice given that it is promoted by an appropriate scarcity heuristic. Nonetheless, given the importance of health promotion in the current obesogenic environment, we particularly welcome future studies to replicate and extend on our current research to further examine and validate the effectiveness of scarcity heuristics to promote healthy food choices. Specially, our finding that the demand scarcity heuristic was more influential also dovetails the recent study by Salmon, Fennis, de Ridder, Adriaanse, and de Vet (2014) who showed that people low in self-control were much more likely to base their food choices on the suggestion of a descriptive norm (i.e. a pie chart showing the behaviour of the majority of previous participants making a healthy choice) that acted as a social proof heuristic. Correspondingly, it may be that the demand scarcity heuristic similarly provides a social proof mechanism. In light of this, it would be interesting to question whether the social information conveyed by these particular heuristics (i.e. demand scarcity heuristic, social proof heuristic) might be the key ingredient to its success. As such, future research could shed insight by comparing heuristics that contain a social component (e.g. authority, reciprocity) with heuristics that only convey an exemplar without any social aspect (e.g. availability, recognition). Moreover, future effort should more stringently consider how to optimally design and maximize the effectiveness of heuristics in low self-control conditions. In the case of scarcity heuristics, it is critical to ensure that scarcity information offers believability (e.g. is the scarcity understood and perceived to be legitimate?), choice (e.g. do people still feel a sense of freedom to choice without feeling threatened or coerced?), and alternatives (e.g. do they need it? Are there substitutes?) (Mortensen & Allen, 2013). If these criteria are not met, there is a chance that the heuristic will backfire and induce the opposite of desired effects.

While there is a positive outlook regarding the usefulness of heuristics, it should nonetheless be acknowledged that the current research relied only on hypothetical choices (although Study 2 attempted to simulate a real product choice task and increase participant engagement by informing participants that they would receive one of the product choices they make). Similarly, in real-life contexts, price is an important determinant of purchase decisions and as such in considering consumers’

choices, future research should take into account how socio-economic factors might interact with behavioural factors such as the ones showcased in this study. For one, it would be important to include broader samples of individuals with diverse socio-economic backgrounds. Furthermore, it has been criticized that the dichotomy of consumption choices, prevalently applied to food choices where “healthy” is considered the good choice and the “unhealthy” alternative is considered the bad choice, is misleading since there is and should be much uncertainty in what defines “good” food and “bad” food in relation to health and wellbeing (Askegaard et al., 2014). As such, to improve and extend on the current research, it is recommended that future studies expand the list of choice outcomes from one-off dichotomized choices to more comprehensive measures such as options from an entire meal (menus), food diaries recorded over time spans, and shopping lists that resemble more closely with real-life and naturalistic settings. Employing such measures rather than relying on one-off binary choice outcomes not only increases ecological validity but also allows for directing focus on moderation and the balance of choices, which are crucial for health and wellbeing.

Having to process considerable amounts of information and make countless decisions on a daily basis, consumers often rely on heuristics to help them to think in ways that are quick and easy (Kahneman, Slovic, & Tversky, 1982; Todd & Gigerenzer, 2007), while heuristic-based thinking is execrated when self-control levels are low (Pochepsova et al., 2009). It is no coincidence that marketing campaigns frequently endorse heuristic principles to entice consumers into buying products to increase profit. However, the first implication of the current research is that the same factors (e.g. low self-control) that lead consumers to making an impulsive or suboptimal choice could be reversed into an impulsive but virtuous choice. Indeed, the current research exploited low self-control conditions and employed conventional marketing tactics that endorse scarcity heuristics in promoting “virtuous” product choices that would support consumers’ long-term interests. This approach deviates from traditional interventions that focus on increasing self-control and instead showcases low self-control as a state that could be favorable to consumer welfare. Consumers low in self-control would indeed make the “right” choice in line with long-term interests if the choice setting offers suitable heuristics promoting them. As Study 1 showed, simply associating healthy food products with scarcity led to more healthy choices made by consumers low in self-control. This strategy could be easily extrapolated from an experimental setting and be implemented as in-store ads or displays as part of health promotion campaigns aimed at healthy eating. Nonetheless, critical to underscore is that certain heuristics may be more suitable in low self-control conditions. The observation in Study 2 that the demand scarcity heuristic performed best overall puts

forth an additional implication. It appears that using limited availability to emphasize product value and presenting a descriptive norm as a social proof component to attest to its value may be important ingredients for the successful promotion of virtuous consumption choices in low self-control conditions. That is, when consumers are seeking to buy a utilitarian product, for example, the demand scarcity acts as a heuristic for consumers to form an accurate judgment of product performance through social proof information (e.g. the probability that so many buyers would purchase a bad product would be unlikely; Ku, Kuo, Yang, & Chung, 2013).

Deviating from traditional approaches that target at raising self-control, our strategy of working with low self-control conditions through the use of scarcity heuristics lends itself as a promising tactic that could be publicly implemented on a large scale to promote consumer welfare. Importantly, the use of scarcity heuristics to promote healthy food products or utilitarian consumer goods (without forbidding their alternatives) aligns well with the call for optimizing choice architectures to encourage more optimal consumption choices (Johnson et al., 2012).

## **CONCLUSION**

The current research began by asking whether following scarcity heuristics endorsed by advertising appeals would invariantly lead consumers into choices that mainly benefit the interests of the marketer rather than the wellbeing of the consumers. By working with low self-control conditions that facilitate heuristic-based thinking, which is typically seen as a vice that inevitably leads to suboptimal choices, the current research found that the influence principle of scarcity was able to promote better consumption choices that would benefit consumers' long-term interests. In this light, low self-control is not necessarily a state that should be avoided, and that scarcity could also be employed as a strategic tool, rather than a weapon of influence, in promoting better consumption choices for consumers low in self-control. Nonetheless, as some tools are sharper than others, our findings also indicate the demand scarcity heuristic, which highlights reward emphasis and provides descriptive norm information, to be more effective than the supply scarcity heuristic in promoting utilitarian consumer goods in the context of low self-control.

## **ACKNOWLEDGEMENTS**

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# *The hunger games*

**USING HUNGER TO PROMOTE HEALTHY CHOICES  
IN SELF-CONTROL CONFLICTS**



CHAPTER 4

## **ABSTRACT**

The majority of existing research and conventional wisdom would advise against shopping on an empty stomach as hunger is assumed to encourage impulsive choices that typically lead to self-control failure (i.e., favouring short-term gratifications at the expense of long-term goals). Nonetheless, through two studies the current research aims to demonstrate that hungry consumers would not always be disadvantaged when encountering a self-control conflict involving a trade-off choice between a healthy vs. a more palatable but unhealthy choice. Particularly we posit that the choice outcome of the self-control conflict is dependent on contextual cues, such that hungry consumers with the tendency to make fast decisions could benefit from relying on a social proof heuristic promoting the healthy options. In Study 1, we indeed observed participants' self-reported hunger to be negatively associated with state self-control, but as most participants generally experienced low levels of hunger we did not observe apparent effects of hunger on food choice (DV), and correspondingly the potential influence of the social proof heuristic in moderating the choice outcome. However, in Study 2 where hunger was manipulated, we found hungry participants making significantly less healthy choices than satiated participants, but a social proof heuristic mitigated this effect (i.e., in the presence of social proof heuristic hungry participants made just as many healthy food choices as satiated participants; and hungry participants made more healthy choices in the social proof condition than in the no heuristic condition). These findings support our approach of providing contextual cues in the environment in order to work with, rather than against, the impulsivity triggered by hunger to promote successful self-control behaviours.

Consumers' self-control, or commonly known as willpower, is often put to the test as trade-offs between immediate consumption pleasure and delayed long-term benefits are apparent even in simple purchase decisions. To illustrate, a consumer aiming to achieve a slimmer waist would need to settle with a lean green salad for lunch and resist the temptation to eat a double cheeseburger. Self-control is the capacity to override or alter predominant response tendencies in support of the pursuit of long-term goals (Baumeister, Vohs, & Tice, 2007). That said, successful self-control involves the ability to bring behaviours in line with long-term interests, whereas giving into short-term cravings is considered as self-control failure. Yet despite having good intentions to pursue long-term goals, consumers' self-control often fails. It appears that the odds are not in consumers' favour seeing that even visceral states such as hunger, thirst, and fatigue, which are part of the mundane daily experience could all become obstacles that impede self-control (Loewenstein, 1996). Indeed, dual-processing models suggest that when viscerally aroused, consumers become increasingly reliant on the swift, automatic and intuitive thinking mode of System I, and less on the slow, reflective and deliberate processing of System II (Kahneman, 2011). Visceral states thereby trigger what is commonly regarded as 'impulsive' behaviour as they leave consumers prone to acting quickly in response to immediate situational demands with little reservation for the deliberate contemplation of how their actions may interfere with long-term goals.

Indeed, "Don't go shopping hungry!" is not only conventional advice but scientific literature has provided ample evidence warning against the negative consequences of making decisions when experiencing a visceral state such as hunger. For instance, Nisbett and Kanouse (1968) have demonstrated a classic "eyes bigger than stomach" scenario, where hungry shoppers compared to satiated shoppers bought more food than they had initially anticipated. More contemporary work by Tal and Wansink (2013) has, however, revealed that hungry shoppers do not necessarily purchase a greater volume of food than satiated shoppers, but that they tend to buy more high-caloric foods relative to low-caloric food. Furthermore, when feeling hungry, people select more junk food for future consumption (Read & van Leeuwen, 1998) and dieters correspondingly weaken their dieting intentions (Nordgren, Van der Pligt, & van Harreveld, 2008). The aforementioned examples illustrate that the response to a visceral state such as hunger, though adaptive in fulfilling the immediate physical needs of the body, often engenders impulsive behaviour where in the heat of the moment people lose sight of long-term goals. In this light, it is hardly surprising that the impulsivity induced by visceral states, such as hunger, has a bad reputation for flirting with self-control failure.

Nevertheless, contrary to the traditional view and the bulk of existing research forecasting detrimental effects of impulsivity, the current research aims to showcase a brighter outlook by demonstrating the benefits of acting swiftly with minimal forethought. Specifically, we propose that impulsive decisions made in a state of hunger could result in choices that align with consumers' long-term interests when there are suitable heuristics in the choice setting promoting them. Considering that heuristics are decisional shortcuts or mental rules-of-thumb that reduce time and cognitive effort (Shah & Oppenheimer, 2008), we reason that viscerally aroused consumers would be more inclined to employ heuristics to expedite their decision-making. Accordingly, our prediction is that when there are heuristics promoting outcomes that favour long-term interests, this would particularly benefit consumers who rely on impulsive processing due to being in a visceral state (e.g., hungry consumers). Our rationale is that when viscerally aroused, consumers would be more compelled to follow heuristics, and as long as these guide them towards choices in line with long-term interests, hungry consumers would perform just as well as satiated consumers in making decisions that favour long-term interests.

Indeed, there is emerging evidence that task demands and contextual cues could foster decision competence derived from impulsive decision-making strategies. For instance, when the decision scenario is complex with a high degree of uncertainty regarding gains and losses, individuals benefited from hunger-induced impulsivity that disposed them to use intuitive 'gut-feelings' to make strategic decisions focusing on long-term gains (De Ridder, Kroese, Adriaanse, & Evers, 2014). More pertinent for the predictions for the current research however, is the recent study by Salmon, Fennis, de Ridder, Adriaanse, and de Vet (2014) showing the effectiveness of heuristics in specifically helping impulsive consumers overcome self-control conflicts. In this study, the authors observed that when faced with a healthy and unhealthy food product, participants who assumedly became impulsive due to previous exertions of self-control (i.e., ego-depletion; Baumeister, Bratslavsky, Muraven, & Tice, 1998) expectedly opted for more tasty, but unhealthy choices. Interestingly, this trend reversed in the presence of a social proof heuristic depicted as a pie chart conveying the majority of previous participants choosing the healthy option. In this context, the social proof heuristic indicated the healthy option as what was considered the most typical, desirable and immediately advantageous choice by many others (Jacobson, Mortensen, & Cialdini, 2011), and when depleted participants impulsively followed the suggestion of the heuristic, they were much more likely to also adopt the healthy choice as their own. These findings hence suggest that impulsivity does not invariably lead consumers to suboptimal choices that compromise self-control, but could be facilitated by contextual cues towards outcomes that are in line with long-term inter-

ests. Building on these findings, the present study tests whether these results would generalize to other impulsive states triggered by different factors besides ego-depletion. Critically, we test the effectiveness of the social proof heuristic in promoting healthy food products in a state of hunger, an even more challenging scenario considering hunger directly triggers the impulsive behaviour of consuming high caloric, unhealthy food (e.g., Tal & Wansink, 2013).

## —— The present research

The current research takes the innovative approach of working with, rather than against, impulsive decision-making tendencies to promote successful self-control. We aim to advance the research by Salmon and colleagues (2014) by examining whether the social proof heuristic would also be effective in influencing the decisions of consumers experiencing hunger, a typical visceral hot state that is notorious for triggering impulsive decision-making (Loewenstein, 1996). Accordingly, in the current study we employ naturally occurring hunger experienced outside the laboratory to induce impulsivity.

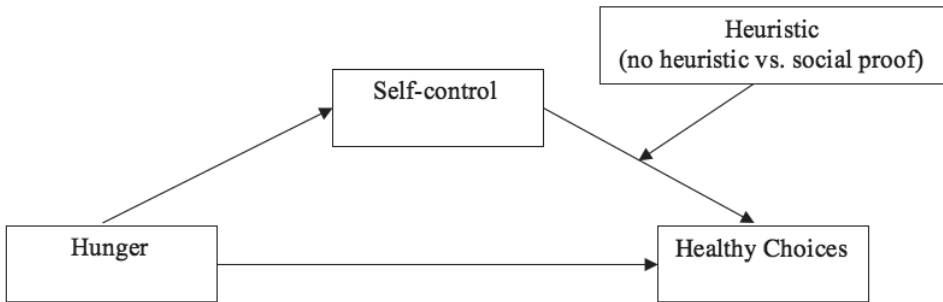
In the present research we investigated hungry participants' (vs. satiated participants') choice behaviour when confronted with a food choice task involving a self-control conflict: unhealthy food that offers immediate consumption pleasure vs. healthy food that has positive long-term implications for health (Mishra & Mishra, 2011). We predicted the choice outcome of such self-control conflict to be dependent on whether there are contextual cues, such as a social proof heuristic, presented in the choice setting to influence the decision-maker. Specifically, we expected hungry (vs. satiated) participants to be less inclined to make healthy choices but only when there is no heuristic promoting the healthy products. However, our prediction is that this effect would be eliminated in the presence of a social proof heuristic promoting the healthy products.

We tested these hypotheses through two experiments in the current research. Specifically, in Study 1 we aim to first establish that the experience of hunger would trigger more System 1 processing. Because System 1 processing is often the culprit behind self-control failure, we expected to see participants self-reporting higher levels of hunger to also report having lower levels of state self-control. Importantly, we tested whether the experience of hunger would invariantly lead to self-control failure. We predicted that participants experiencing greater levels of hunger and hence lower levels of self-control to select more unhealthy choices (vs. healthy choices) from

a three-course meal menu, but that the presence of a social proof heuristic promoting the healthy options would swing their preference towards the healthy options. As mentioned before, the underlying assumption is that individuals would be more susceptible to the influence of heuristics especially when they are under a predominant System 1 thinking-mode. In Study 2 we again tested the effect of a social proof heuristic in influencing the food choices of hungry (vs. satiated) participants. However, rather than relying on participants to self-report their hunger, we employed a stronger manipulation of hunger by recruiting participants at a cafeteria. Specifically, we compared the food choices of participants who were hungry as they were just about to eat lunch versus those who were satiated because they had just eaten. In Study 2 we exposed participants to a slightly different food product choice task that required them to make trade-off choices between healthy vs. unhealthy food products (rather than meal choices in Study 1), but we also expected to see the same pattern of results such that the presence of a social proof heuristic promoting the healthy options would help hungry participants to prefer healthy choices.

## **STUDY 1**

Study 1 was an online study and its first objective was to establish that hunger is related to greater System 1 processing, which we posit would be reflected by lowered self-control capacity. Accordingly, in this study we expected to observe a negative association between participants' self-reported levels of hunger and state self-control as measured on the State Self-Control Capacity Scale (SSCCS; Ciarocco, Twenge, Muraven, & Tice, 2012). Second we aimed to demonstrate the outcome of participants' choices in a food choice task requiring them to make trade-off choices between healthy vs. more tasty but unhealthy options to be dependent on their self-control levels and the presence of a social proof heuristic. To this end, we presented participants with two three-course meal menus and asked them to make trade-off choices for each course of meal (i.e., starter, main dish, dessert). We assumed that in a typical scenario, hungrier participants would exhibit lower self-control, and subsequently prefer more unhealthy options. However, we predicted that this trend for self-control 'failure' due to increased levels of hunger would no longer be apparent in the presence of a social proof heuristic promoting the healthy option. In effect, Study 1 tested a moderated mediation model of the relationships between self-reported hunger, state self-control, the presence of a social proof heuristic, and food choices (see Figure 1). Summarizing, we hypothesized that: 1) greater hunger would lead to less healthy choices, because 2) this relationship is mediated by self-control capacity that is 3) potentially moderated by the presence of a social proof heuristic.



*Figure 1.* Proposed moderated mediation model of the relationships between hunger, self-control, and heuristic on healthy choices.

## Method

**Participants and design.** A sample of 201 participants, consisting of 95 males and 106 females, were recruited online from Amazon Mechanical Turk (Mage = 37.67, SDage = 12.72). All participants were residents in the United States. In regards to participants' highest level of education level, 26.9% had a high school qualification, 57.2% had a college or university degree, and 15.9% had a post bachelor degree. Moreover, 62.2% of participants were employed for wages, 10.9% were self-employed, 3% were out of work and looking for work, 2.5% were out of work but currently not looking for work, 6% were students, 6% were retired, 2.5% were unable to work and 7% were homemakers. The average Body Mass Index (BMI) of participants in the sample was 26.38 (SD = 7.20).

Study 1 had a between-subjects design consisting of three predictors. Hunger and self-control were measured as continuous predictors, and the presence of the heuristic (control vs. social proof) was a categorical predictor manipulated in the food choice task. The dependent variable was the number of healthy choices made in a food choice task, which ranged from zero to six.

**Procedure.** Participants first read an information letter regarding the on-line study. As a cover story for the experiment, participants were informed that they would be completing two unrelated studies with the first being the State Self-Control Capacity Scale (SSCCS; Ciarocco, Twenge, Muraven, & Tice, 2012) described as a mood questionnaire and the second being the food choice task presented a marketing

survey that assessed consumer preferences. After reading this information, participants indicated their consent for participation.

The study began with participants answering questions regarding their age, gender, BMI, level of education as well as occupation. Subsequently they responded to filler questions asking about their current state (i.e., physical and mental fatigue, stress, alertness, affect). Critically, embedded within the filler questions, participants responded to a one-item question enquiring their current levels of hunger (i.e., “How hungry are you feeling at the moment?”) with a seven-point Likert scale ranging from 1 (not at all) to 7 (very much).

