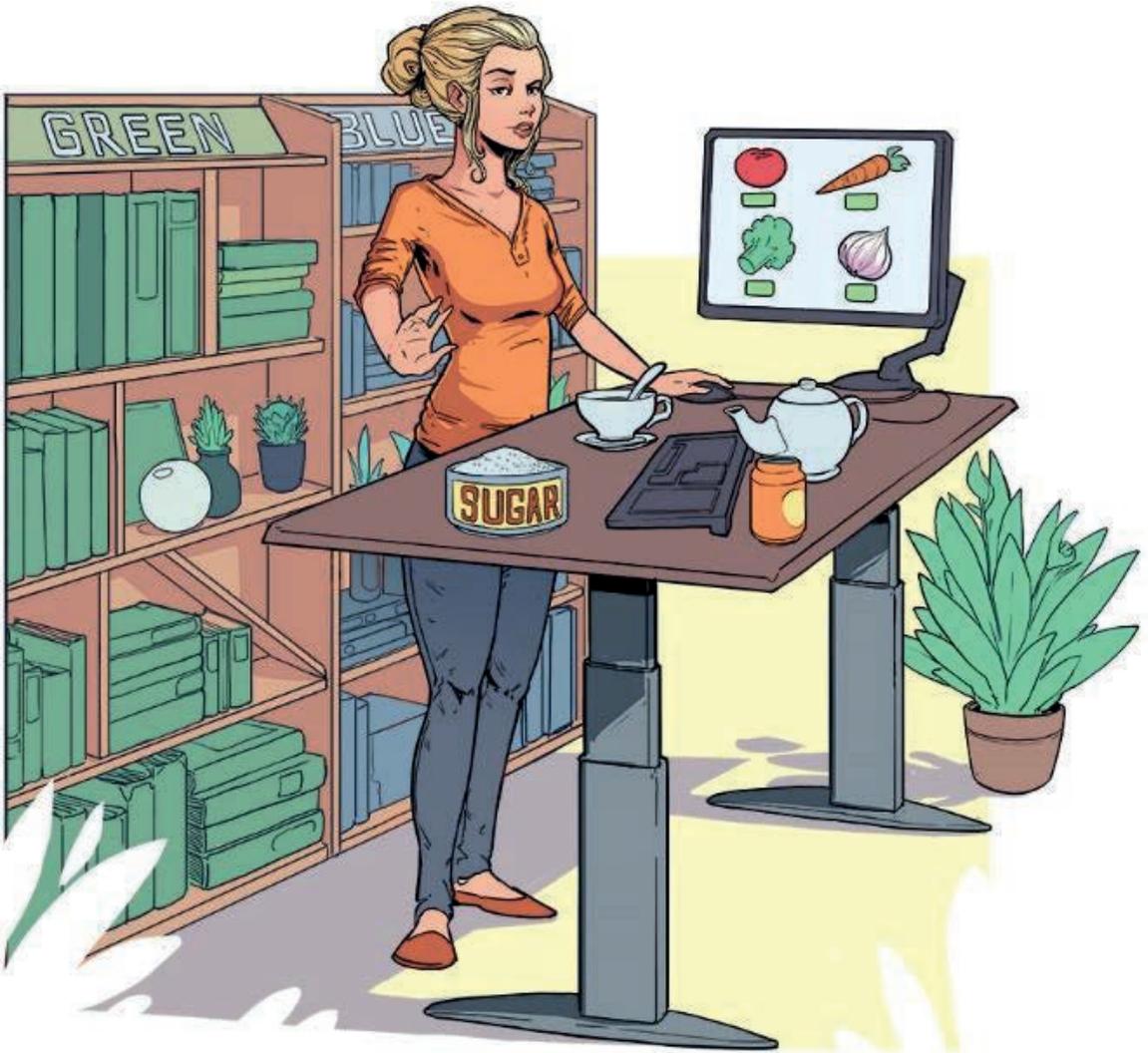


# PREFERENCES AS BOUNDARY CONDITION OF NUDGE EFFECTIVENESS

The potential of nudges under empirical investigation



Tina A.G. Venema



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OF NUDGE EFFECTIVENESS**  
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**PREFERENCES AS BOUNDARY CONDITION  
OF NUDGE EFFECTIVENESS**  
**The potential of nudges under empirical investigation**

**De effectiviteit van nudges in relatie tot persoonlijke voorkeuren  
De potentie van nudges empirisch onderzocht**

(met een samenvatting in het Nederlands)

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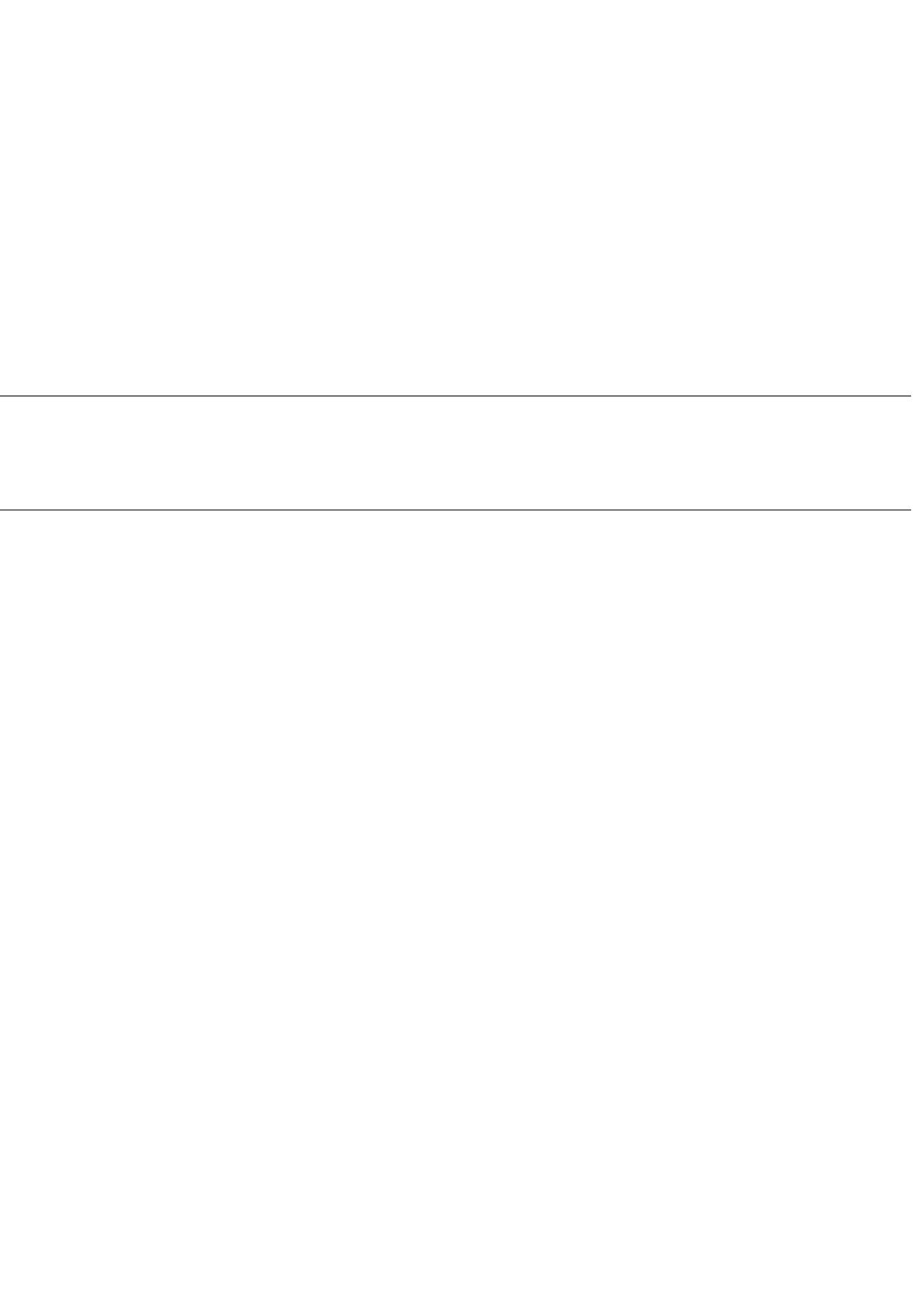
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# CHAPTER 1

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GENERAL INTRODUCTION



*“... The world was beginning to face problems of an entirely new order of magnitude – the exhaustion of resources, the pollution of the environment, overpopulation, and the possibility of a nuclear holocaust, to mention only four. Physical and biological technologies could, of course, help. We could find new sources of energy and make better use of those we had. The world could feed itself by growing more nutritious grains and eating grain rather than meat. More reliable methods of contraception could keep the population within bounds. Impregnable defences could make a nuclear war impossible. But that would happen only if human behaviour changed, and how it could be changed was still an unanswered question...”*

- B.F. Skinner, from the Preface to *Walden Two* (1976)