Participants proceeded to completing the SSCCS (Ciarocco et al., 2012; see Measures), which was presented as a mood questionnaire under ongoing development. The cover story was that participants’ recorded responses would help validate and improve the reliability of the scale. After completing the SSCCS, participants were introduced to a separate marketing survey, which was in fact the food choice task. Participants were informed that the marketing survey assessed consumer preferences, and that they had to select their choice of a starter, a main and a dessert for two different restaurant menus (see Appendix). Importantly, for each course of meal (i.e., starter, main, and dessert) participants had to make a trade-off choice between a healthy vs. an unhealthy option that presented a self-control conflict. The healthy options (e.g., House Salad) were pretested to be perceived as significantly more healthy but less tasty than the unhealthy alternative (e.g., Quesadilla; see pre-test results in Table 1). In effect, after selecting their choice of starter, main, and dessert for two different menus, participants would have had made a total of six trade-off choices.



| Menu 1                       | Healthiness   |                           | Tastiness     |                           |
|------------------------------|---------------|---------------------------|---------------|---------------------------|
|                              | <i>M (SD)</i> | <i>t</i> -test            | <i>M (SD)</i> | <i>t</i> -test            |
| House Salad                  | 7.72 (1.23)   | $t(35) = 12.70, p < .001$ | 5.78 (1.64)   | $t(35) = -2.07, p < .05$  |
| Quesadilla                   | 4.75 (1.59)   |                           | 6.78 (2.18)   |                           |
| California Flatbread         | 5.97 (2.04)   | $t(35) = 4.46, p < .001$  | 5.69 (1.98)   | $t(35) = -4.73, p < .001$ |
| Chicken Parmigiana           | 4.36 (1.96)   |                           | 7.44 (1.61)   |                           |
| Fruit Sorbet                 | 4.58 (2.02)   | $t(35) = 6.26, p < .001$  | 6.36 (1.99)   | $t(35) = -4.35, p < .001$ |
| Cheesecake                   | 2.61 (1.63)   |                           | 7.81 (1.76)   |                           |
| Menu 2                       | Healthiness   |                           | Tastiness     |                           |
|                              | <i>M (SD)</i> | <i>t</i> -test            | <i>M (SD)</i> | <i>t</i> -test            |
| Roasted Garlic & Tomato Soup | 6.53 (1.54)   | $t(35) = 5.32, p < .001$  | 5.61 (1.84)   | $t(35) = -2.20, p = .03$  |
| Calamari                     | 4.44 (2.29)   |                           | 6.50 (2.14)   |                           |
| Tuscan Turkey Wrap           | 5.69 (1.58)   | $t(35) = 6.06, p < .001$  | 6.28 (1.50)   | $t(35) = -2.56, p = .02$  |
| Chicken Fingers              | 3.67 (1.76)   |                           | 7.06 (1.57)   |                           |
| Mixed Fruit Tart             | 4.81 (2.14)   | $t(35) = 8.58, p < .001$  | 6.33 (2.01)   | $t(35) = -3.94, p < .001$ |
| Chocolate Fudge Brownie      | 1.69 (1.35)   |                           | 7.89 (1.60)   |                           |

*Table 1.* Perceived healthiness and tastiness of food choices presented in Menu 1 and Menu 2

Depending on random assignment, participants completed either one of the two heuristic conditions (no heuristic vs. social proof) of the food choice task. In the social proof condition, a social proof heuristic always promoted the healthy option in the food choice task. Similar to the study by Salmon and colleagues (2014), participants were told the cover story that some initial data had been collected for the marketing survey and that the preliminary results based on the responses of previous participants would be presented. Accordingly, a social proof heuristic in the form of a poll (e.g., bar chart) reporting the majority of previous participants (e.g., ranging from 66% to 83%) choosing the healthy option was displayed above the two options for each course of meal on the menus. That said, before making their own choice participants would be able to see how alleged previous participants had chosen based on the information provided by the social proof heuristic. Contrastingly, in the no heuristic condition, participants made their choices for each course of meal without seeing any additional information. In both conditions, after participants had made

their food choices from the two menus, they were asked a few more questions regarding consumer characteristics including their intentions of healthy eating with a one-time question (i.e., “To what extent do you try to eat healthily?” 1 = not at all to 7 = very much) amongst other filler questions regarding their experience of dining at restaurants. Finally, participants were thanked, debriefed and compensated for their participation (\$0.40 for approximately 4 minutes).

### Measures

*State Self-Control Capacity Scale.* The State Self-Control Scale (SSCS; Ciarocco, Twenge, Muraven, & Tice, 2012) was presented as a mood questionnaire that was under ongoing development. Participants were asked to indicate the degree to which they agreed with the 25 statements of the SSCS that described their current state such as “I feel motivated” and “I feel like my willpower is gone” (reverse coded) using a seven-point Likert-scale (1 = not true; 7 = very true). To ensure that the scale was capturing levels of state, rather than trait, self-control, participants were prompted to indicate how they felt currently, and not how they would usually feel. A final SCS score was calculated by as an average score of all the statements, where a higher score represented a higher level of state self-control. The SSCS had a Cronbach’s alpha ( $\alpha$ ) of .95 in the current study.

## Results

**Descriptives and randomization check.** Overall, participants reported relatively low levels of hunger ( $M = 2.89$ ,  $SD = 1.71$ ), and chose an average of 3.10 ( $SD = 1.53$ ) out of six healthy choices. Participants also reported of having a moderate level of intention for healthy eating ( $M = 4.83$ ,  $SD = 1.27$ ), and intention of healthy eating was significantly correlated with the number of healthy choices made ( $r = .44$ ,  $p < .001$ ). An analysis of variance (ANOVA) with participants’ intention for healthy eating as the dependent variable revealed no significant difference between the two conditions,  $F(1, 198) = 1.45$ ,  $p = .23$ , hence indicating the randomization of participants was successful.

**Effects of hunger, self-control and the interaction of self-control and heuristic on healthy choices.** We conducted PROCESS macro for SPSS (Model 14) by Hayes (2013) in order to examine the effects of hunger, self-control, and the interaction of self-control and heuristic (no heuristic vs. social proof) on healthy choices. The moderated mediation model under examination is presented in Figure 1.

We included intention for healthy eating as a covariate. The results are presented in Table 2, and the beta's reported are unstandardized.

|                             | Self-control  |          |          | Number of healthy choices |          |          |
|-----------------------------|---------------|----------|----------|---------------------------|----------|----------|
|                             | <i>b</i> (SE) | <i>t</i> | <i>p</i> | <i>b</i> (SE)             | <i>t</i> | <i>p</i> |
| Constant                    | .52 (.15)     | 3.39     | <.001    | .70 (.42)                 | 1.70     | .09      |
| Hunger                      | -.18 (.05)    | -3.93    | <.001    | -.10 (.06)                | -1.65    | .10      |
| Self-control                |               |          |          | -.17 (.09)                | -1.91    | .06      |
| Heuristic                   |               |          |          | -.23 (.20)                | -1.16    | .25      |
| Self-control x Heuristic    |               |          |          | .07 (.17)                 | .42      | .67      |
| Intention of healthy eating |               |          |          | .56 (.08)                 | 7.22     | <.001    |

Table 2. Results of the moderated mediation analysis

In line with predictions, hunger had a significant negative relationship with self-control ( $b = -.18$ ,  $SE = .05$ ,  $p < .001$ ),  $F(1, 198) = 15.46$ ,  $p < .001$ ,  $R^2 = .07$ . With regard to the number of healthy choices as a dependent variable, the model included hunger, self-control, heuristic (no heuristic vs. social proof), the interaction between self-control and heuristic as predictors, and the intention of healthy eating as a covariate,  $F(5, 194) = 11.06$ ,  $p < .001$ ,  $R^2 = .22$ . Results indicated that the direct effect of hunger on healthy choices was negative, but non-significant ( $b = -.10$ ,  $SE = .06$ ,  $p = .10$ ). Moreover, the predicted self-control x heuristic interaction was also non-significant ( $b = .07$ ,  $SE = .17$ ,  $p = .67$ ). Likewise, the index of moderated mediation was not significant ( $-.01$ , 95% CI:  $-.08, .05$ ), further indicating that the conditional indirect effect of hunger on healthy choices through self-control was not moderated by the condition of heuristic.

## Discussion

In Study 1 we tested the influence of hunger on people's choices when encountering a self-control conflict between a healthy food that offers long-term health benefits and an unhealthy food that gives immediate consumption pleasure. We first predicted that a stronger experience of hunger would lead to less healthy choices, and this effect should be (at least partially) mediated by increased System 1 processing as manifested through a lower capacity for self-control. Second, we posited that the presence of a social proof heuristic promoting the healthy choices would moderate this outcome, such that lower levels of self-control (i.e., greater System 1 processing) would increase the susceptibility to the influence of the heuristic thereby resulting

in more healthy choices. Although we indeed observed that participants who reported higher levels of hunger also reported lower levels of state self-control, we did not obtain further evidence to support our proposed moderated mediation model. On one hand, there was no evidence that hunger directly affected the number of healthy choices made; on the other hand, a non-significant self-control x heuristic interaction indicated that the effect of self-control on healthy choices was not contingent on the presence of a social proof heuristic. Intention for healthy eating as the covariate was the only significant predictor that strongly influenced the choice outcome.

Nonetheless, before ruling out our hypotheses we discuss potential factors that may have contributed to the current (null) findings. First, judging from the low average of self-reported hunger levels accompanied by a relatively small standard deviation, we could deduce that most participants were not experiencing hunger. Hence it could have been possible that we did not observe apparent direct effects of hunger (i.e., negative association between hunger and healthy choices) simply because most participants were not hungry. In contrast, participants reported having considerably high intentions for healthy eating and correspondingly results also indicated that as a covariate it was the only significant predictor of healthy food choices. Taking this into consideration, we could speculate that in the absence of hunger, more deliberate and reflective precursors such as intention of healthy eating could be more effective in inhibiting the impulses or overriding prepotent responses that are typically triggered by the visceral sensation of hunger. This reasoning is line with previous research showing that reflective precursors such as restraint standards or deliberative evaluations play a more directive role in behavioural outcomes when individuals are not hampered by ego-depletion, cognitive load, or time pressure (see Hofmann, Friese, & Strack, 2009 for a review).

## **STUDY 2**

Following up on Study 1, Study 2 similarly tested the hypotheses that hunger leads to less healthy choices made in food choices involving a self-control conflict but that the presence of a social proof heuristic promoting the healthy option would mitigate this effect. However, in this study we made specific modifications to the experimental design to overcome the limitations of Study 1. Critically, we manipulated hunger rather than relying on participants' self-report of hunger. To ensure that our sample included participants experiencing strong sensations of hunger we recruited participants at a cafeteria who had not yet eaten or were just about to eat (hunger condition), and as a comparison group we recruited participants who had just fin-

ished a meal (satiation condition). Additionally, in the product choice task where we measured the outcome variable of healthy choices made from a trade-off between a healthy vs. unhealthy food product, we included additional filler product pairs that do not involve such a self-control conflict to mask the true purpose of the study. Finally, considering that previous research has suggested that females are more likely to diet and attach stronger importance to healthy eating (Wardle et al., 2004), we recruited a homogenous sample of exclusively females to ensure that the food-related self-control dilemmas were relevant to all participants.

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## Method

**Participants and design.** Participants were 188 female students ( $M_{age} = 20.66$ ,  $SD_{age} = 2.47$ ) recruited at a university campus cafeteria in The Netherlands. The average BMI of participants in the sample was 21.70 ( $SD = 2.60$ ). The study was based on a 2 (hunger: satiated vs. hungry)  $\times$  2 (heuristic: no heuristic vs. social proof) between-subjects design. The dependent variable was the number of healthy choices made in a food choice task, which ranged from zero to seven.

**Procedure.** A research assistant approached students at a university campus cafeteria who had either recently ate a meal (satiated condition) or not (hungry condition), and asked if they would be willing to participate in a marketing study, which was in fact a food choice task. The product choice task included a total of ten food pairs. Critically, seven of these product pairs presented a self-control conflict, where a healthy option was paired with an unhealthy alternative. The seven trade-off product pairs presenting a self-control conflict were constructed based on the results of a pre-test (See Table 3) showing the healthy option (e.g., salad) as perceived as more healthy but less tasty than the unhealthy alternative (e.g., pizza). The remaining three food pairs were filler pairs (e.g., grapes vs. Hershey's Kisses chocolate) that did not pose a self-control conflict, such that both healthy and unhealthy options were perceived to be as equally tasty (see Table 3).

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| Trade-off Pairs            | Healthiness   |  | Tastiness     |   |
|----------------------------|---------------|--|---------------|---|
|                            | <i>M (SD)</i> | <i>t</i> -test                         | <i>M (SD)</i> | <i>t</i> -test                          |
| Salad                      | 5.63 (1.22)   | <i>t</i> (83) = 21.91, <i>p</i> < .001 | 4.87 (1.63)   | <i>t</i> (83) = -5.09, <i>p</i> < .001  |
| Pizza                      | 1.83 (1.04)   |  | 5.93 (1.33)   |   |
| Fruit snacks               | 3.84 (1.57)   | <i>t</i> (82) = 11.81, <i>p</i> < .001 | 4.60 (1.77)   | <i>t</i> (82) = -4.14, <i>p</i> < .001  |
| M&M's                      | 1.59 (.88)    |  | 5.55 (1.71)   |   |
| Ricecakes                  | 4.83 (1.48)   | <i>t</i> (82) = 19.27, <i>p</i> < .001 | 2.55 (1.58)   | <i>t</i> (82) = -12.29, <i>p</i> < .001 |
| Donuts                     | 1.23 (.67)    |  | 5.82 (1.60)   |   |
| Dried apricots             | 5.35 (1.16)   | <i>t</i> (82) = 23.75, <i>p</i> < .001 | 3.63 (1.72)   | <i>t</i> (82) = -8.12, <i>p</i> < .001  |
| Ferrero Rocher chocolate   | 1.54 (.75)    |  | 5.71 (1.69)   |   |
| Mixed fruit                | 5.36 (1.22)   | <i>t</i> (83) = 15.85, <i>p</i> < .001 | 4.83 (1.56)   | <i>t</i> (83) = -4.35, <i>p</i> < .001  |
| Popcorn                    | 2.25 (1.38)   |  | 5.64 (1.37)   |   |
| Cereal bar                 | 4.35 (1.44)   | <i>t</i> (83) = 13.65, <i>p</i> < .001 | 4.37 (1.79)   | <i>t</i> (83) = -6.49, <i>p</i> < .001  |
| Twix chocolate bar         | 1.58 (.95)    |  | 5.93 (1.39)   |   |
| Chicken and vegetable soup | 4.15 (1.53)   | <i>t</i> (82) = 9.24, <i>p</i> < .001  | 4.39 (1.48)   | <i>t</i> (82) = -2.58, <i>p</i> = .012  |
| Chicken nuggets            | 2.41 (1.25)   |  | 4.80 (1.77)   |   |

| Filler Pairs                    | Healthiness   |  | Tastiness     |                                       |
|---------------------------------|---------------|--|---------------|---------------------------------------|
|                                 | <i>M (SD)</i> | <i>t</i> -test                         | <i>M (SD)</i> | <i>t</i> -test                        |
| Apple Juice                     | 4.60 (1.55)   | <i>t</i> (81) = 6.31, <i>p</i> < .001  | 5.13 (1.50)   | <i>t</i> (81) = 1.37, <i>p</i> = .17  |
| Iced Tea                        | 3.23 (1.35)   |  | 4.87 (1.62)   |                                       |
| Grapes                          | 6.31 (1.05)   | <i>t</i> (82) = 25.15, <i>p</i> < .001 | 5.53 (1.28)   | <i>t</i> (82) = -1.20, <i>p</i> = .24 |
| Hershey's Kisses chocolate      | 1.71 (.94)    |  | 5.75 (1.57)   |                                       |
| Cashew, cranberry, & almond mix | 5.41 (1.09)   | <i>t</i> (81) = 23.44, <i>p</i> < .001 | 4.87 (1.55)   | <i>t</i> (81) = -.68, <i>p</i> = .50  |
| Rice Crispie Squares            | 1.77 (.89)    |  | 5.01 (1.74)   |                                       |

*Table 3.* Perceived healthiness and tastiness of food products for trade off pairs and filler pairs

Participants willing to take part in the study first filled out an informed consent then were randomly assigned to one of the two heuristic conditions (control vs. social proof) of the product choice task. In both conditions, prior to the actual product choice task participants were asked about their age, current level of hunger (1 = not at all hungry to 7 = very hungry), as well as their intention to eat healthily (i.e., “How much do you intent on eating healthily?” 1 = not at all to 7 = very much) along with eight other filler questions. In the social proof condition, a social proof heuristic always promoted the healthy food in the product choice task. Modeled after the study by Salmon et al. (2014), the social proof heuristic was shown as a pie chart next to each food pair, allegedly displaying the preliminary results of the marketing study where the majority of previous participants (e.g., ranging from 69% to 85%) had chosen the healthy choice. In the no heuristic condition, the product pairs were presented without extra information. When participants returned the completed the product choice task to the research assistant, they were verbally debriefed and thanked for their participation.

## Results

**Descriptives, manipulation check, and randomization check.** On average, participants chose 3.10 (SD = 1.74) out of seven healthy products. Participants also reported of having a fairly high intention for healthy eating ( $M = 5.68$ ,  $SD = .96$ ), and intention of healthy eating was significantly correlated with the number of healthy choices made ( $r = .15$ ,  $p < .05$ ). Participants in the hungry condition self-reported having higher hunger levels ( $M = 4.13$ ,  $SD = 1.64$ ) than participants in the satiated condition ( $M = 3.10$ ,  $SD = 1.61$ ),  $t(186) = 4.35$ ,  $p < .001$ . An analysis of variance (ANOVA) with participants’ intention for healthy eating as the dependent variable revealed no significant difference between the four conditions,  $F(3, 184) = .87$ ,  $p = .46$ , hence indicating the randomization of participants was successful.

**Effect of hunger and heuristic on healthy choices.** In order to test the effect of hunger, heuristic, and their interaction on healthy choices made, a 2 by 2 between-subjects analysis of covariance (ANCOVA) was performed, with intention for healthy eating as a covariate. There was no main effect of heuristic,  $F(1, 183) = .57$ ,  $p = .45$ . The main effect of hunger was significant,  $F(1, 183) = 6.81$ ,  $p = .01$ ,  $\eta^2 = .03$ . As a covariate, intention for healthy eating was marginally significant,  $F(1, 183) = 3.39$ ,  $p = .07$ . Furthermore, there was a significant hunger x heuristic interaction,  $F(1, 183) = 4.99$ ,  $p = .03$ ,  $\eta^2 = .03$  (Figure 2).

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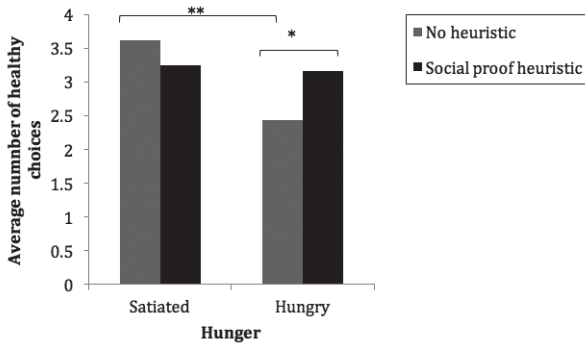


Figure 2. Healthy choices made as a function of hunger and heuristic. \*\*  $p = .001$   
\*  $p < .05$

Simple main effects showed that in the no heuristic conditions, hungry participants ( $M = 2.43$ ,  $SE = .24$ ) made significantly less healthy choices than satiated participants ( $M = 3.62$ ,  $SE = .25$ ),  $p = .001$ . Contrary in the social proof conditions, the healthy choices of hungry participants ( $M = 3.16$ ,  $SE = .24$ ) did not differ from the healthy choices of satiated participants ( $M = 3.25$ ,  $SE = .25$ ),  $p = .79$ . Furthermore, as expected hungry participants made more healthy choices in the social proof condition ( $M = 3.16$ ,  $SE = .24$ ) compared to hungry participants in the no heuristic condition ( $M = 2.43$ ,  $SE = .24$ ),  $p = .03$ ; whereas for satiated participants, there was no significant difference between the number of healthy choices made in the social proof condition ( $M = 3.25$ ,  $SE = .25$ ) compared to the no heuristic condition ( $M = 3.61$ ,  $SD = .25$ ),  $p = .31$ .

## Discussion

In Study 2 we manipulated hunger by recruiting hungry participants who were just about to eat and satiated participants who had just consumed a meal. Hungry vs. satiated participants made trade-off choices between a healthy vs. a more palatable but unhealthy food product in a product choice task. Particularly half of the participants were exposed to a version of the product choice task containing a social proof heuristic that always promoted the healthy products. The results acquired in Study 2 were in line with predictions in showing that hungry participants made significantly less healthy choices than satiated participants when no heuristic was present. However, a social proof heuristic effectively reversed this trend and led hungry participants to make just as many healthy choices as satiated participants. Moreover, seeing that hungry participants made more healthy choices in the social proof condition than in the no heuristic control condition, we obtained evidence to support our prediction that hungry participants would prefer healthy choices when there is a social proof



heuristic promoting them. Lastly, it should be acknowledged that in the present study we also accounted for participants' intention for healthy eating as an individual difference that might have influenced food choices.

## **GENERAL DISCUSSION**

Through two studies our present research aimed to extend on the recent work by Salmon and colleagues (2014) by demonstrating that heuristics could be used to promote consumers' decision competence in making choices that favour long-term interests not only when they are in a state of ego-depletion, but also when they are experiencing hunger. Conventionally both ego-depletion and hunger are similarly assumed to predispose consumers to impulsive processing, thereby heightening their vulnerability to making choices that favour immediate gratifications at the expense of long-term goals. However, we reasoned that being impulsive might simply be a reflection of underlying fast, low-effort and automatic processes preceding deliberative processes that are slow and effortful (see Evans, 2008 for a review of dual-process theories). That said, we proposed that the decision outcome of impulsive, or in more neutral terms fast, low-effort and automatic processing, could be influenced by contextual cues that would work well with such thinking mode – for example, a social proof heuristic (Cialdini, 2009). Specifically, we predicted that the consumers relying on “impulsive”, automatic processing due to hunger would become more responsive to a social proof heuristic that promoted healthy food products.