This dissertation considers the extent to which ‘nudges’ are effective in changing behaviour. In the twentieth century, scholars and novelists such as Skinner and Huxley fantasized about societies in which knowledge about human behaviour, derived from the social sciences, would be applied to guide people’s decisions in creating a utopian world. Decades later, some now wonder whether this fantasy could become reality with the introduction of nudges to (governmental) policy agendas. Nudges are changes to the environment in which people are presented with choice options (i.e., choice architecture) designed to steer them towards a particular ‘sensible’ choice, without restricting alternative options or changing financial incentives (Thaler & Sunstein, 2008). For example, guests in hotel rooms might find a sign stating “84.3% of the previous guests reused their towels, thereby contributing to the reduction of the hotel’s ecological footprint” (e.g., Goldstein, Cialdini & Griskevicius, 2008; Scheibehenne, Jamil, & Wagenmakers, 2016), or employees might be automatically enrolled in a retirement savings plan set up by their employer when signing their contract (Thaler & Bernartzi, 2004). Nudge interventions come in all shapes and sizes, but one thing they all have in common is that they capitalize on psychological processes that guide our interactions with our environment. The potential of nudges has invoked both enthusiasm and apprehension. The current dissertation presents research that critically tests the extent of this potential; are nudges indeed effective in changing behaviour and what are the boundary conditions? In this introductory chapter we will first provide a short overview of how the concept of nudges came into being and how it was received. We will then proceed to outline and explain the aims of this dissertation and introduce each of the empirical chapters.

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## HOW IT ALL BEGAN

In 2008, behavioural economist Richard Thaler and lawyer Cass Sunstein published their book *Nudge: Improving decisions about Health, Wealth, and Happiness*. In this book they successfully introduced the idea that behavioural insights can be of great value to

(governmental) policymaking. To understand how their idea led to the installation of numerous behavioural insights teams/units throughout the world, inspired countless research endeavours and fuelled important philosophical debates, it is first necessary to get an idea of the zeitgeist in which this book was received.

For years, economics was one of the few social science disciplines that exerted an influence on governmental policies (Christenen & Læg Reid, 2002). The classical economist view of human behaviour stipulates that people are ‘maximizers’ when it comes to making decisions. Economic models predict that people weigh the pros and cons of a choice option to make the best possible decision given the information at hand. In other words, people were assumed to make rational decisions, and when they seemed to be making irrational decisions this was attributed to their lacking important information regarding this decision (e.g., Friedman, 1976). From 1980 onwards, governmental policies gravitated towards a doctrine that viewed citizens primarily as self-interested consumers with unbounded rationality and unreserved self-discipline (Christen & Læg Reid, 2002). The two most common ways to influence the behaviour of the public were either prohibition and regulation by law, thereby removing the decision from the public, or education to provide the public with more information so as to improve their decisions. This is not to say that the view of humans as rational decision-makers has gone unchallenged; already in 1974, Tversky and Kahneman published their renowned article on heuristics and biases in human decision-making (Tversky & Kahneman, 1974). This was ensued a couple of years later by Sen’s prominent article “Rational Fools, a critique of the behavioral foundations of economic theory” (Sen, 1977). Many others followed (e.g., Gigerenzer & Goldstein, 1996; Stanovich & West, 2000; Evans, 2003), and gradually it became widely accepted that people seem to predictably make decisions against their better judgement, purposefully ignore information and, most of all, to make decisions mindlessly. While hugely influential in the field of economics (Rehman, 2016), a clear understanding of how to implement this knowledge in public policy was still missing.

With their book *Nudge*, Thaler and Sunstein translated this ‘new’ behavioural insight into a readily applicable tool for behaviour change. They suggested to make use of the influence that *choice architecture* has on people’s decisions. Choice architecture refers to the wide range of settings in which choice options are presented, whether in forms, online, or in supermarkets and public spaces, etc. There are abundant examples of this type of influence, as marketeers have long discovered this presentation tactic. For example, the placing of premium brands at eye-level in supermarkets to increase profits, and the automatic renewal of magazine subscriptions ensuring a steady customer base are just two common manifestations. Making small changes to the environment in which people are exposed to choice options can radically alter the outcome of these choices. Thaler and Sunstein presented compelling examples, including the *Save More Tomorrow* program that offers employees the opportunity to save any future salary raises in a savings account, and the case of rearranging a school canteen so that children

load their plates with vegetables first, leaving less room for unhealthy starches. As well as yielding encouraging results, these interventions are relatively easy and cheap to implement.

To explain *how* choice architecture influences decisions, Thaler and Sunstein referred to a dual systems theory that later received much attention outside of academia with Kahneman's book *Thinking, Fast and Slow* (Kahneman, 2011). This theory posits that there are two systems that govern all human behavioural decision-making: one that is quick, automatic, intuitive, unconscious and efficient (system 1); the other slow, deliberate, reasoned, conscious and effortful (system 2). While system 2 is thorough, the exertion such processing entails means that people cannot use it for every decision; in most cases the sheer amount of information that would need to be incorporated in a decision would simply be overwhelming (Schwartz & Ward, 2004). Imagine grocery shopping while carefully deliberating about every product. Picking a jar of peanut butter could turn into a lengthy endeavour; with or without chunks, organic or generic, with or without palm oil, what size would you like, what would other people in your household like, which jar would give you the most value for your money? Grocery shopping would take all day - best not to start in the frozen section then.