Summarizing our results, in the first study we observed that participants self-reporting higher levels of hunger to also report having lower levels of self-control, which we considered as a manifestation of predominant System 1 processing. However, we did not obtain sufficient evidence in support of the proposed moderated mediation model that depicted the relationship of hunger on healthy choices as mediated by self-control, and the interaction between self-control and the presence of a social proof heuristic. Nonetheless, we speculated that average low levels of hunger self-reported by participants might have contributed to the null findings of Study 1 – if participants were not experiencing hunger it is not surprising that hunger had minimal effect on their food choices. Taking this into account, Study 2 manipulated participants' hunger instead of relying on self-reports of hunger. To this end, Study 2 recruited participants from a cafeteria, a setting where people would be naturally hungry. The results of Study 2 indicated that in the no heuristic condition hungry participants made significantly less healthy choices than satiated participants, but this effect was mitigated by the presence of a social proof heuristic promoting the healthy

choice. Particularly, hungry participants made just as many healthy choices as satiated participants when there was a social proof heuristic to promote the healthy options. Moreover, hungry participants in the social proof heuristic condition made more healthy choices than hungry participants in the no heuristic condition.

Together the results accumulated from the two studies in the present research suggest that hunger is associated with the fast, low-effort and automatic processing of System 1 that is typically a precursor to self-control failure, but that the presence of contextual cues like a social proof heuristic could curb the potential negative consequences. Moreover, our findings allow us to extend on Salmon and colleagues' (2014) research in showing that the social proof heuristic to promote healthy choices is not only effective for individuals experiencing ego-depletion but also for those who are hungry. Nonetheless, as compared to Salmon and colleagues' study the unhealthy food options presented in the self-control conflicts in the current study might even be stronger temptations because participants were experiencing hunger. Nonetheless, the social proof heuristic was still robust and effective in helping hungry participants transcend the strong temptations of unhealthy food in favour of the healthier, but less tasty options.

Generally, our current research has portrayed the impulsivity triggered by a visceral state of hunger in a more favourable light, while demonstrating the strength of environmental factors to influence the destiny of impulsivity. Rather than reducing impulsivity to circumvent self-control failure, we took an innovative approach by installing social proof heuristics in the environment to work with impulsivity to facilitate self-control success. This approach aligns with the call for implementing nudges, which are subtle physical changes in the choice architecture that works with automatic decision-making processing (e.g., System I thinking) to promote positive choices and behaviours without forbidding any option or substantially changing economic incentives (Thaler & Sunstein, 2008). Accordingly, our current findings would nominate the social proof heuristic as a suitable nudge because it promotes virtue choices without banning any vice alternatives, while lending itself as an aid that could be easily installed in everyday environments.

### **Limitations and directions for future research**

First, we acknowledge that these are novel findings that would benefit from future studies to replicate the effects found in the current research. Second, we also

encourage future studies to improve on the limitations inherent to the current research. For example, in both studies in the present research participants made hypothetical choices that were presented as single trade-off choices between a ‘virtue’ vs. ‘vice’. This dichotomized view, especially with food, has been criticized as perhaps being too artificial and simplistic in understanding self-control and consumption choices (Askegaard et al., 2014). As such, future studies could examine the effects of heuristics in influencing actual product choices that have real life consequences for diets and consumption behaviour. Correspondingly, field studies could test the influence of heuristics installed in the cafeteria, supermarket, convenience stores or other settings where hunger would be naturally experienced and where real consumption choices would occur more naturally outside the context of dichotomous trade-offs. Moreover, testing the robustness of social proof heuristics outside a controlled and experimental setting is important considering the effect sizes of the current findings are rather modest. Future studies would benefit from having larger samples that are inclusive of a broader diversity of participants in terms of gender and socio-economic status. Third, in the current studies we constructed a social proof heuristic based on fabricated information regarding the choice behaviour of ‘previous participants’, but it would be worthy to examine the effects of disclosing real-life descriptive norms based on factual statistics (e.g., Mollen, Rimal, Ruiters, & Kok, 2013). Finally, future studies should also look into factors such as individual differences (e.g., habits, personal involvement) or other external factors (e.g., disclosure of the influence attempt) that could potentially influence the impact of heuristics targeting behavioural change.

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## Conclusion

Hunger, a visceral state commonly encountered as a daily experience, is typically assumed to compromise self-control by leading consumers into making mindless, suboptimal choices that favour short-term interests at the expense of long-term goals. Yet, contrary to the “Don’t go shopping hungry” advice, the current research suggests that an empty stomach does not necessarily pose a danger for making decisions that compromise long-term goals, as long as there are suitable heuristics in the environment to steer such impulsive choices towards more optimal outcomes. As demonstrated in our research, the social proof heuristic lends itself as a low-cost and easy to implement intervention to promote choices in line with long-term goals by working with, rather than against, the impulsive tendency of making fast decisions without slow and careful deliberation. Together, current findings posit that the same factors (e.g., visceral states) that dispose consumers to self-control failure could be reversed to help them achieve self-control success.

## **ACKNOWLEDGEMENTS**

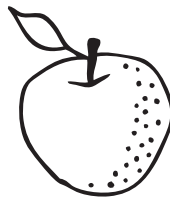
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# *Nudging healthier alternatives for take-away*

**USING HUNGER TO PROMOTE HEALTHY CHOICES  
IN SELF-CONTROL CONFLICTS**



CHAPTER 5

Cheung, T. T., Marchiori, D.R., Kroese, F. M., Gillebaart, M., Fennis, B. M., & De Ridder, D. T. (Submitted for publication). Nudging healthier alternatives for take-away: A field experiment on the effects of (disclosing) three nudges on food choices

## **ABSTRACT**

The promotion of healthy eating is a relevant and urgent priority considering the increasing medical costs and the fatal consequences associated with obesity. In response, the current study demonstrates the effectiveness of nudging as an intervention to promote healthy food choices in a field experiment. Nudging works by using the choice architecture to steer people's automatic decision-making processes, which often underlie food choices, towards more optimal choices in line with consumers' interests (e.g., healthy choices) without imposing restrictions. Three types of nudges were implemented at a take-away food vendor: 1) an accessibility nudge that placed fruits at the front counter; 2) a salience nudge that presented healthy bread rolls to be more visually attractive; and 3) a social proof nudge that conveyed the yoghurt shake as a popular choice. As nudges are often assumed to operate outside of consumers' full awareness, we additionally assessed whether nudging effects would remain robust when a disclosure message was included to inform the nudges' intended purpose. The field experiment was conducted over a seven-week period (i.e., baseline week; nudge week; four washout-weeks; and a nudge and disclosure week), and the measured outcome was the sales of the targeted healthy food products. Findings indicated that the accessibility nudge was particularly effective in significantly increasing the sales of the fresh fruits. Meanwhile, the impact of the salience nudge was limited presumably due to existing preferences or habits that typically facilitate bread purchases. As the sales of the yoghurt shakes remained consistently low over the seven-week period the impact of the social proof nudge remained unexamined. Critically, disclosing the purpose of the nudges did not interfere with effects. Current findings suggest nudging as an effective and low-cost strategy for healthy food promotion, and offer implications for topical debate regarding the ethics of nudges.



Eating more healthily for a slimmer waistline is no longer a private challenge that tops many people's New Year's resolutions list but a foremost priority on the public health agenda. Indeed, there is an urgent need to counter unhealthy eating on a societal level as the growing prevalence of overweight and obesity contributes majorly to the rise of non-communicable diseases (e.g., cardiovascular diseases, diabetes) that not only pose increasing financial strain on healthcare systems (Muka et al., 2015), but even more worryingly lead as a cause of death worldwide (World Health Organization, 2014). Many common public interventions aiming to encourage healthy diets or curb unhealthy eating behaviours are information-based, with the objective to provide objective information (e.g., education on what constitutes a healthy diet; caloric and nutrition labelling) to consumers so that they can make more informed, and hence healthier food choices. However, while information-based interventions have demonstrated effectiveness in increasing consumers' intentions or awareness for healthy eating, the majority have nonetheless been largely unsuccessful in achieving actual and sustained behavioural change (Capacci et al., 2012; Marteau et al., 2012). Some have attributed the shortcoming of such public interventions to their predominant focus in attempting to engage consumers in deliberate and rational thinking, which is at odds with how the majority of food decisions naturally occur (Marteau et al., 2012).

Indeed, research has consistently shown that consumers make food choices in a mindless manner with minimal deliberation, with many consumption behaviours occurring outside of awareness often as the result of environmental influences (Cohen & Babey, 2012; Dijksterhuis et al., 2005; Wansink & Sobal, 2007). In response, in the current research we employ nudging, described as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p.6), as an alternative strategy to promote healthier food choices. An example of nudging is strategically placing fruits at the cashier checkout where consumers tend to make impulse purchases to promote sales of healthy snacks. Unlike information-based interventions, nudging bypasses the need for consumers to engage in deliberate and effortful processing, and instead relies on subtle changes to the choice setting to facilitate the ease and convenience with making a healthy choice, so that even a mindless choice could be a healthy one. This inherent characteristic of nudging is a competitive advantage that makes it a more compatible and effective strategy than information-based interventions to promote healthy consumption behaviours. Accordingly, the primary objective of the current research is to examine the effectiveness of three nudging strategies (i.e., presenting healthy food products to be more accessible, more visually salient, and perceived as more popular) at a take-away food vendor in promot-

ing consumers' purchases of healthy food products. Moreover, we assess whether the effectiveness of nudges hinge on consumers being unaware of their intended purpose. To this end, we test whether using a simple message to disclose the purpose of a nudge might affect its impact.

## **Theoretical background**

Nudging is considered a promising strategy for behaviour change, as it relies on working with, rather than against, the underlying processes that are prominently responsible for the majority of behaviours. This approach is based on the theoretical rationale derived from dual-process models of behaviour. Contemporary dual-processing models posit that behaviours result from the interaction of two modes of processing: an unconscious, fast, and automatic mode (System I) on one hand, and a slow, conscious, and deliberative mode (System II) on the other hand (Evans, 2008; Kahneman, 2011). The interaction between these two systems could be described as a “default-interventionist” relationship (Evans, 2008; Kahneman, 2011). System I processing occurs by default and effortlessly through associations, heuristics and intuition, and should the need arise then such automatic reactions could be halted or modified by the more effortful and deliberate processing of System II that is guided by goals, explicit beliefs and intentions (Kahneman, 2011). While System I processing suffices for getting by day-to-day or routine situations, it is nonetheless prone to cognitive biases and errors in judgements as it heavily relies on environmental cues (Kahneman, 2011). As such, System I processes are commonly also described as ‘impulsive’ in some dual processing models (Hofmann et al., 2008; Strack & Deutsch, 2004) and tend to result in suboptimal behavioural outcomes and decisions that otherwise could have been avoided if more ‘reflective’ processing and analytic reasoning were involved.

In accordance with this theory, while many consumers intend to eat healthily and express weight concerns (De Ridder, Adriaanse, et al., 2014), much of their food decisions and eating behaviours are driven by habit, affect, impulse, or even spontaneous reactions to the environment as opposed to conscious and careful deliberation (Cohen & Babey, 2012; Wansink, 2004). Indeed, the accumulating scientific evidence more generally indicates that, despite having good intentions the majority of behaviours frequently occur on a non-conscious, automatic basis (Bargh & Morsella, 2008; Cialdini, 2008; Dijksterhuis et al., 2005). Research has shown that, for example, feeling hungry (Loewenstein, 1996), being mentally distracted (Shiv & Fedorikhin, 1999) or having engaged in effortful exertions of self-control (i.e., ego-depletion; Baumeister et al., 1998) could all undermine System II processing, making it difficult to engage in

conscious and deliberate processing that warrant healthy choices and behaviours. Instead, the balance is tipped towards more System I processing that typically leads to unhealthy outcomes. In that light, nudging alludes to the increasing recognition that interventions for behaviour change should target the automatic, quick, and non-conscious mechanisms rather than rely on information and persuasion (Hollands, Marteau, & Fletcher, 2016; Sheeran, Gollwitzer, & Bargh, 2013).

## Examples of nudging in public eating environments

Healthy eating begins with making healthy food choices. The use of nudging interventions has increasingly attracted interests from governments from around the world (Ly & Soman, 2013; Sunstein, 2016), nonetheless systematic reviews suggest that more evidence of nudging interventions specifically in healthy eating promotion in public spaces is still needed before drawing confident conclusions about their effectiveness (Skov, Lourenco, Hansen, Mikkelsen, & Schonfield, 2013). In response, the current field experiment aims to add to this body of research, in which we employ three nudges to promote healthy food choices. The selected nudging strategies (i.e., accessibility, salience, and social proof) can easily be employed in public spaces to promote healthy eating and have demonstrated initial success in doing so.

**Accessibility.** The accessibility to food on the basis of physical proximity influences people's consumption of that food, such that people tend to consume a greater amount of food that is closer in proximity compared to food that is further away (Rozin et al., 2011). The assumption for this behaviour is that greater distance involves more effort for obtainment (Maas, de Ridder, de Vet, & De Wit, 2012). Moreover, it has also been proposed that the accessibility of food moderates the activation of eating-related information (i.e., affordances), such that food items within physical reach (vs. distant food) more strongly trigger eating affordances that underlie actual consumption behaviour (Junghans, Evers, & De Ridder, 2013). Accordingly, repositioning food products to be more (or less) accessible by means of altering proximity can increase the intake of healthy food products or in contrast decrease the consumption of unhealthy products. For example, ingredients that were placed on the edge of the salad bar were more likely to be selected than food placed in the center of the salad bar (Rozin et al., 2011); fresh fruits located next to cash registers were more likely to be purchased (Hanks et al., 2013; Kroese, Marchiori, & de Ridder, 2016) and the intake of candies and potato chips at the cafeteria decreased when they were repositioned to be further away from cash points (Meiselman, Hedderley, Staddon, Pierson, & Symonds,

1994). In the current field experiment study, we employed an accessibility nudge to improve the physical convenience for purchasing fruits (i.e., fresh fruits that were initially out of physical reach of consumers were relocated next to the cashier where consumers have direct access) to encourage consumer to purchase more fruits.

**Saliency.** The saying “You eat with your eyes first,” describes how the salience and attractiveness of food are important external cues that trigger consumption (Wansink, 2004). People have a natural tendency to approach objects that they find rewarding (Krieglmeier, Deutsch, De Houwer, & De Raedt, 2010), and the visual quality of a food item can also heighten the motivation for intake (Marcelino, Adam, Couronne, Köster, & Sieffermann, 2001). Many food products are packaged with positive associations (e.g., attractive packaging) to generate approach behaviours (Marteau et al., 2012). Intriguingly, research has shown that even the mere sight of food can stimulate unplanned consumption behaviour (Cornell, Rodin, & Weingarten, 1989; Tuomisto, Tuomisto, Hetherington, & Lappalainen, 1998). Building on these research insights, interventions have relied on enhancing the visibility and attractiveness of healthy food products as a strategy to promote their consumption. For example, enhancing the visual presence of healthy snacks at the cash checkouts by increasing their overall quantity at the top of opened shelves generated more sales of the healthy snacks at a hospital cafeteria (van Kleef, Otten, & van Trijp, 2012); displaying fresh fruits in attractive bowls and tiered stands encouraged more consumption at a student cafeteria (Hanks, Just, & Wansink, 2013); and placing healthy beverages at eye level in refrigerators also introduced greater sales of these items at hospital cafeteria (Thorndike, Sonnenberg, Riis, Barraclough, & Levy, 2012). In the current field experiment, we used a saliency nudge to enhance the visibility and visual attractiveness of healthy bread rolls (i.e., by placing them in a separate container decorated with a green-chequered cloth and a picture of a wheat field) to nudge consumers into preferring these healthy bread rolls over the unhealthier alternatives.

**Social Proof.** The food choices of others often have a strong influence on people’s own consumption decisions, and the operation of social norms has been proposed as a mechanism underlying such influence (Higgs, 2015). Descriptive norms are a type of social norms conveying the typical or prevalent behaviour in a given situation, and people often use descriptive norm information as a social proof heuristic (e.g., “if most people are doing it, it must be the right thing to do”) to ascertain their own behaviour (Cialdini, 2008). The social proof heuristic functions as a mental shortcut in the decision-making process and thereby influences behaviour especially in situations where people are not engaged in full cognitive capacity (Jacobson, Mortensen, & Cialdini, 2011; Salmon et al., 2014). The provision of descriptive norms regarding the

food choices of others has shown to be a successful strategy in encouraging healthier food consumption. For example, presenting a poster denoting that “Everyday more than 150 students have a tossed salad for lunch here” led to significantly more purchases of salads at a university campus cafeteria (Mollen, Rimal, Ruiters, & Kok, 2013) and installing placards on grocery shopping carts informing the average number of fresh produce bought and the most common fruits and vegetables sold at the supermarket also resulted in a higher proportion of fresh produce purchased (Payne, Niculescu, Just, & Kelly, 2015). In the current field experiment, we installed a social proof nudge to convey an explicit descriptive norm (i.e., “Bestselling choice”) suggesting the yoghurt shake as the most popular choice amongst customers to encourage its sales.

## ——— Transparency

In essence, nudging calibrates the choice architectures to work with non-conscious and automatic processes, by steering them towards more optimal outcomes in the interests of consumers (Sustein & Thaler, 2008). Like the examples described above, the goal of nudging in healthy food promotion is then to redirect an automatic and mindless choice towards a healthier outcome by changing the environment in such a way that the healthy choice becomes a more convenient, attractive, or normal choice (Wansink, 2015). Correspondingly, this view has led to some criticism that nudging is only effective if people are not cognizant of being influenced (Bovens, 2009). For example, if students were informed that the display of the food in the school cafeteria was intentionally arranged to encourage healthy eating, the nudging intervention might backfire as a consequence. The underlying premise is that disclosing the intended purpose of nudges may trigger psychological reactance (Wortman & Brehm, 1975), in which people deliberately resist their influence in reaction to feeling manipulated or having their freedom of choice threatened.

Nonetheless, there is scarce research systematically evaluating whether nudging strategies are indeed only effective in covert conditions where consumers are unaware of being nudged. Put differently, it remains an open question whether effects of nudging would still be observed when their purpose is disclosed, potentially stimulating consumers to be more reflective and cognizant in the situation. To our knowledge the study by Kroese, Marchiori and De Ridder (2016) is the only field study assessing the effects of the disclosure of nudging specifically targeted at healthy eating promotion, and even so this study has only examined disclosure applied to one type of nudge (i.e., accessibility nudge). In the current research we investigate whether an accessibility nudge, a salience nudge and a social proof nudge would still be influential

when they are accompanied by a disclosure message revealing their presence and intent. Answering this research question not only increases understanding of the drivers behind nudging effects, but also responds to the topical debate surrounding the ethics of employing a strategy (i.e., nudging) that is assumed to operate outside of people's conscious awareness (Hansen & Jespersen, 2013; House of Lords, 2011). Our research findings shed insight by examining whether the provision of a disclosure could be a viable solution to enhance the transparency of nudging.

### \_\_\_\_\_ **The current research**

The first objective of the current research was to conduct a field experiment to test the effectiveness of an accessibility nudge, a salience nudge, and a social proof nudge to encourage more purchases of fresh fruits, healthy bread rolls, and yoghurt shakes respectively at a take-away food vendor. Considering that in previous research similar nudges have successfully promoted the purchases of healthy products in student cafeterias (Hanks et al., 2013; Kroese et al., 2016; Mollen et al., 2013), in the current study we hypothesize that all three nudges will increase the sales of the targeted healthy options. As a second objective, the current research addresses an underexplored research question by investigating whether nudging effects are robust when their purpose is disclosed.

Together, our research findings first and foremost offer relevant practical implications for the design and application of nudging interventions promoting healthy food choices. Furthermore, our findings are also relevant in exploring the provision of disclosure as a viable solution in alleviating ethical concerns over duplicitousness.

## **METHOD**

### \_\_\_\_\_ **Setting and participants**

The study took place at a take-away food vendor that sold a variety of hot and cold beverages (e.g., coffee, tea, fruit juices, soft drinks, etc.), small meal items (e.g., salads, bread rolls, sandwiches and baked goods), and snacks (e.g., yoghurt, cookies, fruits, etc.) at a large academic hospital in The Netherlands. Participants consisted of all customers who made purchases at the take-away food vendor during the seven-week period that the field experiment took place.