Conversely, decisions made using system 1 processes are characterized by efficiency. For example, you would just pick the peanut butter jar closest to hand. This system is proposed as the default operating modus (Thompson, 2009; Thompson, Turner, & Pennycook, 2011; Epstein, 2003). While in this modus, people might often unintentionally use 'rules of thumb', also called heuristics, to guide their decisions. To illustrate, students might act on the basis that the longest answer to a multiple-choice exam question must be the correct one; or tourists assume that, after disembarking from a train, the direction in which the majority of people are walking must be where the exit is located. While these rules of thumb often serve people well, they can also backfire: it can happen that the teacher setting the exam may be aware of this belief and deliberately pre-empts it, and the majority of other passengers may be transferring to another train rather than leaving the station. Although with heuristics people might from time to time evaluate whether their assumptions are correct, most decisions reached via system 1 processes are taken without much conscious awareness. The efficiency of this system is demonstrated by the fact that we can effortlessly operate a moving car and chat with our passengers at the same time without causing traffic accidents. This example can also be used as an analogy for how people make daily decisions, i.e., system 1 is driving the car while system 2 processes check in occasionally to check that system 1 is "not making a mess" or to determine the final destination (Kahneman & Frederick, 2002).

Nudges were introduced as a behaviour change tool that acknowledges people have bounded rationality and therefore cannot be expected to carefully deliberate all their decisions. A nudge intervention changes the choice architecture in such a way that it can be navigated by relying on system 1 processes (Thaler & Sunstein, 2008). By

contrast, classical behaviour change tools, such as educational campaigns, typically rely on effortful system 2 processes. For example, people can learn that women need an average of 2,000 kilocalories a day and that men need 2,500 to maintain their current weight; but for this knowledge to result in actual behaviour change people need to read the calorie information of labels in the supermarket and monitor their intake, which can be quite effortful. When the environment is designed in such a way that low-calorie food products are more easily accessible than high-calorie products, however, people might make better choices even without this knowledge. What distinguishes nudges from marketing ‘tricks’ is the intention behind the design. Thus, whereas companies might employ strategies that rely on system 1 processes to encourage consumers to buy their products, nudges aim to encourage choices that are in the best interests of the decision-maker.

Nudges are thus designed to *help* people make decisions that are in line with their own goals and values, i.e., to support people’s autonomy (see also Vugts, Van den Hoven, De Vet, & Verweij, 2018). On a political spectrum, nudges are ideologically considered as *libertarian paternalism*. They are paternalistic in that they are based on the idea that certain choices are better than others to improve well-being in the long run, albeit only insofar as people themselves are in agreement with the goals represented by these choices. Thaler and Sunstein (2008) refer to the idea of *hypothetical consent* to support this claim (see also Van de Veer, 1986). The ‘libertarian’ aspect requires that these choices are not enforced, but rather only suggested, with alternative options still accessible. Referring back to the aforementioned analogy of system 1 processes driving the car, nudges can be seen as a navigation device. If system 2 has fallen asleep during the drive or is busy with something else, system 1 will drive the car to the pre-set destination with the help of the navigation device (Sunstein, 2017). If system 2 is awake and decides that it wants to stretch its legs at a gas station, it can easily overrule the instructions of the navigation device.

To summarize, nudges promise to be a behaviour change tool that works without relying on people’s full attention or reasoning capacity, that is easy and cheap to implement, that helps people to make decisions that are in line with their own goals and values, without eliminating alternative options or changing financial incentives.

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## THE RECEPTION: CRITICISM AND ACCLAIM

Whereas Skinner and Huxley painted rosy portraits of how behavioural insights could be used to create a utopia, their contemporaries, such as Orwell and Wells, did the exact opposite. Through novels such as *1984* and *The Sleeper Awakes* they warned against the invisible powers that governments could wield over their citizens. In 1957 there was a public outcry when James Vicary revealed an experiment in which he found that moviegoers had bought significantly more cola when he had flashed the words “Drink Coca Cola” very briefly on the screen throughout the film. The commotion

grew to such magnitude that the US Congress decided to hold hearings on subliminal communications. Despite the fact that Vicary later admitted his experiment was a hoax, the furore only subsided after legislation was passed prohibiting subliminal communications (O’Barr, 2005). Although the critique on nudges has not reached epic heights such as the one Vicary’s claim brought on, the essence of this criticism is quite similar: nudge critics fear that people will be manipulated because nudges mostly rely on processes that people are not aware of (Bovens, 2009; Selinger & Whyte, 2011; Blumenthal-Barby & Burroughs, 2012; Hansen & Jespersen, 2013).