## Design

The current experiment employed three different nudges (see Nudges) to promote the sales of fruits, healthy bread rolls, and a yoghurt shake. The field experiment was designed over a seven-week course such that: 1) Week 1 was a baseline week where no nudges were implemented; 2) Week 2 was an experimental nudge week where all three nudges were simultaneously implemented (yet targeting different healthy food products) to promote healthy food choices; 3) Week 3, 4, 5, and 6 were washout weeks where all three nudges were simultaneously removed to eliminate carryover effects from the previous nudge week; and 4) Week 7 was an experimental nudge and disclosure week where all three nudges were re-implemented with an additional disclosure slogan (see Disclosure) conveying the purpose of the nudge.

All purchases were recorded electronically on a weekly basis. The field experiment has been approved by the faculty's institutional review board.

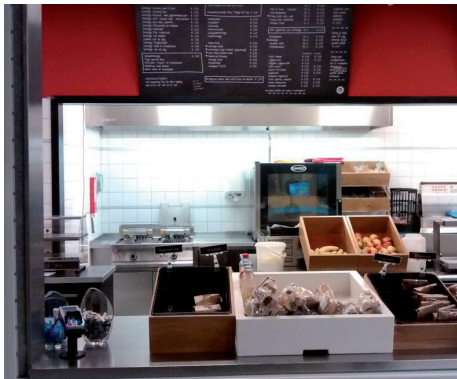
## Procedure

On both the two experimental weeks (i.e., nudge week, nudge and disclosure week) the three different nudges including the accessibility nudge, salience nudge, and social proof nudge (see Nudges below) were set up simultaneously at 7.30 a.m. on Monday morning when the take-away food vendor opened, and removed at 5.00pm on Friday when the vendor closed. During the nudge and disclosure week, an additional sign of the disclosure (see Nudge Disclosure below) informing the purpose of the nudge was displayed adjacent to each nudge. The nudges were not implemented during the baseline or washout weeks. After the study had completed its course, the manager of the take-away food vendor provided the electronically recorded weekly sales data of the seven-week period to the researchers.

## Nudges

**Accessibility nudge.** During the baseline week, the fruits were placed behind the counter at the back of the take-away food vendor out of customers' physical reach (see Figure 1a). The accessibility nudge removed this physical barrier by placing the fruits at the front counter next to the cashier where customers have direct access (see Figure 1b). Hence the accessibility nudge aimed to promote the sale of fruit by enhancing the ease and convenience of access for customers.

**Salience nudge.** During the baseline week, the bread rolls with muesli were placed together with the croissants in one container, and the bread rolls with currants were placed in a different container with the cheese croissants (see Figure 1a). The salience nudge was implemented in order to draw attention to both bread rolls, which were considered the relatively healthier bread options. Hence, the salience nudge re-arranged the bread product display by placing both types of bread rolls together in one container, and both types of croissants together in another container. Furthermore, a green-checked cloth lined the container holding the bread rolls, and a picture of a wheat field was placed on the backside of the container, in order to enhance the overall presentation and salience (see Figure 1b).



*Figure 1a (left).* This was the product arrangement during the baseline week where the fresh fruits were placed in containers at the back of the take-away food vendor and was out of consumers' physical reach. The healthy and unhealthy bread rolls were placed together in the same container at the front counter.



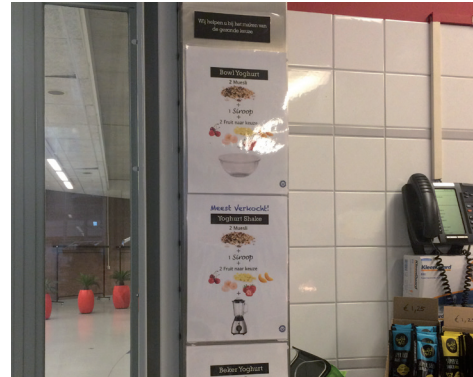
*Figure 1b (right).* This was the product arrangement during the nudge week where the accessibility nudge and the salience nudge were installed. The accessibility nudge made the fresh fruits more accessible for consumers by relocating the fruits from the back to the front counter. The salience nudge made the healthy bread rolls more visually salient by placing them in a different container (from the unhealthy bread rolls) decorated with green chequered cloth and a picture of a wheat field.



**Social proof nudge.** During the baseline week, the labels for the three yoghurt options (i.e., yoghurt bowl, yoghurt cup, and yoghurt shake) were placed flat on the counter. Customers would not have noticed the labels unless they approached the counter (see Figure 2a). The social proof nudge aimed to promote the yoghurt shake by conveying that it was the preferred choice by the majority of customers. To implement this nudge, the labels for the three yoghurt options was redesigned. First, pictures (e.g., pictures of fruits, muesli, containers) were added to accompany the text to visualize how the three yoghurt options were different from each other. Second, the labels were placed on the wall in clear view. Critically, on the label for the yoghurt shake, an additional tagline “Bestselling choice!” was included to trigger a descriptive norm, thereby providing a social proof heuristic for customers (see Figure 2b).



*Figure 2a (left).* This was baseline week where the labels of the yoghurt products were placed flat on the counter.



*Figure 2b (right).* During the nudge week where the social proof nudge was installed, the labels were redesigned to include pictures (e.g., pictures of fruits, muesli, containers) to accompany the text describing the three yoghurt products. Moreover, the labels were placed on the wall at eyelevel. Importantly, the social proof had an additional tagline “Bestselling choice!” to convey a descriptive norm to promote the yoghurt shake.

## —— **Nudge Disclosure**

A small sign with the simple one-sentence message, “We help you make healthy choices”, was displayed accompanying each individual nudge during the nudge and disclosure week to disclose the intention of the nudges in place.

## —— **Data treatment and analysis**

In order to test the effectiveness of the accessibility nudge, the salience nudge, and the social proof nudge respectively, we first present the sales data of the targeted healthy products (i.e., fresh fruits, healthy bread rolls, and yoghurt shakes) collected over the seven-week period (i.e., Week 1: Baseline week, Week 2: Nudge week; Week 3 – 6: Washout weeks; Week 7: Nudge and disclosure week). We acknowledge that the reported increase or decrease in sales of the targeted healthy products compared between the baseline vs. nudge vs. nudge and disclosure week is only descriptive. Due to the nature of the weekly sales data, which recorded the total daily sales of each food product rather than individual sales transactions, means and standard deviations could not be calculated, and hence statistical analyses could not be carried out for significance testing to examine the differences in sales between the baseline, nudge, and nudge and disclosure week. Nonetheless, in addition to providing descriptives, we conducted chi-square analyses to test the effectiveness of the respective nudges. Specifically, the chi-square compared the sales of the targeted healthy product to the sales of a comparable unhealthy product between the baseline vs. nudge vs. the nudge and disclosure week.

Additionally, exploratory analyses investigated whether potential spill over nudging effects existed, such that the hypothesized increase of sales for targeted healthy food products would extend from the nudge week to the subsequent washout weeks when the nudges were removed.

## —— **Results**

Table 1 presents an overview of the sales of fruits (vs. confectionary), healthy bread rolls (vs. croissants), as well as yoghurt shake (vs. yoghurt bowl and yoghurt cup) across the seven-week course of the entire field study.

| Week                    | Fresh Fruits | Confectionary | Healthy bread rolls | Croissants | Yoghurt Shake | Yoghurt Bowl | Yoghurt Cup | Total of all sales transactions |
|-------------------------|--------------|---------------|---------------------|------------|---------------|--------------|-------------|---------------------------------|
| Baseline Week           | 90           | 142           | 291                 | 255        | 7             | 5            | 117         | 14,698                          |
| Nudge Week              | 156          | 132           | 318                 | 237        | 6             | 7            | 122         | 20,921                          |
| Washout Week 1          | 101          | 129           | 287                 | 214        | 3             | 13           | 142         | 12,308                          |
| Washout Week 2          | 140          | 107           | 329                 | 209        | 10            | 7            | 136         | 12,259                          |
| Washout Week 3          | 122          | 82            | 310                 | 160        | 7             | 9            | 130         | 11,579                          |
| Washout Week 4          | 90           | 82            | 277                 | 186        | 4             | 7            | 130         | 13,099                          |
| Nudge & Disclosure Week | 164          | 137           | 327                 | 226        | 8             | 9            | 147         | 15,579                          |

*Table 1.* Sales of fresh fruits vs. confectionary; healthy bread rolls vs. croissants; and yoghurt shake vs. yoghurt bowl vs. yoghurt cup; and the total of all sales transactions at the take-away food vendor across the baseline week, the nudge week, the washout weeks, and the nudge and disclosure week

**The effects of the accessibility nudge on the sales of fruits.** During the baseline week a total amount of 90 pieces of fruit were sold. The total amount of fruit sales increased to 156 during the nudge week, which is equivalent to a 73.3% increase. Furthermore, a total amount of 164 pieces of fruit were sold during the nudge and disclosure week. This was a 82.2% increase compared to the baseline week, and a slight increase of 5.1% compared to the nudge week.

We conducted a chi-square test to compare the sales of fruits to the sales of confectionary (e.g., sweets, cookies, energy bars) to examine the impact of the accessibility nudge. Confectionary was chosen as a comparison group because they competed for sales as the ‘unhealthy’ snack alternatives as they were also placed next to the cashier. In line with predictions, the results of the chi-square indicated that there was a significant difference in the proportion of sales between the three weeks,  $\chi^2(2, N=821) = 16.08, p < .001$ .

Specific pairwise comparisons to examine the sales data of fruits vs. confectionary between the baseline vs. nudge week, baseline vs. nudge and disclosure week, and also nudge vs. nudge and disclosure week. Results from the follow-up pairwise comparisons revealed that the proportion of fruit sales to confectionary sales in the nudge week (fresh fruit: 156; confectionary: 132) was significantly different to the proportion in the baseline week (fresh fruit: 90; confectionary: 142),  $\chi^2(1, N=520) = 12.18$ ,  $p < .001$ . The proportion of fruit sales to confectionary sales in the nudge and disclosure week (fresh fruit: 164; confectionary: 137) was also significantly different to the proportion in the baseline week,  $\chi^2(1, N=533) = 12.93$ ,  $p < .001$ . Finally, the proportion of fruit sales to confectionary sales in the nudge week was not significantly different to the proportion in the nudge and disclosure week,  $\chi^2(1, N=589) = .006$ ,  $p = .94$ . Complementing the descriptives, the results from the chi-square analyses demonstrate that the accessibility nudge was effective in promoting fresh fruits (relative to unhealthy confectionaries).

#### **The effects of the salience nudge on the sales of healthy bread rolls.**

During the baseline week a total of 291 healthy bread rolls were sold. The total amount of healthy bread rolls increased to 318 during the nudge week, which is equivalent to a 9.3% increase. During the nudge and disclosure week a total of 327 healthy bread rolls were sold, which was a 12.4% increase compared to the baseline week, and a 2.8% increase relative to the nudge week.

We conducted a chi-square test to compare the sales of healthy bread rolls to the sales of croissants to examine the impact of the salience nudge. The croissants were selected as a comparison group because they were the competitive 'unhealthy' alternatives in the same product category. Results from the chi-square indicated that the overall differences in proportion of sales in healthy bread rolls compared to croissants was not significantly different between the baseline week (healthy bread rolls: 291; croissants: 245), the nudge week (healthy bread rolls: 318; croissants: 225), and nudge and disclosure week (healthy bread rolls: 327; croissants: 220),  $\chi^2(2, N=1626) = 3.67$ ,  $p = .16$ . While descriptives suggest the sales of healthy bread rolls were higher in the weeks where the salience nudge was implemented, we did not obtain evidence from the chi-square analysis that the proportion of healthy bread rolls compared to croissants was statistically significant different across the three different weeks.

**The effects of the social norm nudge on the sales of yoghurt shakes.**

During the baseline week, a total of 7 yoghurt shakes were sold. Comparatively, during the nudge week a total of 6 yoghurt shakes were sold, and, a total of 8 yoghurt shakes were sold during the nudge and disclosure week. Considering the descriptives, it was apparent that the sales of the yoghurt shake across the entire seven-week period remained consistently low and would not have warranted sufficient statistical power for analysis. For this reason, statistical analyses were not conducted to examine the effect of the social proof nudge.

**Exploratory analyses of potential spillover nudging effects.** In light of the finding that the accessibility nudge significantly increased the sales of fresh fruit in the nudge week compared the baseline week, we explored whether this increase in sales ‘spilled over’ or was sustained in the washout weeks subsequent to the nudge week. Similar to the chi-square analysis used previously, we compared the sales of fresh fruits to the sales of confectionaries between the baseline week vs. nudge week vs. washout week (averaged between the four weeks) vs. nudge and disclosure week. The results of the chi-square indicated that there was a significant difference in the proportion of sales between the weeks,  $\chi^2(3, N=1034) = 16.73, p < .001$ . Specific follow-up comparisons revealed that the proportion of fresh fruit sales to confectionary sales during the washout week (fresh fruit: 113; confectionary: 100) was significantly different to the proportion in the baseline week (fresh fruit: 90; confectionary: 142),  $\chi^2(1, N=445) = 9.10, p = .003$ . On the other hand, the proportion of fruit sales to confectionary sales during the washout week (fresh fruit: 113; confectionary: 100) was not significantly different to the proportion in the nudge week (fresh fruit: 156; confectionary: 132),  $\chi^2(2, N = 501) = .06, p = .80$ ; nor to the nudge and disclosure week (fresh fruit: 164; confectionary: 137),  $\chi^2(1, N=514) = .10, p = .75$ . These results demonstrate that the increase of sales of fruits on the nudge week from the baseline week sustained during the washout-weeks after the accessibility nudge has been removed, thereby suggesting a potential spillover effect of the accessibility nudge.

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## Discussion

The automatic basis on which many food choices are made without much deliberation offers a window of opportunity for using choice architectures to gently nudge consumers towards healthy food choices. Specifically, we employed an accessibility nudge to increase the convenience for picking healthier fresh fruits, a salience nudge to enhance the visibility and attractiveness of healthy bread rolls, as well as a social proof nudge to promote the popularity of yoghurt shakes at a take-away food vendor located at a university hospital. Considering the sales data, it was evident that the accessibility nudge was a particularly effective nudge in this study. Consistent with previous research findings (Hanks et al., 2013; Rozin et al., 2011), simply repositioning the fruits from the back to the storefront improved the convenience for picking a fruit and as a result led to a significantly higher proportion of fresh fruits sold compared to confectionaries. Exploratory analyses examined whether the increase in sales of fresh fruits by the accessibility nudge would still be observable in the subsequent washout weeks when the nudge was removed. We acquired some suggestive evidence that the average sales of fresh fruits were sustained during the four subsequent washout weeks at a level similar to the nudge week, and the nudge and disclosure week. Such finding suggests that even when the fresh fruits were no longer physically and immediately accessible customers still continued to purchase them in relatively greater quantities than confectionaries that were, in contrast, within physical reach. Although this is an intriguing finding it would require considerable replication and future studies should rule out potential confounding factors that may have prompted the ‘spillover effect’ observed in the current study.

The salience nudge was intended to enhance the visibility and visual attractiveness of the healthy bread rolls. Compared to the baseline week it was apparent that in terms of absolute sales of healthy bread, there was a relatively greater proportion of healthy bread rolls sold relative to the croissants in the nudge week, as well as in the nudge and disclosure week. The observed increase was however not significant in statistical terms across the three weeks. Nonetheless, these findings do not necessarily dismiss the effectiveness of a salience nudge in general. It may be the case that the influence of the salience nudge was overpowered by consumers’ existing preferences and habits for bread purchases. In an in-store experiment, De Wijk and colleagues (2016) found that an accessibility nudge to improve the convenience for purchasing whole-wheat bread did not influence sales. Similar to our cause, the researchers attributed the lack of effect to the strong habitual or planned nature that drives consumers’ bread purchasing behaviour. That said, it would be interesting for future research to examine nudges’ extent of influence in the presence of existing preferences and

habits. Lastly, we should once again acknowledge that the low sales of yoghurt shake across the entire seven-week period did not warrant statistical analyses that would be sufficiently powered to examine the effects of the social proof nudge.

In current research, we tested the effectiveness of three nudges (i.e., accessibility, salience, and social proof) in a real-life setting as opposed to a more controlled environment in the lab. We observed that the accessibility nudge appeared to have worked particularly well in promoting a healthy food product in spite of the distractions that were taking place in the setting. On the other hand, due to practical reasons all three nudges were implemented simultaneously in the current study. Future studies could potentially examine whether presenting multiple nudges together would cause interference between the nudges, or whether they could complement each other and have additive effects.

As a second objective, the current study also examined the impact of disclosure. Our findings indicated that disclosing the intended purpose of the nudge did not interfere with its effects (e.g., the sales of fresh fruits in the nudge and disclosure week was comparable to the nudge week), which corroborates recent work by Kroese and colleagues (2016). We also did not observe reactance effects – disclosing that the nudge was meant to help consumers make healthy choices did not result in compensation effects or a decrease in the purchasing of unhealthy products. However, in the current study we only disclosed the intended purpose of the nudge, and not the actual presence of the nudge (e.g., rearranged product placement) in the disclosure message. While our findings suggest that nudging effects remain robust when consumers are made aware of the nudge's intended purpose through a simple disclosure message, future research should further scrutinize whether this effect still holds when consumers are made aware specifically of the nudge's presence (i.e., the fact that products were repositioned). Nonetheless, our current finding may be relevant in consideration of the topical debates surrounding the ethics of implementing interventions (i.e., nudging) that may be influencing individuals at large without their awareness. For example, the House of Lords Behaviour Change report (2011) published in the United Kingdom asserts that a main criterion for evaluating whether an intervention is ethically acceptable depends on the extent to which it is covert. The report considered two different means to enhance the transparency of the interventions – either through direct disclosure of the intervention or by ensuring that any perceptive person would be able to discern that an intervention (i.e., nudge) has been implemented. The report concluded the latter to be ethically acceptable under the assumption that full transparency might potentially limit the effectiveness of the intervention. However, our research finding actually suggests that it would be viable to disclose the purpose

of the nudge with full transparency without undermining its effects. Nonetheless, in the current research we did not assess whether consumers actually read the disclosure message, and therefore would recommend future research to more stringently investigate whether nudging effects would be immune against transparency.

Our current research has demonstrated nudging to be a low-cost and easy-to-implement strategy to promote healthy food choices. It appears that the fast, non-conscious, and automatic processes are not destined towards unhealthy choices, but could rather be gently nudged by the choice architecture into more optimal, healthy outcomes. These nudging effects are perhaps even immune to conditions when consumers are made aware of being guided toward healthier choices. In closing, with the increasing trend of people eating outside their homes, public eating environments have been identified as strategic places for health promotion (Skov et al, 2013), and nudging presents itself to be a promising strategy to deliver results in these environments akin to the expression “an apple a day keeps the doctor away”.



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# *Under consumers' scrutiny*

**AN INVESTIGATION INTO CONSUMERS'  
ATTITUDES AND CONCERNS ABOUT NUDGING  
IN THE REALM OF HEALTH BEHAVIOUR**



## CHAPTER 6

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## **ABSTRACT**

Nudging strategies have recently attracted attention from scholars and policy makers for their potential in influencing people's behaviours on large scales. But is the fact that nudges do not forbid any choice-options or significantly alter people's economic incentives sufficient to conclude that nudges should be implemented? While this is discussed amongst scholars from various disciplines the voices of consumers, the target-group of nudges, remain unheard. Since understanding their knowledge about nudging and their opinions on being nudged are crucial for the evaluation of the moral appropriateness of nudging, the current study examines consumers' knowledge of and attitudes toward nudging in general and the realm of health behaviour. In this qualitative investigation in-depth semi-structured interviews with UK consumers were conducted to examine consumers' attitudes to four domains of inquiry around which the scholarly discussions about nudging have revolved: consumers' approval of nudging, consumers' views on the origin of nudges, consumers' perceived effectiveness of nudging, and consumers' concerns about manipulative aspects of nudging. Interviews revealed that consumers are largely unfamiliar with the concept of nudging altogether. Once defined and explained to them most consumers approve of the concept, especially in the realm of health behaviour, given particular conditions: 1. Nudges should be designed for benefiting individuals and society; 2. consumers comprehend the decision-making context and the reasoning behind the promotion of the targeted behaviour. Interviews revealed very limited concerns with manipulative aspects of nudges. These findings call for better information-management to ensure consumers knowledge of nudges and awareness of their current implementation. Under that condition the findings encourage the implementation of nudges benefitting individuals and society in domains that consumers comprehend, such as health behaviours. Further research is required to clarify consumers' concerns and requirements for nudges in more complex domains such as financial decisions and retirement plans.