The notion that nudges exploit people’s cognitive and behavioural biases to influence their decisions seems antithetical to the obligation on governments in democratic societies to make their policies transparent to the public (Feitsma, 2019). It has been suggested that nudges limit people’s autonomy to evaluate, deliberate and choose for themselves (e.g., Hausman & Welch, 2010) and that nudges therefore have no place in public policy (e.g., Leggett, 2014).

In the debate on nudges the word *autonomy* has different conceptualisations. Vugts and colleagues (2018) distinguished three recurring types of autonomy: autonomy understood as freedom of choice, autonomy as agency, and autonomy as self-constitution. The third type (autonomy understood as self-constitution) is the least common of the three and refers to the notion that the choices people make can be an expression of their identity (e.g., Baldwin, 2014). In fact, autonomy understood as freedom of choice is the most prevalent in the literature on nudges, and this conceptualization means that alternative choice options are available without extra cost and people are not coerced in their decision (i.e., the nudged option should be easily resistible) (e.g., Saghai, 2013). To illustrate, this type of autonomy was deemed to be violated when Mayor Bloomberg of New York City installed the Sugary Drinks Portion Cap Rule in 2013, prohibiting the sale of portion sizes larger than 16 ounces (0.47 litre) for sweetened drinks. Even though citizens could buy two smaller portion sizes if they wished to drink more than half a litre of sugary drinks, the New York Court ruled that this ban infringed on citizens’ autonomy. The conceptualization of autonomy as freedom of choice is mostly discussed as an element in the definition of nudges, stipulating that alternative options should remain available (Thaler & Sunstein, 2008; Vugts et al., 2018).

Whereas the conceptualization of autonomy as freedom of choice refers to a more or less technical operationalization of nudges, the second type (i.e., autonomy understood as agency) refers to the *influence* of nudge interventions on people’s decisions. This conceptualization of autonomy stems from the view of humans as agents with relatively stable long-term goals and the capacity to make decisions that are in line with these goals (e.g., Scanlon, 1998). When a nudge leads to a decision that is not in line with an individual’s goals and values it is argued that the choice architect has manipulated the decision-maker (e.g., Sugden, 2017). For example, a default nudge that automatically transfers people’s tax refunds into a savings account could be considered manipulation

(Bronchetti, Dee, Huffman, & Magenheim, 2013) if those affected already had vague plans to spend their refunds but the nudge intervention exploited their inability to make an active decision (i.e., inertia). In this conceptualization, infringement of an individuals' autonomy would occur if the nudge interferes with a persons' ability to set goals or their capacity for 'practical reasoning'.

However, this type of autonomy is incompatible with the notion that people are not always rational decision-makers. Accordingly, the conceptualization of autonomy as agency has not only been used to argue that nudges might infringe on such agency but also to illustrate how nudges have the potential to *support* individuals' autonomy. For example, the default savings account nudge, mentioned above, would help those people who *want* to save money but typically spend it as soon as it comes in. A phenomenon called the intention-behaviour gap describes the widely recognizable situation that we form good intentions but fail to act upon them (Sheeran, 2002). For example, we resolve to eat healthier but forget about this intention when our colleague offers us home-made brownies. Or we resolve to change banks after we learn that our bank invests in logging rainforests, but there never seems time to put this intention into effect. Or we intend to exercise directly when we come home from work, but instead our habitual behaviour kicks in and we end up on the couch. Loss of self-control, inertia and bad habits are all examples of self-defeating obstacles that are said to rely on system 1 processes (e.g., Wood, Labrecque, Lin & Runger, 2014; Sheeran, 2002; Hofmann, Friese, & Strack, 2009). Nudge interventions that steer behaviour to *facilitate* the enactment of peoples' goals and values are therefore argued to be supportive of autonomy, conceptualized as agency (Saghai, 2013; Vugts et al, 2018). Nudge sceptics point out that nudge interventions target groups of people rather than individuals, and that choice architects therefore cannot know the goals and values of all the individuals exposed to the nudge (e.g., Goldin, 2015; Sugden, 2017). Given the notion that nudges appeal to system 1 processes, some have suggested that nudges should be considered as forms of behavioural paternalism rather than libertarian paternalism (e.g., Gigerenzer, 2015; Glod, 2015). The extent to which nudges promote or hinder people's self-set goals is thus an important issue in the debate on nudges.