Policy makers in a number of countries have revealed growing interest in novel strategies to improve consumer decision-making. UK Prime Minister Cameron's Behavioural Insights Team was the first to investigate the possibility of moving from a pure information-driven strategy to improve consumer welfare to behavioural-economics-informed strategies that are no longer based on the image of the purely rational consumer. The United States and Denmark have also recently adopted such innovative approach, while currently both Germany and Belgium are establishing similar groups. These libertarian paternalistic strategies, commonly known as nudges, influence behaviour by changing the way choices are presented in the environment by either presenting them in a more salient or interesting light, or by making them the easier or default option rather than enforcing restrictions or by changing people's economic incentives (Thaler & Sunstein, 2008). Importantly, nudges promote choices or behaviours that are assumed to benefit the target individual and society as a whole, thereby distinguishing themselves from marketing techniques that primarily benefit the turnover or profit of companies (Thaler & Sunstein, 2008; Hansen, 2013).

In light of such large-scale interest into the implementation of nudges in combating rising obesity rates, encouraging retirement savings and organ donations, and in improving environmental protection (Vallgård, 2012), scholars from various academic disciplines have been investigating the appropriateness of nudging as a policy instrument in targeting societal matters. While this multidisciplinary assessment has revealed the high complexity of the question about the appropriateness of nudging, it has nevertheless been deficient of the opinion of the presumably most important group – the consumers themselves, as their concerns and attitudes have remained largely uninvestigated. At the same time though, it remains unclear to what degree consumers have knowledge about ongoing policy interests in employing nudges and about nudges themselves. In response to these missing insights the present article makes a two-fold contribution by employing in-depth semi-structured interviews to investigate UK consumers' attitudes and concerns about nudging in general, and in dedicating particular attention to the domain of health behaviour, an area to which many nudges apply (De Ridder, 2014). Consequently, the findings of this study reveal the ideas of the presumably most essential group when examining the appropriateness of nudges, the consumers, which will allow researchers and policy makers to determine when, how, and what nudges are accepted. These findings offer practical implications for researchers and policy makers in the design and implementation nudges.

Throughout the introduction we will first introduce four domains of inquiry, which are based on questions and concerns previously raised by scholars that have provided the foundation for our interviews with consumers. These four domains – 1)

the approval of nudging; 2) the origin of nudges; 3) the effectiveness of nudging; and 4) concerns about manipulative aspects of nudging – reflect both questions and concerns in previous scholarly investigations and those relevant to the target group of nudges, the consumers. Furthermore, we explain our choice for investigating attitudes towards nudges in the realm of health behaviours specifically.

## —— Approval of nudging

The concept of nudges is based on libertarian paternalism, embedded between the more extreme ideologies of liberal markets on the one hand and interventionist states on the other. Nudging is described as libertarian in the sense that people are free to choose what to do, and paternalistic in that people's choices are guided in the direction of their own, as well as societies' best interest (Pykett et al., 2011; Wilkinson, 2013; Goodwin, 2012) – hence, together, nudges could be qualified as soft paternalism. An example that has featured prominently in the previous literature is the promotion of healthy eating in cafeterias. In this example, healthy food is placed more prominently and saliently or is positioned in such way that it is easier to reach compared to less healthy alternatives (Hanks, Just, Smith, & Wansink, 2012; Maas, De Ridder, De Vet, & De Wit, 2012; Rozin, Scott, Dingley et al., 2012). All choices remain available, while the consumer is nudged towards choosing the healthier food via these choice architectural strategies. Thus, the strategy is liberal as the consumer is not coerced into choosing the healthy food, and it is paternalistic in that the consumers' behaviour is subtly, and often unconsciously, guided towards the better options.

The discussion about the appropriateness of nudging is rooted in the debate over the state's rights and obligations to promote public welfare. While extreme liberals are reluctant to interfere with the natural rights of people, such as property rights, life, and liberty, utilitarian and social contract perspectives, respectively, contend that the state should attempt to maximize societies' overall welfare, or determine state involvement on the basis of collective decision (Calman, 2009). Additionally, there is a disagreement over how truly libertarian or paternalistic nudges are. Proponents of nudges try to reconcile state intervention with the maintenance of people's liberties and authority (Pykett et al., 2011) by advocating that interventions are not paternalistic when they do not limit a person's choices and liberties to behave in any way, especially when there is an option to 'opt-out'. However, critics argue that although nudges may not restrict the available choices, they limit the possibility to rationally deliberate on the decision-making process of choosing (Hausman & Welch, 2010). These opposing positions regarding the issue of state intervention in the promotion

of public welfare as well as the definition of liberty drive the dispute on the appropriateness of nudging, as well as the different levels of concern about the paternalistic aspects of nudging. Nonetheless, it is unclear where consumers position themselves in this debate. Therefore, the first objective of the current study is to investigate the consumer perspective on the first domain of inquiry: Consumers' approval of nudging in general and in the domain of health behaviours. Do consumers approve of being influenced despite lacking awareness? Do consumers feel that their choices are limited or that their autonomy is infringed upon? Findings will therefore shed insight to the questions of debate from a consumers' perspective.

### \_\_\_\_\_ **The origins of nudges**

The second factor to present here refers to the problem of which body can define what behaviours and choices should be promoted over others. The demarcation of good behaviours and choices is problematic. Essentially, the question revolves around the eligibility for the right to declare specific behaviours and choices as good or better compared to others. For critics libertarian paternalistic policies are based on social norms, shared realities, and familiarity that define particular behaviours as superior to others (Vallgård, 2012). For instance, current societal and medical discourses describe healthy lifestyles as superior to unhealthy lifestyles, where they consider long, healthy lives as the ultimate goal, slim and fit bodies as the indicators of a healthy lifestyle, and all the while promoting behaviours to align with these norms. Such discourse is persistent despite the lack of consistent support for the notion that slimness is a major factor contributing to long-term health (Askegaard et al., 2014). In promoting these aligned behaviours policy makers reinforce the existing social norms and shared realities (Askegaard et al., 2014; Schnellenbach, 2012), thereby promoting the health of some members of society while simultaneously leading to increased stigmatization of those members not willing or capable of behaving in accordance with these prescribed norms (Seacat, Dougal, & Roy, 2014). In light of these arguments, this study explores the second domain of inquiry: Consumers' opinions regarding the origin of nudges. In other words, do consumers care or have concerns over who designs the nudges? Are consumers concerned about the definition of good behaviours?

### \_\_\_\_\_ **The effectiveness of nudging**

A factor of more practical relevance refers to the effectiveness of nudging in changing long-term behaviours and value structures. Critics of nudging question

whether the design of choice architectures leads to long-term changes in people's behaviours and value structures (Goodwin, 2012). They claim that substantial behavioural impact leading to long-term healthy or sustainable behaviours requires consumers' recognition of the urgency to change lifestyles and subsequent conscious behavioural adjustments. Merely being nudged into these behaviours without deliberation is judged as an insufficient, short-term strategy (Goodwin, 2012). Furthermore, marketers can easily counteract uninformed behaviours caused by nudges in an attempt to increase sales and maximize profit. Consequently, these opposing forces could lead to a system in which large amounts of public finances are invested into nudging behaviours that benefit society and consumers which are simultaneously neutralized by marketing strategies guiding choices and behaviours in the opposite direction (Goodwin, 2012; Seacat, Dougal, & Roy, 2014). This aspect is investigated in the current study by examining the third domain of inquiry: Consumers' perceived effectiveness of nudging. While this perception does by no means translate into an objective evaluation of the effectiveness of nudging, it contributes to an understanding of consumers' attitudes toward the usefulness of nudges.

### **Concerns over the manipulative aspects of nudging**

A final point of concern is the potentially manipulative nature of nudging. This factor of concern is essentially an extension of the considerations raised in the first domain of inquiry, the approval of nudging. As mentioned in that first paragraph, opponents of nudges critique the paternalistic aspect of nudging, the idea that nudging may potentially limit the possibility for consumers to rationally deliberate on the decision-making process by promoting particular choices outside their conscious awareness (Wilkinson, 2013; Goodwin, 2012; Hausman & Welch, 2010). Accordingly, the fourth domain of inquiry explores consumers' opinion on this aspect and whether they have concerns about the manipulative aspects of nudging, as raised by the critics. The case of health behaviours

Health behaviours are prominent targets of recently implemented nudges that have been subject of scientific investigation. These nudges specifically target behaviours such as smoking, dieting, physical exercise, and alcohol consumption (Diepeveen, Ling, Suhrcke, Roland, & Marteau, 2013). Health behaviours are a good candidate for developing nudging interventions for two main reasons: Firstly, most members of society want to lead healthy lifestyles and at the same time report problems in adhering to this goal, especially in light of short-term temptations. These



problems can be the result of health-illiteracy or limited self-regulatory skills, which explains the ineffectiveness of information-based approaches to promoting healthy lifestyles (Marteau, Hollands, & Fletcher, 2012). These factors imply that the promotion of health behaviours is particularly suitable to nudging (Hollands, Shemilt, Marteau, et al., 2013). Secondly, health behaviours are often driven by habits and impulses and are therefore little subject to rational considerations (De Ridder, 2014). As such, health behaviours align particularly well with the functioning of nudging in the sense that they avoid conscious deliberations about choices and instead promote behaviours via relatively unconscious routes, making healthy behaviours easier and healthy choices more salient (Thaler & Sunstein, 2008).

There is good reason for policy makers to be concerned with the promotion of health behaviours considering the increasing number of people with obesity, and especially the increase in overweight children, as well as consequent health problems such as diabetes, cardiovascular diseases, and cancers (Diepeveen et al., 2013). Despite this growing interest in nudging strategies, governments and policy makers are concerned with the acceptability of such interventions by the public, due to the concerns raised in the scholarly debates described above. In response to this, researchers have been calling for investigations into consumers' acceptability of nudges and concerns about being nudged (De Ridder, 2014; Hollands et al., 2013). A first investigation by Diepeveen and colleagues (2013) examined electronic databases and empirical studies reporting attitudes towards health interventions, including nudging strategies in health behaviours. This investigation revealed strongest acceptability of strategies targeting others rather than the self and less intrusive strategies. Yet, this study did not directly assess consumers' attitudes and concerns related to nudging as is required for a holistic, in-depth understanding of consumers' reasoning. This gap of knowledge is to be filled by the current study.

## \_\_\_\_\_ **Research question**

The aim of this research project was to examine consumers' knowledge of and attitudes about nudging in general and nudging in a health domain as well as their concerns about being nudged. To obtain an understanding of consumers' attitudes and concerns about the aspects of nudging that feature prominently in the scholarly discussions this project investigated four domains of inquiries, each of which relates to one point of discussion among scholars mentioned previously in the introduction. As such we investigated (i) consumers' approval of nudging by uncovering consumers' familiarity with nudging, their attitudes towards nudging in general and nudging within

a health domain; (2) consumers' views on the origin of nudges by exploring their attitudes in regards to who designs nudges and determines behaviours to be promoted, (3) consumers' perception in how they judge the effectiveness of nudging, and (4) and consumers' concerns with nudging, and potential manipulative aspects, as a strategy of improving consumers' behaviours. As no explicit hypotheses about these attitudes and concerns were specified, the research was essentially exploratory in nature and targeted at examining any associations consumers had in relation to nudging.

## **METHOD**

### **\_\_\_\_\_ Semi-structured interviews**

In addressing these research questions a qualitative, exploratory design was implemented. The researchers held semi-structured in-depth interviews with consumers in an informal communication setting in order to obtain as many ideas, associations, attitudes, and concerns people may have in relation to nudging (Bauer, Gaskell, & Allum, 2000). The semi-structured interviewing method was chosen because it allows for both structure and flexibility. The structure of semi-structured interviews allows interviewees to answer questions as set out in an interview guideline addressing the research questions under examination, with their responses fully probed and explored. Meanwhile, the flexibility of semi-structured interviews allows the researcher to be responsive to the relevant issues raised spontaneously by the interviewee (Legard, Keegan, & Ward, 2003). As such, while the interview guideline provided basic questions to be addressed in specific phases of the interview, questions varied between interviews as a natural progression of the situation as well as the input from interviewees.

The interview guideline specified four phases to provide a structured framework addressing the domains of inquiry presented in the introduction. In phase 1, interviewees were prompted to explain their familiarity with nudging and their general attitudes without the provision of a clear definition for nudging. For example interviewees were asked whether they had ever heard of the concept of nudging and whether they could explain what they understood it to be. In phase 2 the same questions were asked in reference to nudging in a health behaviour domain. In phase 3 the interviewer provided a definition of nudging which included two main aspects. Firstly, nudges were defined as subtle cues designed to help people make better choices and behave more optimally which may or may not occur outside of conscious awareness. Secondly, nudges were defined as influences on behaviour by the way choices are pre-

sented rather than by removing choices. To facilitate understanding of the concept examples of nudges were provided including the distancing of color printers to prevent unnecessary use of color prints; the use of colored bin bags to ease the separation of waste; and the provision of smaller plates in a cafeteria to prevent eating large portions. Based on this definition and the examples interviewees' general attitudes and concerns were collected. For example, interviewees were asked what they thought of these nudges, whether they would appreciate being nudged, and whether it mattered to them who designed these nudges. Additionally, attitudes and concerns relating to nudging in the health domain were targeted by providing more examples of health-related nudges such as exchanging unhealthy snacks at the cashier with healthier snacks; placing healthy snacks more prominently on shelves in supermarkets; and downsizing the serving plates at all-you-can eat buffets. In phase 4, questions were presented about the acceptance of nudges targeted at the interviewee him/herself. Specifically, interviewees were asked whether they would approve of being targets of nudges, whether there are specific domains in which they do/do not accept behavioural guidance, and whether they believe in the effectiveness of nudges on their own behaviour.

## **Participants and procedure**

To ensure access to the attitudes and concerns of a broad range of societal groups, a sample of participants was recruited through a marketing research company that represented a large variety in terms of age, socioeconomic status/educational background, gender, and BMI of the participants. It was anticipated that having interviewees with varying backgrounds in terms of age, socioeconomic status/educational background, and gender would improve the representativeness of the sample. Socioeconomic status (SES) and educational background were accounted for on the basis of the UK demographic classification scheme (National Readership Survey social grades) which classifies citizens as high SES A and B (N = 5), middle SES C1 and C2 (N = 8), and low SES D and E (N = 7). Furthermore, as a particular focus of the current study relates to healthy eating behaviour, we included interviewees with varying BMI scores (i.e., normal weight, overweight, obese). Interviewees were matched on their BMI classifying underweight < 18.5 (N = 1), normal weight 18.5 – 24.9 (N = 8), overweight 25–29.9 (N = 10), and obese > 30 (N = 1) interviewees. All interviewees were recruited from public settings in London and invited to participate in interviews for monetary reward. The resulting sample consisted of 21 interviewees of whom one was excluded due to limited English proficiency.

Prior to each interviewing session, all participants were informed about the nature of the semi-structured interview. It was explained to participants that they would be asked to discuss and express their opinions on a specific topic, and they would not be obligated to respond should they feel uncomfortable at any stage of the interview. Furthermore, participants were informed that the interviews would be recorded for research purposes (i.e., data analysis at a subsequent stage), and it was emphasized that the contents of interviews would be kept anonymous at all times. It was made known to the participants that there would be a possibility that direct quotes would be presented in a published research report, but that their anonymity would be ensured. The interviewing session began after participants have provided verbal consent for the interview to be recorded. The interviews lasted for a maximum of approximately 40 minutes. At the end of the interview, each participant was provided with an opportunity to ask questions, thanked and compensated with monetary reward for their participation. This study was conducted in accordance with the ethical standards described by the Medical Research Involving Human Subjects Act (WMO, 2012), which exempts research on healthy human subjects from review for as long as it does not involve any invasion of participants' integrity. Consequently, no formal ethical approval was required according to Dutch national standards. Nevertheless, ethical approval was obtained at Utrecht University for the EU funded FP7 umbrella project Marie Curie Fellowship Consumer Competence Research Training (CONCORT), a European network collaborating the research efforts of 14 Early Stage Researchers from various academic disciplines dedicated to generate research improving consumer welfare. The current study is part of the research effort directed under CONCORT. Furthermore, the UK market research agency operates under and is member of the Market Research Society Code of Conduct.

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### **Thematic Analysis**

All recorded interviews were first transcribed and subsequently subjected to thematic analysis. The thematic analysis aimed at finding key patterns of ideas and attitudes in the interviews by coding for recurring codes and themes. Throughout the process coders were interested in those responses by interviewees that related to the research questions. A semantic approach was employed that focused on a description of the interviewees' responses rather than the interpretation of these responses (Braun & Clarke, 2006).

The analysis was based on Braun and Clarke's (2006) step-wise procedure. Two coders (the same as interviewers) familiarized themselves with the interviews and

transcriptions in the first phase of the analysis. During this phase, using a deductive approach, the coders independently collected preliminary codes that identified extracts of data containing meaningful information relevant to the research questions. These preliminary codes were subsequently compared, discussed, and revised by the two coders. In a subsequent step, codes were connected together based on repeated co-occurrences (i.e., they were frequently detected in natural clusters in the transcriptions) and semantic relationships (i.e., they depicted a concept when manually put into proximity) into overarching themes (Crabtree & Miller, 1999). No numeric requirements were set for determining the existence of a theme or code but their occurrence and prominence determined the classification. These overarching themes were named in a manner that described and interpreted an aspect of the data that was relevant to the research questions. This process led to the final coding scheme including both themes and codes accompanied by a definition and an example (see Table 1). Afterwards, a second round of coding was performed where the established codes from the final coding scheme were independently applied to the transcribed interviews. In cases where codes diverged between coders explanations and discussion led to an agreement in all cases.

Table 1. Coding Scheme

| Theme                  | Code            | Definition and example  |
|------------------------|-----------------|---|
| Knowledge              | Familiarity     | Acquaintance with the concept of nudging.<br>E.g., ["The topic that I would like to talk about is nudging. Have you ever heard of nudging?"] "I have never heard of it."  |
|                        | Observed Nudges | Examples of nudges. E.g., "There are these signs, neon signs, an electronic sign that shows you a sad face when you're going above the speed limit or a nice smiley if you're ok."  |
|                        | Novel ideas     | Suggestions for domains for new nudges. E.g., "I think walking more around London is a good way. I know they encouraged more cycling but I think people should walk more."  |
| Individual Differences | Objective       | Differences in peoples' motives. E.g., "I think of people are willing to do the right thing and willing to be healthy, I think....."  |
|                        | Indifference    | Lack of interest in target behaviour. E.g., "There are a lot of people who care about it but you get certain people who don't. They just do it because they just can't be bothered to put it into the other bags."                    |
| Self-target            | Approval        | Level of agreement with being nudged for the self. E.g., ["Would you appreciate it if you were nudged into healthy eating?"] "Yes. I would appreciate it. I think everyone wants to do it and it is great to be encouraged to do it." |

## TURNING VICE INTO VIRTUE

|                |                        |   |
|----------------|------------------------|---|
|                | Effectiveness          | Judgment of the extent that nudging would be successful when targeted at the interviewee. E.g., “Personally I don’t think I need any nudges but I guess it helps, yes. I am generally quite healthy anyway.”  |
| General target | General Approval       | Level of agreement with nudging targeted at anyone. E.g., “I think the food is an absolutely brilliant idea, absolutely brilliant because we have got so much obesity and it is too easy for them to go and grab a big plate, fill it up and then just go back again but if you have got something smaller then you can only eat what is on the plate if you like and I think that is a good thing. I think that would help a lot of people. The stairs is good too because it makes it fun because sometimes exercise can be so boring.” |
|                | General Effectiveness  | Judgment of the extent that nudging would be successful when targeted at anyone. E.g., “No, what I am saying is, it has its benefits so people who alright yeah, who go to the supermarket and take the back and read it looking at the calories because they are health-conscious but for those that are not they can see a healthy food and just pass it back. So being there means nothing to somebody who has no idea.”   |
|                | Specific Target Groups | Potential population segments targeted by nudges. E.g., “So yeah, I think it would be important and from a children’s perspective as well because in supermarkets sweets are deliberately put by the checkout in order for a child to spot them and also last minute shopping so it is all psychological.”  |
| Origins        | Actors                 | Individuals or groups implementing or designing nudges. E.g., [“Would it matter for you who is deciding on what is a good behaviour?”] “Probably the dieticians or the doctors.”  |
|                | Expertise              | Required level of knowledge in the targeted behaviour. E.g., “Someone who, maybe a nutritionist or something like that because they obviously knows about health things or someone who has done psychology as well and know why people are going to pick things. Perhaps a psychologist and a nutritionist.”  |
|                | Intention              | Motives of the agents involved in designing nudges. E.g., [“Does it matter who implements these health nudges or who decides on what the good behaviour is?”] “It doesn’t matter as long as the goal is clear that it is to help people lead healthier lives.”  |
|                | Trust                  | Degree of confidence in agents’ motives related to the design of nudges. E.g., “I would trust somebody that had done their research and it is maybe Government funded or maybe a Government initiative or a health initiative so something that has got a sort of, a reputable backing.”  |
| Behaviour      | Habit                  | People’s routine behaviours. E.g., “In retrospect, the nudges then hopefully become part and parcel of your life and your everyday working life or home life.”  |

|                   |                          |  |
|-------------------|--------------------------|--|
|                   | Individual Capacity      | People's extend of influence on their own behaviour. E.g., "Yes actually yes, because we try to push ourselves but sometimes something else influences it, you know what yeah I am going to do it."  |
|                   | Facilitation             | Supportive effects of nudges on behaviour. E.g., "As long as people have opinions but make it easier for them to choose the more healthier option."  |
|                   | Social Environment       | The relationship between people's behaviour and their social surrounding. E.g., "It might change you one day to say "Come on, everybody is so I might as well" and it is good for the future."   |
| Freedom of Choice | Coercion                 | Oppressive influences of nudges on behaviour. E.g., "What you do is you manipulate their decision making whereby it is them noticing that you are doing it or them not noticing that you are doing it, it doesn't matter. You just manipulate them to do what you want them to do."  |
|                   | Nudging-suitable domains | Appropriateness of behavioural domains for nudging. E.g., "I don't know how you can nudge in those areas because there is so much out there, there's so much and it is personal choice isn't it? It is personal belief in terms of religion."  |
|                   | Choice-set limitation    | Restricting the availability of choices and possible behaviours. E.g., "I think alternative options are always good like if you had an alternative option but I don't think they should take anything that is currently there and then say you can't have that anymore." Counter-reaction to the promoted behaviour.   |
| Cognition         | Reactance                | Counter-reaction to the promoted behaviour. E.g., "There are people who are set in their ways and bringing in anything that is going to be far from their norm, even if it is a simple task, is not going to go down well with them and there are those people who just don't like change. Even if you bring it, you might want to resist."  |
|                   | Awareness                | (No) Realization of the influence of nudges. E.g., "I think we are nudged every day in life and we don't realize we are being nudged."   |
|                   | Need for Cognition       | Required level of information on being nudged and/or the targeted behaviours. E.g., "Because they are trying to encourage healthy eating and it is educating people because information is power. If you know the good and the bad things, I hope there are going to be loads of advertisements about these things because people need to be educated and they need to be aware of things before they can be applied in practice." |

## Results

The results are structured according to the four domains of inquiry based on information extracted from the interviews using deductive coding, for an overview of the codes and resulting themes that were used to identify relevant information pertaining to the research questions, see Table 1. We would like to emphasize that the goal of this investigation was to learn about any representations, thoughts, attitudes, and concerns consumer may have on the matter of nudging rather than to provide a numerical overview of the distribution of these opinions. Citations provide examples of responses from interviewees but are selected for demonstration purposes rather than representativeness.