To summarize, the criticism on nudges pertains mainly to the notion that nudges operate "in the dark", i.e., via processes people are unaware of and the paternalistic nature of nudges. However, these issues are mostly discussed in merely hypothetical scenarios and theoretical terms. The importance of studying what *actually* happens when people are exposed to nudges can be illustrated, for example, by the finding that the default nudge mentioned above that automatically transferred people's refunds to a savings account did not in fact work for people who had already made plans to spend their refunds (Bronchetti et al., 2013). We argue that more empirical research is required to investigate people's pre-existing (i.e., a priori) preferences in relation to nudge effectiveness in order to critically investigate both the promise of nudges to create a utopia and the threat of nudges to make us mere puppets of choice architects.

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## A DECADE LATER

It is important to note that the arguments on both sides of the debate on nudges are primarily based on theoretical principles and concerns. To grasp the extant potential (or threat) of nudge interventions, however, we need to exert to *empirical* research. An important underlying assumption held by both proponents and opponents of nudging is that nudges are effective in steering behaviour. Zanna and Fazio (1982) distinguished three research generations which new phenomena usually go through: the first generation deals with the question “*Is there an effect?*”, i.e., does altering the choice architecture lead to behaviour change?. The second research generation investigates “*When does the effect occur?*”, i.e., what are the boundary conditions of nudge effectiveness? Finally, the third research generation is concerned with “*How does the effect occur?*”, i.e., how can we explain the effectiveness of nudges?

*The first research generation.* Assessing the effectiveness of nudges is complex, since nudges have not only been applied to a wide range of behavioural domains, such as health, sustainability and finance, they also come in all shapes and sizes (e.g., Van Kleef & Van Trijp, 2018). There is little consensus in the literature on exactly how many nudge types there are, however a non-exhaustive list would include defaults, positioning nudges, social proof nudges, portion size nudges, prompts/reminders, pre-commitment nudges and proximity nudges (e.g., Thaler & Sunstein 2008). As a result of this versatility, most meta-analyses and systematic scoping reviews focus on a particular behavioural domain, for example dietary behaviour (e.g., Arno & Thomas, 2016), or on a specific type of nudge such as portion sizes (Zlatevska, Dubelaar, & Holden, 2014). There are, however, a few notable exceptions (e.g., Szaszi, Palinkas, Palfi, Szollosi, & Aczel, 2018; Hummel & Maedche, 2019), and the conclusions in these articles do not differ much from the findings of more specific overviews, namely that nudges can be effective, but the effect sizes vary greatly. For example, Hummel and Maedche (2019) covered multiple behavioural domains and multiple types of nudges, including 100 empirical articles in their meta-analysis. They found that 62% of nudging interventions resulted in a statistically significant change in behaviour. Across all included studies, the average percentual change on the outcome measure (e.g., the number of calories consumed, or the number of participants that selected a particular option) between the nudge intervention group and the control group was 21%. What this tells us is that nudge interventions do not always work, and that even when they are effective they might not work for everyone (Olejnuk & Algina, 2000).

*The second and third research generations.* Understanding the boundary conditions (i.e., the extent) of nudge effectiveness is necessary both to improve current nudging interventions and to assess whether nudges do indeed constitute a threat to people’s autonomy. To date, only a few studies have addressed specific moderators of nudge effectiveness (Szaszi et al., 2019; Arno & Thomas, 2016; Marchiori, Adriaanse, & De Ridder, 2017). A decade after the publication of the book *Nudge*, the literature on nudges is only just starting to verge into the second research generation, let alone the third. To

find answers to the questions *when* and *how* nudges exert an influence on behaviour, we could go back to their original source. Whereas it was behavioural economists who successfully introduced the idea of nudges, the knowledge that informs and inspires different types of nudges often stems from the field of cognitive or social psychology. For example, social proof nudges that signal what other people have chosen, are derived from theories on social influence (e.g., Deutsch & Gerard, 1955; Cialdini, 1984). Choice architects interested in prompts, i.e., reminders of people's goals, can resort to the vast literature on (supraliminal) priming (e.g., Bargh & Chartrand, 2000). Most of the concepts on which nudges are based have been studied in the field of psychology since long before Thaler and Sunstein came up with the umbrella-term nudge. It can thus be easily understood that the reaction of psychologists to nudging is sometimes along the lines of 'that is nothing new - merely old wine in new bottles' (e.g., Vallgård, 2012; Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011). Besides providing an applied outlet for fundamental behavioural insights, however, the concept of nudges has something better to offer the field of psychology. Before the overarching label 'nudge' was used, all 'types of nudges' had their own closed-off niche in the psychological literature. For example, social proof 'nudges' were studied in the social influence literature and prompts were studied in the priming literature. In this dissertation we argue that using nudges as an umbrella-term can contribute to a deeper understanding of the working mechanisms of all different types of nudges, since known boundary conditions in one type of nudge might prove equally applicable to other types of nudges. Using nudges as an umbrella-term thus inspires a search for patterns that would have otherwise been missed and provides answers to the questions that still surround nudges.