**Consumers' approval of nudging.** This first domain of inquiry uncovered consumers' familiarity with nudging, their attitudes towards nudging in general and nudging within a health domain. Despite the vivid discussion around nudging in the scientific community as well as frequent coverage on media outlets, interviewees were largely unfamiliar with the concept of nudging as influences on behaviour. If interviewees voiced any interpretation of what nudges could be, they were understood in the literal sense of poking or (gentle) shoving.

*“In a poking kind of sense or  
some applications to send someone a nudge”*

(Male, 27, high SES, overweight)

Due to this general unfamiliarity most interviews moved directly into phase 3 of the interview guideline in which interviewees were introduced to nudging via the provision of a definition and examples from first the general nudging domain and later the health-related nudging domain. While some interviewees could relate to these examples, i.e. reported having observed similar nudges, it did not remind them of having heard of the concept of nudging as influence on behaviour prior to the interview. Nevertheless, some interviewees reported being familiar with the concept of the subtle, unconscious influences, however, more in the context of marketing techniques that surround people in everyday life.



*“Advertising in a sense is a nudge about a product”*

(Male, 29, middle SES, normal weight)

During the interview a distinction was made between approval of nudges in general, approval of nudges in the domain of health behaviours, nudges applying to people in general as well as those applying specifically to the interviewee. Additionally, interviewees were asked whether there were any domains in which they would consider nudging inappropriate.

In principle, interviewees reported to appreciate the idea of nudging as a whole without seeing negative aspects.

*“No. I don’t think there is a disadvantage because at the end of the day it is to create a safer and a better environment. If they don’t agree with it then I guess they just don’t have to do it if they don’t want to but at the end of the day it is a benefit for everyone”*

(Female, 28, middle SES, normal weight)

While the initial responses were mostly positive, some interviewees also reported these nudges to be related to manipulations. Nevertheless, throughout the interviews a strong majority appreciated nudging as a whole and even more so when they target health behaviours. Interviewees could relate to the difficulties revolving around health behaviours on a societal level as well as related to their own health behaviours.

*“I am all for it. Anything to do with health behaviour and improving people’s health in general, I am always supporting that. I think it is a very clever idea because no one likes change because if you tell people “Do this” then they will do that. There won’t be a good reaction. But I think nudging is in some ways subconsciously trying to get people to do or to make a better choice, so yeah I support it”*

(Male, 27, high SES, overweight)

While interviewees differed in the degree to which they consider health-related nudges applicable and necessary for themselves this did not reduce their support. Even in cases where interviewees considered health-related nudges unnecessary for themselves they remained supportive of nudges targeting society as a whole including themselves.

*“Yes. I would be more in favour. I think it’s needless for me. In the country everyone is getting fatter so the teenagers coming into these buffets, if they were having smaller plates and they had smaller plates at home they wouldn’t think “I will eat more”. It might help”*

(Male, 24, high SES, normal weight)

Considerations of manipulations when investigating attitudes to health-related nudges specifically remained very rare. Approval of nudges appeared to be related to the intentions of the nudging body/institution. The positive attitudes towards nudges were driven strongly by the idea that nudges are designed with the intention of improving peoples’ behaviours for the better of society and themselves. This requirement was often mentioned as the basis for approval and became most evident in the case of health-related nudges, which were understood as helping people to behave in more health-promoting ways. For nudges in the general domain, interviewees were particularly appreciative of nudges relating to environmentally friendly behaviours such as separating waste and keeping streets clean.

*“Like I said before, anything that promotes good behaviour and living healthily is part of good behaviour, I think it’s good, it is a good idea”*

(Male, 48, low SES, overweight)

Disagreements with the concept of nudging as a whole or in relation to health-behaviours were not encountered during the interviews. Nevertheless, some interviewees raised concerns, mostly upon probing for negative aspects of nudges, that nudges and behavioural influences were similar to manipulations. However, interestingly, these concerns were described as manipulations common to standard marketing practices, such as placing products in shelves to increase attention to particu-

lar choices. These considerations will be further discussed in the results on concerns about manipulative aspects of nudging.

*“It depends on what kind of thing it was, I suppose and what kind of decision it was that they were trying to force you into. If it was an environmentally good thing then I wouldn’t mind if someone is making these nudges but if it was something to do with making me pay out for something that I don’t necessarily need and they are just trying to force it upon me then I would find that negative”*

(Male, 24, high SES, normal weight)

Whereas interviewees had difficulty reporting any behavioural domains for which they would not appreciate nudges, with few exceptions mentioning financial domains, they did raise concerns regarding nudges targeted at particular groups such as children, while in other examples children are considered a particularly good target group. Based on the argument that children are easily manipulated nudges targeting children were rejected by some of the respondents. This rejection was irrespective of the fact that nudges were defined as based on good intentions and with behaviours improving outcomes for the target population in mind. There were both expressed support and concern over the exposure of nudging to children:

*“So yeah, I think it would be important and from a children’s perspective as well because in supermarkets sweets are deliberately put by the checkout in order for a child to spot them and also last minute shopping so it is all psychological”*

(Female, 59, low SES, normal weight)

*“With children maybe and maybe that is too pushy in that sense because it is not being explained. It is just being forced on them if you like. Yeah, maybe in children but not in adults, no. I think it is fine”*

(Female, 46, low SES, overweight)

**The origin of nudges.** Interviewees generally expressed that if the intention behind the nudge was good, as most agreed in the case of health behaviour and healthy eating, they would not be particularly concerned with the actors who design or implement the nudges. Furthermore, interviewees also mentioned that because they would not be immediately aware of the presence of the nudge due to its subtle nature, the actor hence becomes irrelevant for them to consider. Nonetheless, some interviewees suggested that if the nudges were targeted particularly at healthy eating, they would have greater trust in actors who have a reputable backing and specialized expertise in the subject. For example, in the domain of health and food, some interviewees expressed their trust in doctors, dieticians, or nutritionists. Psychologists were also considered as good candidates for designing nudges as they would have knowledge of consumer behaviour and the factors that shape people's choices. To illustrate, when discussing potential actors for nudges for healthy eating, one respondent said,

*“Someone who, maybe a nutritionist or something like that because they obviously know about health things or someone who has done psychology as well and knows why people are going to pick things. Perhaps a psychologist and a nutritionist”*

(Male, 29, middle SES, normal weight)

Trust in governments or politicians was mixed. On one hand, the Government was spoken about as an actor who has the authority and the responsibility to guard and improve the welfare of its citizens, and therefore should exercise its influence by directing health behaviour initiatives through the implementation and design of nudges. On the other hand, as one respondent quoted,

*“...anything Government-related or anything that comes from the Government people instantly distrust. Because the Government is coming from a discredited stance a lot of times to start with. So based on that people are not going to take what they say. They said about the meat that people were eating and how it was the Government knew that was all this type of meat that we were being served and they said – Let them still eat it – and stuff like that”*

(Male, 56, high SES, overweight)

Interviewees also voiced that they would not appreciate being nudged into behaviours or choices by actors such as marketers with commercial purposes of gaining profits for a company. Nonetheless interviewees recognized that this is inevitable, and is in fact quite an existing mundane scenario in everyday situations.

*“I mean it is all about marketing in this particular case. And since here is always going to be somebody trying to, I guess the word is manipulate other people so it might as well to be somebody who has, thinks of ways to help them and somebody else that might think a bit more about the money and not so much about what is good for people”*

(Male, 34, middle SES, overweight)

This quote described a general sense of consensus amongst interviewees in approving actors in designing and carrying out nudges, given that they are dedicated to promoting the wellbeing of consumers and the general public, as counter efforts to companies and marketers whose aim is to increase commercial profits and private gains.

**Consumers’ perceived effectiveness of nudging.** Nudging was overall approved by interviewees, but as a general concept it was too abstract for interviewees to judge its potential/expected effectiveness. However, given some examples interviewees discussed the effectiveness of nudges more fluently. According to interviewees, what made nudges potentially effective was that they subtly facilitated the targeted behaviours. Similarly for health behaviours and healthy food choices, nudges were regarded effective because they made healthy behaviours easier or more fun to perform, and made healthy food choices more salient. As such, the nudged behaviour

became easy to adopt and to carry out as a habit, and eventually be integrated into the social environment that further endorses the behaviour. Furthermore, targets' individual objectives and capacity to influence their own behaviour were considered as important contributing factors. Interviewees acknowledged that considering the recent focus on issues surrounding food, health, and obesity in the media and public discourse, most people generally have an awareness of behaving healthily, although the level of intention varies between individuals. As such, nudging was rated as effective for those who already have an intention to eat healthily and are taking actions to fulfill this goal.

On the other hand, interviewees who, in their opinion, already have a successful individual capacity for healthy behaviours evaluated nudges to be less effective when applied on themselves, but nonetheless would appreciate the potential benefits.

*“Personally I don’t think I need any nudges  
but I guess it helps yes. I am generally quite  
healthy anyway”*

(Male, 29, middle SES, normal weight)

Overall interviewees considered nudges to be effective for the society as a general target, and in most cases for themselves as targets. Nonetheless, nudges were not considered useful for individuals who have no intention or are indifferent to healthy eating.

*“Someone that really doesn’t care,  
it is going to be quite hard to nudge them”*

(Female, 28, middle SES, normal weight)

Furthermore, price was considered as a significant determinant in people's food choices. As such, some interviewees saw price as a potential obstacle to the effectiveness of nudges in promoting healthy food choices, considering that some people choose the cheaper option regardless of the food product's nutritional value.

Finally, the need for information was mentioned as a factor that could contribute to the effectiveness of nudges. Although nudges were intended to be subtle and not explicitly instructive, interviewees felt that people would need to have an initial understanding of the importance of health behaviours before they could bene-

fit from a nudge. For example, it was suggested that complimentary information such as the benefits of healthy eating could be presented adjacent to the nudge in order to increase its effectiveness.

**Concerns about manipulative aspects of nudging.** When examining consumers' concerns as to the manipulative aspects of nudges a minority of interviewees showed concerns over the freedom of choice offered by nudges. The main hesitation was that the interviewees would potentially lose autonomy over their decisions or that there would be a limitation to their choice set.

*“There will be a problem if you are saying people shouldn't eat junk food or if you take away the elevator”*

(Female, 30, high SES, overweight)

When discussing nudges without a particular context, only a few interviewees demonstrated skepticism and hesitation, as they understood the influences of nudges and manipulations as employed but actors such as marketers in a similar light. Interviewees also expressed that they would not appreciate if they realized that they had been led to a decision that was out of their awareness. This did not necessarily mean that they did not want to be nudged, but if so, they did not want to detect the influence.

*“But the disadvantage of it is if it is something negative and if the customer of the person finds out that things are actually strategically placed or done for that reason and they might be offended”*

(Female, 27, middle SES, overweight)

Nonetheless, this feeling of coercion was mainly limited to nudges intended for marketing purposes, or that the intention behind the nudge was not to the best of their interests. Considering that, by definition, these influences are not nudges, they should not be understood as resistance to appropriately implemented nudges but to other external influences on behaviour.

*“but if it was something to do with making me pay out for something that I don’t necessarily need and they are just trying to force it upon me then I would find that negative”*

(Male, 24, high SES, normal weight)

*“Although it was the right thing that I had got but I had been manoeuvred there. Some people would rather take the wrong thing but it was their choice”*

(Male, 56, high SES, overweight)

On the other hand, nudging in the domain of health behaviour, there were no concerns about coercion from the part of the interviewees. Particular to healthy eating, the general perspective was that nudging was more of a facilitation of better choices rather than a manipulation of choices. Interviewees also indicated that there were clear benefits to healthy eating; therefore they would not be concerned if they were nudged into healthier choices out of their awareness. Additionally, interviewees implied domains such as religion, politics, and contraception would not be suitable nudging domains as they involved individuals’ expression of personal beliefs.

*“For example in schools now, I am of Christian and I have been brought up to understand that marriage is between a man and a woman. I am being told, I have come to know that there are silent nudges that try to force same-sex marriage or same-sex down the throats of people at churches [...] no matter what orientation you choose but they are slowly taking away that freedom. How do I explain it, sometimes nudging feels like a propaganda by certain people in the Government to force”*

(Female, 30, high SES, overweight)



## **DISCUSSION**

The main conclusion of the interviews is that consumers are generally appreciative of nudging both as a general concept and when targeting health behaviours. While a surprisingly high unfamiliarity with the concepts was revealed this unfamiliarity further justifies the study's rationale in involving consumers in the discussion over the appropriateness of nudging and the implementation of nudges. At the same time it raises the question of whether consumers are sufficiently familiar with nudging strategies to provide sophisticated and elaborate attitudes toward the concept. Considering the lacking familiarity with nudging prior to the interviews consumers may have provided a rather crude attitude toward a concept defined and explained to them. This issue by no means implies that consumers should not be involved in judging the appropriateness of nudging. It does, however, indicate a need for increased consumer information about these already ongoing strategies and stronger consumer involvement in determining their appropriateness. Thus, the findings yield the question: Who should judge a nudge? And are policy makers sufficiently informing and involving the target group of nudging to ensure Thaler and Sunstein's (2008) requirement of transparency and the possibility to opt out?

Looking into the general attitude towards nudging most eloquent approvals were encountered when communicating about examples of nudges, which may have aided interviewees' understanding of the concept as well as the reasons for the promotion of particular behaviours. Employing examples, especially examples of health behaviour, helped demonstrating the difference between a good behaviour that should be promoted and a bad behaviour that should be avoided. As such, it may be the case that nudging receives particular support when consumers understand the reasons for promoting, as is the case for health behaviour, but lower support when it is discussed in general, abstract terms, which are more complex to grasp. Despite the general approval interviewees were hesitant in forming an opinion regarding the appropriateness of nudging in areas such as religion and politics, as these domains were subjective to personal beliefs and moral value.

Good intention behind nudges was the main driver for approval of the concept. When interviewees reported negative aspects they mostly referred to restricting choices (which by definition is not part of nudging) or a disapproval with being influenced in principle. On the other hand, standard marketing techniques were sometimes compared to nudges, but people readily distinguished marketing as a source of negative external influence, because unlike nudges, the targeted behaviours by marketing techniques were not always in the interests or advantage of the consumers. At

the same time, consumers did not question how and why a promoted behaviour would be considered a good behaviour. Yet, it remains unclear to this point whether this lacking scrutiny derives from a strong trust in the sources of nudging, a general disinterest, or an uncritical acceptance of the existing discourses about health behaviours.

While there was no clear preference for who should design or implement nudges, this was only under the general assumption that the origin of nudges endorsed good intentions. Interviewees generally perceived an intention to be good if it pursued a clear objective in promoting positive behaviours for individuals and society. Given this circumstance, nudging for the promotion of health behaviours was widely approved considering that there are clear distinguishable benefits and negative consequences associated with health. Related to this was the notion of freedom of choice. A minority of interviewees voiced concerns over the potential choice limitations or coercive directions imposed by nudges. However, these concerns were not weighted as heavily given that nudges ought to be based on good intentions to benefit the recipients or the greater society, such as the case for promoting healthy or environmentally friendly behaviours.

Finally, there was awareness that while nudging could be implemented to promote positive behaviours amongst the masses, its effectiveness was sensitive to individual differences of the recipients. Specifically in the context of health behaviour, nudging was judged to be less effective for those who already have a good personal capacity and are successful in managing and conducting these behaviours. For example, interviewees who, in their opinion, already have a successful individual capacity for healthy behaviours evaluated nudges to be less effective when applied on themselves, but nonetheless would appreciate the potential benefits. Furthermore, a disregard or indifference to the value of health was suggested to potentially undermine the influence of nudges toward health behaviour or choices.

Nonetheless, the outlook on nudges was that they would be an effective strategy because they are subtle and could be easily integrated in the everyday environment; and since the general public has a fundamental understanding of the advantages and values of good health, most people could benefit from the facilitation of nudges in performing healthy behaviours.

In light of the ongoing current debate surrounding the ethics and implementations of nudges in the academic and political arena, there is a dearth of research investigating the perspectives of consumers, who are the ultimate targets of nudging. Responding to the call for research investigating acceptability of nudges and concerns

over being nudged (De Ridder, 2014; Hollands et al., 2013), the current research is the first to our knowledge to examine this topic by directly reaching out to consumers. While the findings of the current study shed light into a less-explored research territory, it contains certain limitations. First, the interview questions included in the semi-structured interview schedule were strictly linked to the current research's overarching research questions. This choice could have potentially limited the findings that may have emerged if the interviews were open-ended and fully participant directed. Similarly, only deductive coding was employed in order to extract data from the interviews that were directly relevant in answering the main research questions, which may have prevented interesting, but less research topic-relevant findings to surface. Another inherent limitation of qualitatively interviewing is that interviewees' responses are subjected to social desirability and demand-characteristic effects of the interview situation (Orne, 1962). Finally, as our findings revealed the extent to which consumers were familiar with the concept of nudging was minimal, this raises the question as to how much and how accurately consumers would be able to convey their attitudes and perspectives on a concept that they do not have substantial knowledge in. The issues mentioned above may have influenced the validity of the data, but the findings of the current research serve as a first starting point to examine consumers' attitudes and concerns about nudging and to stimulate future research using more rigorous scientific methods in examining a topic that requires much research attention.

## — Conclusions

These revelations are particularly important in light of the current scholarly discussion as to the appropriateness of nudging. While this discussion is relevant and theoretically interesting, it should not function as a basis for deciding for or against the implementation of nudges. In contrast, the attitudes, concerns, and requirements of the target group – the consumers – should be considered as an additional source of such decision-making. At the same time, this study uncovered a lacking familiarity with the concept of nudging and possibly insufficiently critical reflections of these strategies on the side of the consumers. Considering the moral need of including consumers into the process of judging nudges this finding calls for improved consumer information about nudging strategies and stronger consumer involvement into judging their appropriateness to ensure safeguarding mechanisms such as the possibility to opt out of unappreciated influences on behaviour.

Meanwhile, in contrast to the scientific debate, we find no direct justification to reject nudging, especially within the realm of health behaviour for which con-

sumers understand the benefits of promoted behaviours nudging strategies. However, these conclusions cannot be conclusively drawn for other behavioural domains. Additional research will be required to determine consumers' acceptance and concerns with nudges in the domains such as financial decision making, fund raising, organ donations, and many more. Furthermore, due to the qualitative nature of the study no deliberate procedures were taken to obtain quantitative data. Our findings suggest a majority of approval for nudges but there is no precise quantitative information about the distributions of these opinions. Future research is encouraged to employ quantitative measures to explore and measure the distribution of public opinion on nudging in order to compliment the current findings.

For governments currently employing or considering the implementation of nudges and paternalistic strategies into their range of policy instruments the findings speak in favor of such strategies despite criticisms from some scholars and media while simultaneously call for more information about nudges. However, the findings shows that nudges are particularly accepted in behavioural domains consumers comprehend. Consequently, information-based approaches and nudging strategies should go hand in hand to achieve both acceptance of the strategies and improvements of consumer welfare. Nudges should neither be rejected on the basis of philosophical concerns, nor be implemented blindly, without providing information to the consumer as requested by proponents of traditional information-based approaches.





# *General discussion*



CHAPTER 7

**D**espite having good intentions to act in line with long-term goals, people often fail to exercise self-control. Reality is, as research has shown, that many mundane situational or personal circumstances such as having previously exerted self-control (i.e., ego-depletion; Baumeister, Bratslavsky, Muraven, & Tice, 1998), being mentally distracted (e.g., Shiv & Fedorikhin, 1999), and being viscerally aroused (e.g., hunger; Loewenstein, 1996) could all hamper self-control performance. Considering that these circumstances are inevitably features of daily experience, the current dissertation was dedicated to gaining a deeper understanding of low self-control states and how they affect performance. Critically, we were interested in working with, rather than against, states of low self-control, exploring strategies that capitalized on the decision-making processes prominent in these situations to promote goal-oriented behaviours.

The research objective of the current dissertation was three-fold. The first objective of the current dissertation was to examine how motivational processes toward immediate desires vs. outcomes with long-term benefits may manifest differently when System II processing is assumedly impaired under states of low self-control (i.e., ego-depletion and cognitive load). The second objective was to examine whether individuals under states of low self-control (i.e., ego-depleted or hungry) who are inclined to rely on System I processing would benefit from following heuristics that steer them towards behavioural outcomes in line with long-term goals. Lastly, the third objective was to assess the application of heuristics as a type of nudging intervention to promote healthy eating, a form of self-control success, in real-life contexts.

## —— **Summary of findings**

Commencing the dissertation with the first research objective of investigating the role of motivation in supporting self-control performance, we specifically investigated how motivational processes toward immediate desires vs. outcomes with long-term benefits may manifest differently when System II processing is assumedly impaired under states of low self-control (i.e., ego-depletion and cognitive load). As demonstrated by the results of Chapter 2, we found that individuals in states of high self-control exhibited significantly greater approach motivation towards goal-oriented stimuli (e.g., healthy food product) compared to a reward-oriented alternative (e.g., unhealthy food product). Contrastingly, individuals in states of low self-control due to ego-depletion or high cognitive load respectively showed similar levels of approach motivation towards both goal-oriented and reward-oriented stimuli. Based on these findings, we assumed the apparent difference in motivation towards a virtue vs. vice



exhibited by individuals in states of high self-control as a strategic advantage underlying successful self-control outcomes. In comparison, we inferred the lack of distinction in motivation towards a virtue vs. vice in low self-control states might consequentially lead individuals to be more susceptible to environmental cues.

Correspondingly, the second objective of the current dissertation was then to investigate when states of low self-control could facilitate goal-oriented behaviours. Based on the premise that states low self-control increase the propensity for relying on System I processing that is quick, automatic, and highly susceptible to environmental influences, we predicted that these circumstances would predispose individuals to follow heuristics installed in the choice setting to expedite their decision-making. Accordingly, in Chapters 3 and 4, we examined the benefits of heuristic-based processing by empirically testing the hypothesis that individuals in states of low self-control (i.e., due to ego-depletion or hunger) would favour more goal-oriented outcomes if they were promoted by suitable heuristics installed in the environment. Building on the research by Salmon, Fennis, De Ridder, Adriaanse & De Vet (2014), in Chapter 3 we examined the influence of scarcity heuristics on individuals experiencing low levels of self-control. We observed that individuals having self-reported low state self-control were more susceptible to the suggestions of a general scarcity heuristic promoting healthy food products even when accounting for individual differences (i.e., need for cognition, frequency of purchasing healthy products). Intriguingly, when more stringently distinguishing different types of scarcity, we found that a demand scarcity heuristic (i.e., scarcity resulting from popular demand) outperformed the supply scarcity heuristic (i.e., scarcity as a consequence of deliberate restrictions by supplier) in promoting utilitarian products over hedonic products for ego-depleted individuals. We speculated that the potency of the demand scarcity heuristic might be due to its endorsement of a social proof component, which has been demonstrated by previous research (i.e., Salmon et al., 2014) to be especially effective on ego-depleted participants. In Chapter 4, we further assessed whether the influence of the social proof heuristic would extend to a state of low self-control instigated by the visceral arousal of hunger. Our findings showed that hunger led to lower levels of (self-reported) self-control and that hungry people selected significantly more healthy food choices when there was a social proof heuristic promoting these choices (vs. when no social proof heuristic was present). Collectively, the results of Chapter 3 and 4 suggested that successful self-control in low states of self-control is feasible when there are heuristics in the choice setting to stimulate goal-oriented behaviours.

As the final research objective, we tested the applicability of heuristics as a type of nudging intervention in real-life contexts. In Chapter 5 we conducted a field study in which we explored the effectiveness of a social proof nudge, and additionally

an accessibility nudge and a salience nudge, in promoting healthy food choices at a take-away food vendor. Although we did not experimentally manipulate or measure people's self-control in the field study, the take-away food vendor represented a prototypical situation where food decisions were made with little deliberation seeing that consumers bought small meals and snacks on the go during short breaks. The accessibility nudge, which relocated fresh fruits to a more convenient location at the front counter where consumer had direct access, appeared to be particularly effective in increasing the sales of fresh fruits. Meanwhile, due to a floor effect (i.e., consistent low sales of the yoghurt shake during the experimental period), we could not statistically examine the effectiveness of the social proof nudge, which was intended to promote the yoghurt shake by suggesting it was the most popular product on the product list. In contrast, we speculated that a ceiling effect (i.e., consumers' strong existing initial preference for the healthy bread rolls) contributed to the limited influence of the salience nudge, which was installed to promote the healthy bread rolls by enhancing their visual appearance to be more attractive and distinct from the unhealthy alternatives. Lastly, we observed that the provisions of a disclosure message informing the intended purpose of a nudge did not have any impact on the effectiveness of the nudge. This finding offers a practical solution for increasing the transparency of nudges, thereby mitigating ethical concerns over the employment of nudges that are assumed to operate outside of consumers' awareness.

In addition to investigating how nudges may work in real-life, in Chapter 6 we conducted a qualitative study in which we explored consumers' perceptions, opinions, and concerns over nudges through semi-structured interviews. Consumers, as an important group of stakeholders who would be directly targeted by nudges, generally had a positive view of nudges once they understood that nudges were designed as choice architectures to promote more desirable choices and behaviours. Nonetheless, consumers expressed that nudges would be acceptable under the conditions that they were designed and implemented by knowledgeable experts and trustworthy authority that upheld consumer and societal interests. Moreover, our findings revealed that consumers were more appreciative of nudges implemented in behavioural domains that they can readily understand the decision-making context. That said, as consumers could easily relate and understand the importance and benefits of healthy eating behaviours, nudging implemented in the domain of healthy food promotion was highly appreciated.

## **Theoretical Contributions**

Deviating from the traditional view that low states of self-control are negative, a key theoretical contribution of the current dissertation is that it showcases states of low self-control in a more positive light. The findings of the dissertation suggest that low self-control states do not invariably lead to outcomes that violate long-term goals, but that they could rather provide favourable circumstances for heuristics and contextual influences in general to promote goal-oriented behaviours.

First, in addressing a research gap in understanding the role of approach motivation in supporting self-control performance, our findings uncovered that when people were in states of high self-control, they were more readily motivated to approach a virtue (e.g., healthy food) than a vice (e.g., an unhealthy food). We inferred that having significantly greater approach motivation favouring the more virtuous option may be a strategic advantage that promotes self-control success. However, this distinction in motivation towards a virtue vs. a vice was not apparent for people in states of low self-control due to ego-depletion or high cognitive load. Particularly, in low states of self-control people exhibited similar levels of approach motivation towards both virtue and vice in the self-control conflict, where such a situation of ‘indifference’ might therefore expose vulnerability for self-control failure. Nonetheless, we posit that these low self-control states where there is no clear motivational preference might also present a unique opportunity for contextual cues (e.g., heuristics) in the environment to exert influence to swing preferences towards more desirable outcomes favouring long-term goals.

This finding alludes to our approach with working with the heuristic-based processing that is dominant in low self-control states to promote goal-oriented behavioural outcomes. When people are under states of low self-control, they have a heightened propensity to rely on quick and automatic System I processing that is driven by environmental input, which is in contrast to the effortful and deliberate processing of System II that operate according to explicit goals and intentions. As such, there is a common association of System I processing with being impulsive, where short-term gratifications are favoured at the expense of long-term goals. However, we challenged the preconception that being impulsive is necessarily goal-averse. Indeed, our results demonstrated that with the heightened propensity for System I processing under states of low self-control people became more inclined to follow heuristics that promoted outcomes in line with long-term goals. As a result, by following heuristics in an impulsive manner, people in low self-control states were more able to enact goal-oriented behaviours. Accordingly, a key implication of these findings suggest that the im-

pulsive processing in states of low self-control does not invariantly lead to suboptimal choices averse to long-term goals, but instead could be directed by heuristics towards more optimal ends.

Building on the research by Salmon and colleagues (2014), our findings also showcased heuristics as a promising tactic to promote successful self-control outcomes for people in a state of low self-control due to ego-depletion. While Salmon and colleagues initially demonstrated the effectiveness a social proof heuristic in promoting healthy food choices for ego-depleted individuals, our research put forth the scarcity heuristic as an alternative heuristic that could achieve similar results. Importantly, our research also distinguished the demand scarcity heuristic as particularly influential (vs. supply scarcity heuristic) in conditions of ego-depletion, presumably due to its inherent endorsement of a social proof component. Furthermore, our research extended on the Salmon and colleagues' work by demonstrating that the effectiveness of a social proof heuristic is not limited to conditions of ego-depletion, but could be generalized to another situation of low self-control as a consequence of hunger. While our findings generally corroborated with the research by Salmon and colleagues such that people under low self-control states were particularly susceptible to the influence of heuristics, one notable difference evidenced between our own research compared to theirs is the extent of influence by the heuristic. As we observed in Chapter 2 and 3, having a social proof heuristic or a demand scarcity heuristic respectively displayed 'restorative effects' on self-control performance in low self-control states, such that they elevated the self-control performance of ego-depleted or hungry participants to be on par with their non-depleted or satiated counterparts. Comparatively in research by Salmon and colleagues, the social proof heuristic exhibited 'performance enhancing effects', such that it enabled ego-depleted participants to outperform their non-depleted counterparts. This divergence in findings is notable and warrants future research to shed light on the extent to which heuristics can promote goal-oriented behaviours (e.g., restorative vs. performance enhancing effects) in low self-control states.

Zooming out from the specific objectives of the current research, the overarching theme of the dissertation was to gain a deeper understanding of low self-control states. Recognizing that people's self-control performance lapses in everyday life, we investigated the antecedents to these situations. Accordingly, in addition to ego-depletion, the current dissertation also assessed the impact of cognitive load and the visceral arousal of hunger on self-control performance. Briefly contrasting ego-depletion and cognitive load, the former could be described as an after effect or 'hangover' due to prior exertions of self-control, whereas the latter could be described as an immediate

effect due to concurrent cognitive processing (Maranges, Schmeichel, Baumeister, in press; Vosgerau, Dhar, Wertebroch, & Bruyneel, 2008). In a similar vein, the visceral arousal of hunger could be considered as an immediate effect as the sensations felt are the direct manifestations of the current physiological needs of the body. Despite being different in nature, our findings suggest that ego-depletion, cognitive load, as well as the visceral arousal of hunger are comparable in that they similarly propagate System I processing, where heuristics could be conducive to promoting goal-oriented behaviours.

Taken together, findings of the current dissertation contribute to the theoretical understanding of low self-control states by showcasing how they are not necessarily vices to be avoided, but could lead to virtuous choices and behaviours as long as these are promoted by environmental cues such as heuristics.

## **Limitations and suggestions for future research**

In the following section, we would like to acknowledge the limitations of our research process. In addressing these shortcomings, we also discuss opportunities and suggestions for future research.

In our main investigation in assessing heuristics in low self-control conditions, we encountered a limitation that was more practical in nature. Before we could test the impact of heuristics, it was necessary to first manipulate participants' experience of impaired self-control to simulate low self-control states. It should be noted that on different occasions we experienced difficulty in experimentally inducing the ego-depletion effect, in which we failed to produce an apparent effect or that the resulting effect was opposite to predictions. These encounters of failed experimental ego-depletion manipulations questioned whether our null findings were a result of weak experimental manipulations or extraneous confounding factors at work. While we did not have a clear answer to this, this setback nonetheless served as an additional incentive to adopt other manipulations, namely cognitive load and the visceral arousal of hunger, to simulate low self-control states. On one hand this approach served as a practical solution, on the other it presented an opportunity to gain more theoretical understanding of how the effects of cognitive load and the visceral arousal of hunger are comparable to ego-depletion. Moreover, in our experience the naturally occurring visceral arousal of hunger (e.g., in Chapter 3, Study 2: hungry vs. satiated participants were recruited at the cafeteria) was a relatively effective and reliable manipulation

for simulating a state of low self-control. That said, besides relying on experimental manipulations, it would be beneficial for future studies to evaluate self-control performance in real-life contexts under more naturally occurring states of low self-control. For instance, one could assess consumer' ability to exert self-control in making healthy food choices at the supermarket after they have had finished a long intensive workday (i.e., ego-depletion), when they have to keep a long grocery list in mind (i.e., cognitive load), or simply when they are hungry. Using naturally occurring states of low self-control not only provides an alternative method to the dual-task paradigm for studying self-control performance, but also strengthens the ecological validity of observed results.

In our research we have mainly used a pie chart to depict majority behaviour as means to activate a social proof heuristic, other studies have demonstrated the success of social proof heuristics presented in alternative formats to promote healthy food choices. For instance, similar to our field study that attempted to convey a social proof heuristic through a message suggesting the popularity of a healthy product, Salmon and colleagues' work (2015) showed that a simple slogan, "Most sold in this supermarket", was effective in promoting the sales of a low-fat cheese in a supermarket. Moreover, the field study by Mollen, Rimal, Ruiters, & Kok (2013) found that presenting social proof through factual statistical information regarding the sales of a healthy salad ("Every day more than 150 university students have a tossed salad for lunch here") led to increased salad consumption at a university cafeteria. This approach is notable because it presents credible information to convey social proof rather than suggestive information which some might consider as misleading. As opposed to explicitly presenting information, there is also emerging evidence that social proof implicitly represented in the physical environment, such as leftover food wrappers (Prinsen, De Ridder, & De Vet, 2013) or varying the stock of merchandise on shelves (Parker & Lehmann, 2011), could influence people's food choice behaviours. Building on existing evidence, future research should investigate how the social proof heuristic could be presented in different formats that could be installed in grocery stores, restaurants, and other food outlets to market healthy food choices in an ethical manner. Finally, seeing that the social proof heuristic has delivered promising results in the promotion of healthy eating, it would be interesting to examine its application in other domains such as environmentally friendly or charitable behaviours in real-life.

In assessing the social proof heuristic and also the scarcity heuristic in the current dissertation, our findings suggested that heuristics containing a social component (e.g., demand scarcity heuristic) might be more effective than other heuristics that do not have this characteristic (e.g., supply scarcity heuristic). To verify this

conclusion, it would be useful to test other heuristics (e.g., authority, reciprocity) that endorse principles of social influence (Cialdini, 2008). The authority heuristic and the reciprocity heuristic have respectively demonstrated effectiveness in promoting compliance in states of low self-control due to ego-depletion (Janssen, Fennis, Pruyn, & Vohs, 2008) and it would be interesting to see how well they would perform in influencing people's decisions when encountering self-control conflicts.

Lastly, the experiments in the current dissertation were mostly limited to having participants make hypothetical choices as a measure of their self-control performance. Arguably, the ultimate goal of our research was to generalize our finding that heuristics could be used in real-world settings for nudging desirable behavioural outcomes. Chapter 5 provided initial evidence for the effectiveness of such environmental cues in promoting healthier food choices in real life, although more field studies testing heuristics and more generally nudging interventions applied in real-life settings are highly encouraged. As an additional objective of our field study, we also made an initial attempt to increase the transparency of nudges through a simple disclosure message to inform customers about the purpose of the nudge. While our findings provided preliminary evidence that such disclosure message did not interfere with the nudge's impact, we did not assess whether consumers were aware of the nudge itself, whether they read the disclosure measure, and whether they made the connection between the disclosure measure and the installed nudge. Admittedly, due to practical restraints of the field study, our research could not directly examine these issues. Hence future studies should examine how consumers potentially perceive and process disclosure messages in greater detail. Furthermore, we propose that variations of the disclosure message could be used to directly inform the actual implementation and the purpose of the nudge. For example, "we arranged the product placement to make it more convenient to make a healthy choice" could be such variation.

## —— **Practical Implications**

In the current dissertation, we examined how low self-control states could be transformed from a situation of vice to a situation that fosters virtuous outcomes. To this end, we employed heuristics to promote goal-oriented behaviours in low self-control states. In light of public health concerns over obesity and how having a healthy diet is often considered a form of self-control success, we applied heuristics in the domain of healthy eating promotion. Overall, our findings support the use of heuristics as a low-cost and easy-to-implement intervention to promote healthy food choices in real-life contexts where people are not inclined to exercise self-control.

At the same time, our findings highlighted some practical concerns and challenges with implementing nudges in real-life settings. For instance, in our field study (Chapter 5) we encountered some extraneous situational factors that may have circumscribed the influence of our nudges. One important factor is related to pre-existing preferences that people may have. For example, we speculated that customers might initially already have a strong preference for the healthy bread rolls, so that installing a salience nudge to promote these products had minimal added benefit. In contrast, we may also have overlooked the unpopularity associated with certain products (e.g., yoghurt shakes) that could also have made it difficult for nudges to yield any influence on behavioural change. Future studies could more directly identify and examine the boundaries that delineate nudges' extent of influence. For example, when consumers have a clear strong preference for a particularly unhealthy snack, how far could a nudge steer them towards the opposite direction of a healthier alternative? The observations from our field study would suggest that strong preferences are robust against the persuasion attempts of nudging. This is related to a second point to consider when implementing nudges in practice, its ethicality. It is important to note that the essence of nudging is that it is only meant to be a subtle influence attempt that does not violate people's freedom of choice or infringe on their autonomy. However, critics of nudges have argued that when nudges target automatic processes that are largely outside of people's conscious awareness, it might be very difficult if not impossible for people to exercise autonomy to make choices other than the ones induced (Vallgård, 2012). The finding from our field study that the presentation of the disclosure message about the intended purpose of the nudge (i.e., "We help you make a healthy choice") did not interfere with the impact of nudge speaks to this ethical concern. An important implication of this finding is that subtle disclosure messages accompanying a nudge could be a practical solution for increasing the transparency of nudges. Secondly, this finding also reveals that nudges are just as effective when implemented overtly where people might be aware of their operations.

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## **Concluding Thoughts**

We opened the introduction to the dissertation with the quote "when there is a will, there is a way". Yet in everyday life, most people can probably relate to experiencing situations where their will is just lacking and that the exercise of self-control is difficult. In these situations, whether it is the experience of ego-depletion, mental distraction or hunger, people are prone to self-control failure as they fall back on default, quick, and automatic processes that are also prone to external influences to guide actions and choices, as opposed to the more effortful but deliberate processes



that are directed by goals and intentions. Nonetheless we demonstrate that people are not necessarily disadvantaged in these scenarios because heuristics could be installed in the choice setting to steer impulsive tendencies towards more optimal outcomes favouring long-term interests. In this light, we conclude that there when there is no will, there is still a way to successful self-control outcomes if contextual cues are strategically implemented in the environment to scaffold goal-oriented behaviours.