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## A PRIORI PREFERENCES AS A BOUNDARY CONDITION

One of these questions is whether people are genuinely free and able to select alternative options when faced with a nudge (e.g., Glod, 2015). Insights from the priming literature would predict that, even when people are not aware of the nudge, a priori preferences determine whether a nudge will influence behaviour. A conceptual replication of Vicary's study (the cola prime) demonstrated that when people were shown the name of a soda brand so quickly that it could be processed, but not consciously perceived (subliminal priming), then it was indeed likely to influence their subsequent choice of beverage, though only when participants were thirsty (Karremans, Stroebe, & Claus, 2006). In other words, subconsciously processed information only influenced their decision when the processed information was relevant to them. A similar pattern was found in studies looking into the boundary conditions of the influence of descriptive norms (i.e., what other people do). These studies ascertained that the likelihood of norms influencing behaviour increased according to how relatable, and thus how relevant, the modelled group was (Abrahamse & Steg, 2013). For example, hotel guests were more likely to reuse their towels when the card stated that 'the majority of guests

*in this room* reused their towels' than when it just stated 'guests' in general (Goldstein, et al, 2008). Although priming and social influence purportedly have different working mechanisms, viewing nudges as an umbrella-term reveals that the influence of choice architecture on people's decisions might be dependent on the relevance of the nudge to their own goals and values.

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## RESEARCH AIMS AND CHAPTER OVERVIEW

This dissertation follows up on this insight and in a series of experimental studies, both in field and lab settings, we investigated *to what extent people's a priori preferences influence the effectiveness of nudges to alter people's choices*. Throughout the chapters, we made use of different types of nudges that are tested on different types of behaviours. There are several ways in which people's (a priori) preferences can be deduced and assessed; we can observe what people do (e.g., Dhar & Gorlin, 2013), we can ask them what they usually do (e.g., Wood & Neal, 2009), we can assess motivation for different components of the choice (e.g., Fotopoulos, Krystallis, Vassallo, & Pagiaslis, 2009). Or we can measure unobtrusively how certain they are of their choice (e.g., Lepora & Pezzulo, 2015). Each of these options has been tested in one of the empirical chapters in this dissertation. Since each chapter was written with the purpose to be read independently from the others, you might find a recurrence in the argumentation that the promise that nudges influence behaviour for the better should be critically investigated.

In **Chapter 2** we investigated the effectiveness of a default nudge to increase stand-up working. This field study took place at the municipality of Utrecht. Three years prior to the start of this study, the municipality had invested in electronically operable Sit-Stand Desks (SSD's), yet it was noticed that these desks were hardly used for stand-up working. A baseline observation revealed that the SSD's were used only 1.8% of the time for working in a stand-up position. These desks were typically found at sitting height when municipality employees arrived in the office. We examined whether changing the default setting of the desks would engender employees to work more often in a stand-up position. During the intervention weeks, this default position modus was changed to standing height for two consecutive weeks. Before and after the nudge intervention, surveys were conducted inquiring into people's *intentions* to use these desks for stand-up working, their *attitudes* and views on *social norms* regarding the use of these desks, and their *ability* to use these desks for stand-up working. Secondly, we examined if the default nudge would still have an impact after the nudge intervention period had ended. Will a nudge still have an effect after say, four weeks, or even two months? Together, the observations and the answers from the surveys provided valuable insights into the effectiveness of a nudge and what happens to this effectiveness after frequent and prolonged exposure.

Next, we investigated what happens to the effectiveness of a nudge when preferences have become automatized, as is the case with habits. Habits can be defined as behaviours

(or cognitions) that are frequently performed in a particular contextual setting, to the extent that the enactment has become automatized (Orbell & Verplanken, 2010; Wood & R nger, 2016). For example, experienced drivers do not have to think about how to operate a car, since system 1 can do that. In a recent study, De Wijk and colleagues (2016) repositioned whole-wheat bread to a more prominent place in the supermarket with the aim of encouraging the consumption of this healthier alternative. The results indicated, however, that people went looking for the bread they habitually bought, thereby rendering the nudge intervention ineffective. Figuratively speaking, it seems that existing habits could be the nemesis of nudges in the *competition* for system 1 processes.