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# Appendix



Chapter 2 – Study 1 Three-course Meal Menu 1

## MENU A

*- A la carte 3 course menu -*

On the next few pages, you will be presented with the options for a three-course meal. Please proceed to make a choice of **starter**, **main** and **dessert**.

### **Starter**

Please make your choice of starter from the selection below.

Quesadilla - Baked flour tortilla layered with Cajun chicken, cheddar cheese, salsa sauce, green onions and diced tomatoes. Served with sour cream, salsa and shredded lettuce.

House Salad - Mixed greens with fresh lemon, olive oil, new potatoes, chickpeas, yellow and green beans, and tomatoes, then sprinkled with sesame seeds and our sweet & spicy Thai vinaigrette.

### **Main Course**

Please make your choice of starter from the selection below.

Chicken Parmigiana - Fried Parmesan-crust chicken breast topped with tomato sauce and mozzarella cheese. Served with a generous side of our fettuccine Alfredo.

California Flatbread - Roasted red peppers, Kalamata olives, sun-dried tomatoes, mushrooms, roasted garlic, pesto sauce and goat cheese.

### **Dessert**

Please make your choice of dessert from the selection below.

Fruit sorbet - with red fruit compote, whipped cream and sugared almonds

Cheesecake - with rhubarb, lemon ice cream and crunch of Amaretti cookies

## Chapter 2 – Study 1 Three-course Meal Menu 2

**MENU B**- A la carte 3 course menu -

On the next few pages, you will be presented with the options for a three-course meal. Please proceed to make a choice of **starter**, **main** and **dessert**.

**Starter**

Please make your choice of starter from the selection below.

**Roasted Garlic & Tomato Soup** - Smooth tomato puree in a light vegetarian broth, with hints of garlic, basil, fennel and sweet cream

**Calamari** - Lightly dusted in flour and spices, fried golden brown, served with lemon & seafood sauce.

**Main Course**

Please make your choice of starter from the selection below.

**Chicken Fingers** - Tender strips of chicken, seasoned and breaded, then fried golden brown. Served with plum sauce and our fries.

**Tuscan Turkey Club Wrap** - Turkey, diced tomatoes, fresh lettuce, cheddar cheese and homemade pesto-mayo.

**Dessert**

Please make your choice of dessert from the selection below.

**Chocolate Fudge Brownie** - Chocolate brownie served warm with a scoop of creamy vanilla ice cream.

**Mixed Fruit Tart** - A flaky pastry cup filled with light cream, topped with a mix of seasonal berries and fresh fruit.



# *Nederlandse samenvatting*



(DUTCH SUMMARY)

Waar een wil is, is een weg, zo luidt een populaire gezegde. In dit gezegde schuilt wetenschappelijke waarheid, aangezien onderzoek heeft aangetoond dat zelfcontrole (ook wel wilskracht genoemd) ten grondslag ligt aan veel successen in het leven. Zo is aangetoond dat zelfcontrole samenhangt met academisch succes, voldoening in interpersoonlijke relaties en welbevinden (Tangney, Baumeister, & Boone, 2004). Recent onderzoek suggereert bovendien dat zelfcontrole ook samenhangt met een gelukkig leven (Cheung, Gillebaart, Kroese, & De Ridder, 2014; Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013). In wetenschappelijke termen wordt zelfcontrole gedefinieerd als het vermogen om impulsen te onderdrukken die op gespannen voet staan met een persoonlijk lange-termijn doel. Het realiseren van dit soort doelen wordt vaak gehinderd door onmiddellijke verleidingen die zelfcontrole op de proef stellen. Iemand die aan de lijn doet kan bijvoorbeeld op een feestje geconfronteerd worden met een stuk taart en toegeven aan het korte termijn plezier van deze lekkernij, wat het lange-termijn doel van een slankere taille niet ten goede zou komen. Of een student kan geconfronteerd worden met de keuze tussen een goedkopere functionele laptop of een duurder variant met een aantrekkelijk design en kiezen voor de aantrekkelijke laptop, wat uiteindelijk negatieve gevolgen heeft voor het langetermijn doel van sparen. In deze situaties kan het uitoefenen van zelfcontrole helpen om niet toe te geven aan de initiële impulsen voor korte termijn bevrediging en op die manier het behalen van lange termijn doelen bevorderen.

Ondanks de vele goede voornemens die mensen hebben, mislukt het vaak om zelfcontrole uit te oefenen om lange-termijn doelen te bereiken. Een verklaring hiervoor is te vinden in theoretische modellen van gedrag, met name de zogeheten duale-procesmodellen. Deze modellen onderscheiden twee processen die in samenhang gedrag bepalen. Aan de ene kant is er een impulsief, automatisch systeem ('Systeem 1'), dat leidt tot snelle beslissingen die bijvoorbeeld gebaseerd zijn op emoties of invloeden uit de omgeving. Aan de andere kant is er een rationeel, beredeneerd systeem ('Systeem 2'), dat leidt tot weloverwogen beslissingen die bijvoorbeeld gebaseerd zijn op overtuigingen of doelen die mensen hebben. Hoewel dus juist het rationele Systeem 2 nodig zou zijn om goede voornemens waar te maken, blijkt juist het automatische systeem vaak dominant in het bepalen van gedrag. Dit maakt het moeilijk om zelfcontrole uit te oefenen.

Onderzoek heeft aangetoond dat verschillende persoonlijke omstandigheden ertoe kunnen leiden dat het impulsieve, automatische systeem dominant wordt, waardoor het moeilijker wordt om zelfcontrole uit te oefenen en doelen te verwezenlijken. Als mensen bijvoorbeeld herhaaldelijk zelfcontrole moeten uitoefenen zal dat steeds minder goed lukken. Dit wordt ego-depletie genoemd, de 'uitputting van wilskracht'

(Baumeister, Bratslavsky, Muraven, & Tice, 1998). Ook als mensen mentaal afgeleid zijn (bijvoorbeeld wanneer zij tegelijkertijd met andere taken bezig zijn; Shiv & Fedorikhin, 1999) of hongerig (Loewenstein, 1996), laten ze hun gedrag meer leiden door het automatische Systeem 1 en minder door hun rationele Systeem 2. Deze omstandigheden (ego-depletie, mentale afleiding, en honger) worden in dit proefschrift beschouwd als condities waarin het vermogen tot zelfcontrole tijdelijk verminderd is. Omdat situaties met ego-depletie, mentale afleiding en honger vaak voorkomen, en mensen dus regelmatig niet op hun wilskracht kunnen vertrouwen, gaat dit proefschrift dieper in op de vraag op welke wijze tijdelijk lage zelfcontrole het beslissingsproces van mensen beïnvloedt. In het bijzonder beoogt dit proefschrift een innovatieve aanpak te onderzoeken waarin gekeken wordt of we gebruik kunnen maken van de impulsieve beslisprocessen die mensen in condities van lage zelfcontrole toepassen. Specifiek wordt onderzocht of mensen in condities van lage zelfcontrole gestuurd kunnen worden in de richting van gedrag dat meer in overeenstemming is met hun persoonlijke lange-termijn doelen door gebruik te maken van de automatische, impulsieve beslissingsprocessen die ze geneigd zijn toe te passen in deze omstandigheden. In het eerste deel van het proefschrift (Hoofdstuk 2) wordt gekeken naar motivatie als onderliggende factor bij het nemen van beslissingen en het al dan niet uitoefenen van zelfcontrole. Uit dit hoofdstuk blijkt dat mensen onder normale omstandigheden (wanneer ze over voldoende zelfcontrole beschikken) meer gemotiveerd zijn om keuzes te maken die in overeenstemming zijn met hun doel (bijvoorbeeld gezond eten) in plaats van beloningsgerichte keuzes (bijvoorbeeld lekker maar ongezond eten). Wanneer zelfcontrole tijdelijk verlaagd is, door ego-depletie of mentale afleiding (bijvoorbeeld het onthouden van een 7-cijferig getal), hebben mensen echter gelijke motivatie voor doelgerichte en beloningsgerichte keuzes, waarbij geen van de twee een voorkeur lijkt te hebben. Wanneer er geen sterke voorkeur is, is het aannemelijk dat mensen zich meer laten leiden door invloeden van buitenaf. Deze bevinding is overeenstemming met de centrale premisse van dit proefschrift, waarin wordt gesteld dat tijdelijk lage zelfcontrole ervoor zorgt dat mensen hun keuzes minder baseren op hun rationele overwegingen en meer op invloeden uit de omgeving.

In het tweede deel van het proefschrift (Hoofdstuk 3 en 4) is het effect van omgevingsinvloeden op het besluitvormingsproces onderzocht, waarbij we specifiek geïnteresseerd waren in het gebruik van omgevingsinvloeden om doelgericht gedrag te bevorderen voor mensen in lage zelfcontrole condities. Gebaseerd op de theoretische veronderstelling dat mensen in lage zelfcontrole condities de neiging hebben om te vertrouwen op automatische, snelle 'Systeem 1' processen en daarmee zeer vatbaar zijn voor omgevingsinvloeden, verwachtten we dat mensen in deze omstandigheden meer geneigd zijn heuristische te volgen. Heuristiek zijn zogenaamde mentale

‘shortcuts’ of vuistregels die mensen gebruiken bij het nemen van beslissingen (Cialdini, 2008). Voorbeelden hiervan zijn het volgen van de meerderheid (de ‘social proof’ heuristiek), kiezen voor producten die schaars zijn, of kiezen voor wat wordt aanbevolen door een autoriteit. Deze beslisregels worden vooral gebruikt wanneer mensen niet de motivatie of de mogelijkheid hebben om hun keuzes bewust af te wegen (e.g., Janssen, Fennis, Pruyn, & Vohs, 2008)

In Hoofdstuk 3 en 4 is gekeken naar de mogelijkheden van het gebruik van heuristieken bij het maken van keuzes wanneer mensen tijdelijk lage zelfcontrole hebben. Het ging hierbij om keuzes tussen producten die voordelen bieden op de korte termijn (bijvoorbeeld lekker, ongezond eten) en keuzes die passen bij doelgericht gedrag dat gunstig is op de lange termijn (bijvoorbeeld gezond eten). De hypothese was dat individuen in lage zelfcontrole condities (bijvoorbeeld door ego-depletie of honger) meer doelgerichte keuzes zouden maken wanneer deze keuzes werden aangeprezen met een heuristiek. In Hoofdstuk 3 is de invloed van de schaarsteheuristiek onderzocht. Schaarste producten worden gezien als waardevoller (Cialdini 2009). In een eerste studie moesten participanten keuzes maken tussen gezonde en ongezonde producten. Er is hierbij gebruik gemaakt van een generieke schaarsteheuristiek, uitgedrukt als een marketing slogan: “Aanbieding van de week, zolang de voorraad strekt”. Deze heuristiek werd gekoppeld aan de gezonde voedselproducten. In overeenstemming met de hypothese vonden we dat vooral mensen die aangaven een laag niveau van zelfcontrole te hebben vatbaar waren voor de suggesties van de schaarsteheuristiek en daardoor gezondere voedselkeuzes maakten dan wanneer er geen heuristiek werd gebruikt. Interessant was dat, wanneer verschillende subtypes van de schaarsteheuristiek werden onderscheiden, vraaggedreven schaarste (bijv. “Op is op! Populair artikel!”) meer invloed had dan voorraadgedreven schaarste (bijv. “Op is op! Alleen deze week!”; Studie 2). Om te kijken of deze bevindingen stand houden wanneer een andere heuristiek wordt toegepast, is in Hoofdstuk 4 onderzocht of de social proof heuristiek (het volgen van de meerderheid), invloed had op het keuzegedrag van mensen in een lage zelfcontroleconditie (in dit geval als gevolg van honger). Mensen mét en zonder honger werd gevraagd keuzes te maken tussen gezonde en ongezonde producten, waarbij gezonde producten al dan niet werden vergezeld van een social proof heuristiek (uitgedrukt in een taartdiagram dat aangaf dat de meerderheid van deelnemers het gezonde product koos). De resultaten lieten zien dat mensen met honger significant meer gezonde voedselkeuzes maakten wanneer deze aangeprezen werden door de social proof heuristiek. Tesaamen genomen suggereren de resultaten van Hoofdstuk 3 en 4 dat in lage zelfcontrole condities het maken van keuzes die in overeenstemming zijn met lange-termijn doelen mogelijk is wanneer er heuristieken aanwezig zijn die doelgericht gedrag stimuleren.



Het derde en laatste deel van het proefschrift beschrijft onderzoek naar de toepasbaarheid van heuristieken in nudging interventies die gericht zijn op het bevorderen van de gewenste keuze wanneer mensen niet geneigd zijn om zelfcontrole uit te oefenen. Nudges worden gedefinieerd als subtiele veranderingen in de fysieke of sociale omgeving die het doelgericht gedrag van mensen gunstig kunnen beïnvloeden, zonder dat er restricties worden opgelegd in de keuzemogelijkheden (Thaler & Sunstein, 2008). Het plaatsen van fruit dichtbij de kassa (toegankelijkheidsnudge), het presenteren van gezonde broodjes op een aantrekkelijke manier ('salience nudge') of het aangeven dat een gezonde yoghurt shake het best verkochte product is (social proof nudge) zijn voorbeelden van nudges; het verbieden of weghalen van junk food is daarentegen géén nudge omdat het de alternatieve keuze onmogelijk maakt. In het onderzoek, beschreven in Hoofdstuk 5, is gevonden dat een toegankelijkheidsnudge op een effectieve manier de verkoop van fruit kon stimuleren. De social proof nudge en de salience nudge waren echter beperkt effectief in het bevorderen van de gezonde keuze, vermoedelijk door bestaande sterke voorkeuren van de consument. Verder werd gevonden dat het verschaffen van informatie bij een nudge ("We helpen u bij het maken van gezonde keuzes"), om daarmee de transparantie te verhogen, geen invloed had op de effectiviteit van de nudge. Tot slot wees een kwalitatieve studie, beschreven in Hoofdstuk 6, uit dat consumenten over het algemeen open staan voor nudging interventies wanneer deze ontworpen en geïmplementeerd zijn door deskundige personen en betrouwbare autoriteiten die de interesses van consumenten en de maatschappij voorop stellen. Consumenten stonden bovendien over het algemeen positief tegenover nudges gericht op het bevorderen van gezond eetgedrag omdat ze de voordelen van gezond eten gemakkelijk inzagen.

Het onderwerp van dit proefschrift werd geïntroduceerd met het populaire gezegde "Waar een wil is, is een weg". Ondanks de populariteit van wilskracht en het blinde vertrouwen dat veel mensen hebben in wilskracht blijkt dat zij in het dagelijks leven regelmatig situaties ervaren waarin de wil ontbreekt en waarbij het uitoefenen van zelfcontrole lastig blijkt, of dit nu komt door ego-depletie, mentale afleiding of honger. Desalniettemin geven de resultaten van de studies die zijn beschreven in dit proefschrift aan dat mensen niet noodzakelijkerwijs verkeerde keuzes maken in deze situaties: wanneer er heuristieken beschikbaar zijn die mensen helpen om de goede keuze te maken, juist wanneer ze lage zelfcontrole hebben, zijn mensen beter in staat om keuzes te maken die aansluiten bij hun lange-termijn doelen. De voornaamste conclusie van dit proefschrift is dan ook dat ook wanneer er geen wil is, er toch altijd een weg gevonden kan worden om de goede keuze te maken en dat is wanneer er heuristieken aanwezig zijn die compenseren voor een gebrek aan zelfcontrole.



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# *Curriculum Vitae*



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## **Curriculum Vitae**

Tracy Cheung was born on July 2, 1988 in Hong Kong, and at young age she moved with her family to Toronto, Canada. She attended Bayview Secondary School and received her high school diploma in 2006. The next four years she studied at Queen's University in Kingston, Canada where she pursued a Psychology major and a History minor. In the third year of her undergrad, Tracy participated in a brief study abroad program at the International Bader Study Center at Herstmonceux Castle in England, learning art history, British history and international business. Shortly after graduating with a Bachelor of Arts (Honours) on the Dean's Honour List in the spring of 2010, Tracy returned to England in the fall to begin postgraduate studies in Educational Psychology at the University of Bristol. In 2011, she graduated with a Master of Education degree with distinction.

In 2012, Tracy joined the European Commission Marie Curie Fellowship as an early stage researcher of the Consumer Competence Training (CONCORT) network. Under the supervision of Professor Denise de Ridder, Professor Bob Fennis and Assistant Professor Floor Kroese, Tracy conducted her PhD research on the topic of self-control and the promotion of healthy eating at the Self-Regulation Lab at Utrecht University in The Netherlands. In 2016, Tracy started working as a trend researcher at TrendsActive in Utrecht, researching and translating consumer insights relevant for consultancy in business and marketing strategy.

## International Publications

**Cheung, T., Gillebaart, M., Kroese, F., & Ridder, D. (2016).** Self-Control Success Revealed: Greater Approach Motivation Towards Healthy versus Unhealthy Food. *Applied Cognitive Psychology*, 30(6), 846-853.

**Cheung, T. T. L., Junghans, A. F., Dijksterhuis, G. B., Kroese, F., Johansson, P., Hall, L., & De Ridder, D. T. D. (2016).** Consumers' choice-blindness to ingredient information. *Appetite*, 106, 2-12.

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**Cheung, T. T. L., Gillebaart, M., Kroese, F., & De Ridder, D. (2014).** Why are people with high self-control happier? The effect of trait self-control on happiness as mediated by regulatory focus. *Frontiers in Psychology*, 5, 722. <http://doi.org/10.3389/fpsyg.2014.00722> AQ13 Childs, E. (2010). Religious attendance and

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## Submitted Manuscripts

**Cheung, T.T.L., Kroese, F.M., Fennis, B.M., & De Ridder, D.T.D.** The Hunger Games Using Hunger To Promote Healthy Choices In Self-Control Conflicts.

**Cheung, T. T.L., Marchiori, D.R., Kroese, F. M., Gillebaart, M., Fennis, B. M., & De Ridder, D. T.D.** Nudging Healthier Alternatives For Take-Away: A Field Experiment On The Effects Of (Disclosing) Three Nudges On Food Choices.

## Selection of presentations

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (August, 2016).** Changing the fate of impulsivity - using heuristics to steer impulsive choices into healthy choices. Oral presentation at the 30th Conference of the European Health Psychology Society Conference, Aberdeen, UK.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (June, 2016).** Bringing the virtue out of vice - using heuristics to promote virtuous choices for consumers in impulsive states low in self-control. Oral

## TURNING VICE INTO VIRTUE

presentation at the 45th European Marketing Association Conference, Oslo, Norway.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (January, 2016).** Using social cues and salient cues to steer impulsive choices healthy choices. Oral presentation at the 5th Association of Researchers in Psychology and Health, Maastricht, The Netherlands.

**Cheung, T. T. L., Gillebaart, M., Kroese, F., & De Ridder, D. (November, 2015).** Why are people with high self-control happier? An investigation into the mediating effects of regulatory focus on trait self-control and happiness. Poster presented at the annual Associatie van Sociaal-Psychologische Onderzoekers Conference, Amsterdam, The Netherlands.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (September, 2015).** Put a limit on it – the protective effects of scarcity heuristics when self-control is low. Oral presentation at the 29th Conference of the European Health Psychology Society Conference, Limassol, Cyprus.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (June, 2015).** Promoting healthy food choices in low self-control conditions. Oral presentation at the 44th European Marketing Association Conference, Leuven, Belgium.

**Cheung, T. T.L., Junghans, A.J., Dijksterhuis, G.B., Kroese, F., Johansson, P., Hall, L., De Ridder, D. (March, 2015).** C(1)ue me in – Enhancing consumers' attention to ingredient list information. Presented at 143rd EAAE/AAEA Joint Seminar, Naples, Italy.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (February, 2015).** When less is more – using scarcity heuristics to promote healthy choices in low self-control conditions. Oral presentation at the 4th Association of Researchers in Psychology and Health, Ghent, Belgium.

**Cheung, T. T. L., Gillebaart, M., Kroese, F., & De Ridder, D. (August, 2014).** Why more self-control makes your happier? Examining the relationship between self-control, regulatory focus, and happiness. Oral presentation at the 28th Conference of the European Health Psychology Society Conference, Innsbruck, Austria.

**Cheung, T. T. L., Kroese, F., Fennis, B.M., & De Ridder, D. (February, 2014).** Inclined to gratify: reward-orientation towards unhealthy food under low self-control conditions. Oral presentation presented at the 3rd Association of Researchers in Psychology and Health, Groningen, The Netherlands.

**Cheung, T. T.L., Kroese, F., Fennis, B.M., & De Ridder, D. (August, 2013).** Size matters: approach motivation towards healthy and unhealthy foods under low self-control conditions. Oral presentation at the 27th Conference of the European Health Psychology Society Conference, Bordeaux, France.



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