Accordingly, in **Chapter 3** we took a slightly different approach, with the idea of beating habits at their own game, testing a nudge that could work *with* existing habits instead of against them. In this chapter we describe a study that was conducted in the United Kingdom in collaboration with professor Verplanken. Free from as many contextual influences as possible, this lab study set out to test the role of habits in the effectiveness of a portion size nudge. Portion size nudges capitalize on people's tendency to consume the portion of food or drinks that they are given, regardless of the size. The nudge typically consists of a reduction in the plate size, container/package or serving utensil to reduce the consumption of unhealthy products. With a slight wink at cultural stereotypes, the habit of adding sugar to tea was chosen to serve as the target behaviour. Unsuspecting participants were invited to come to the lab and drink tea. Careful screening ensured we only included participants who used sugar in their tea. The teaspoons in the sugar bowl to be used for scooping sugar were subjected to a portion size nudge: all participants made their tea once with a regular-sized teaspoon and once with a teaspoon that was half the size. The tested hypothesis was that participants with a strong habit of adding a particular number of teaspoons of sugar to their tea would add less sugar (measured in grams) when using the smaller spoon. Whereas participants who had a weak habit or no habit at all might be more aware of their behaviour and therefore be less susceptible to the nudge effect, i.e., would add an equal amount of sugar regardless of the spoon size.

**Chapter 4** describes a series of studies conducted to test whether people would *act upon* their (articulated) personal preferences when faced with a center-stage nudge. This nudge makes use of people's tendency to select the middle option from a horizontal array. In this chapter we make an imperative distinction between preferences that are *congruent* with the aim of the nudge (i.e., where the nudge and choice architect desire the same end) and preferences that are actually *incongruent* with the aim of the nudge (i.e., the aim of the nudge does not match individuals' personal preferences). These studies assessed the effectiveness of a center-stage nudge to steer participants' choices to the smallest of three glasses filled with sugary soda, i.e., the healthiest option. In all these studies we operationalized and measured nudge-incongruent preferences as the visceral state of thirst and the hedonic pleasure derived from drinking the soda:

liking. While these nudge-*incongruent* preferences might thwart the effectiveness of a nudge, preferences that *are* congruent with the aim of the nudge are equally important when assessing the effectiveness.

The effectiveness of nudges might be overestimated when failing to take into account the fact that some people will in any case prefer and select the ‘sensible’ option regardless of the arrangement of the choice architecture. A distinction can be made between wanting something specifically and more generally thinking that a certain option is ‘a good idea’. Therefore we tested different operationalisations of nudge-congruent preferences. In Study 1, nudge-congruent preferences were operationalized as the extent to which participants had an intention to reduce their soda intake, while in Study 2 congruent preferences were operationalized at a higher abstraction level as healthy consumption goals. Even though people might not have a specific goal to reduce soda consumption, the behaviour this nudge encourages would *fit* with the goal to adhere to a healthy consumption pattern. Since people sometimes lose track of these general goals, we manipulated the focality of this goal in Study 3 by bringing it to mind without specifically pointing out that they had this goal. In all studies we hypothesized that when the libertarian aspect of nudges holds up to scrutiny, strong personal preferences would render a nudge ineffective, i.e., that when people know what they want they will be less influenced by choice architecture.

In Chapter 5 we present two studies that tested the inverse of this notion, i.e., whether a nudge is effective when people do *not* know what to choose. Critically, we distinguish between having no preferences (i.e., indifference) and having conflicting preferences as two situations in which people might not know what to choose. Both studies tested the hypothesis that when people are uncertain about their decisions they are more likely to be influenced by the choice architecture. We selected a social proof nudge to test this idea; we showed the answers of alleged previous participants during the choice tasks. A key characteristic of indifference is that the outcome of a decision is deemed irrelevant or unimportant. In Study 1, a state of indifference was simulated by letting participants categorize coloured squares into either ‘blue’ or ‘green’. While participants could be fairly certain about their answer in most trials (i.e., the colour was clearly either blue or green), the trials of interest invoked uncertainty. The colours in these trials can best be described as ‘ocean’ or ‘turquoise’, and it was precisely in these trials that we tested whether seeing the answers of alleged “previous participants” would influence the participants’ decisions.

In Study 2 the effectiveness of the social proof nudge was tested in cases when people experience conflicting preferences. The consumption of meat has been well documented in the literature as causing ambivalent feelings (e.g., Buttlar & Walther, 2018; Berndsen & Van der Pligt, 2004). On the one hand, people like the taste of meat, while on the other hand they might experience discomfort when thinking about what happened to the animals they eat or the consequences for the environment. Hence deciding to buy meat can invoke conflicting preferences. We invited participants to

come to the lab to do a supermarket-shopping task. While participants were tasked with deciding whether they would select or reject 200 products, we were actually only interested in the trials with meat products. We hypothesized that participants who experience highly conflicting preferences would be more likely to be influenced by the nudge.

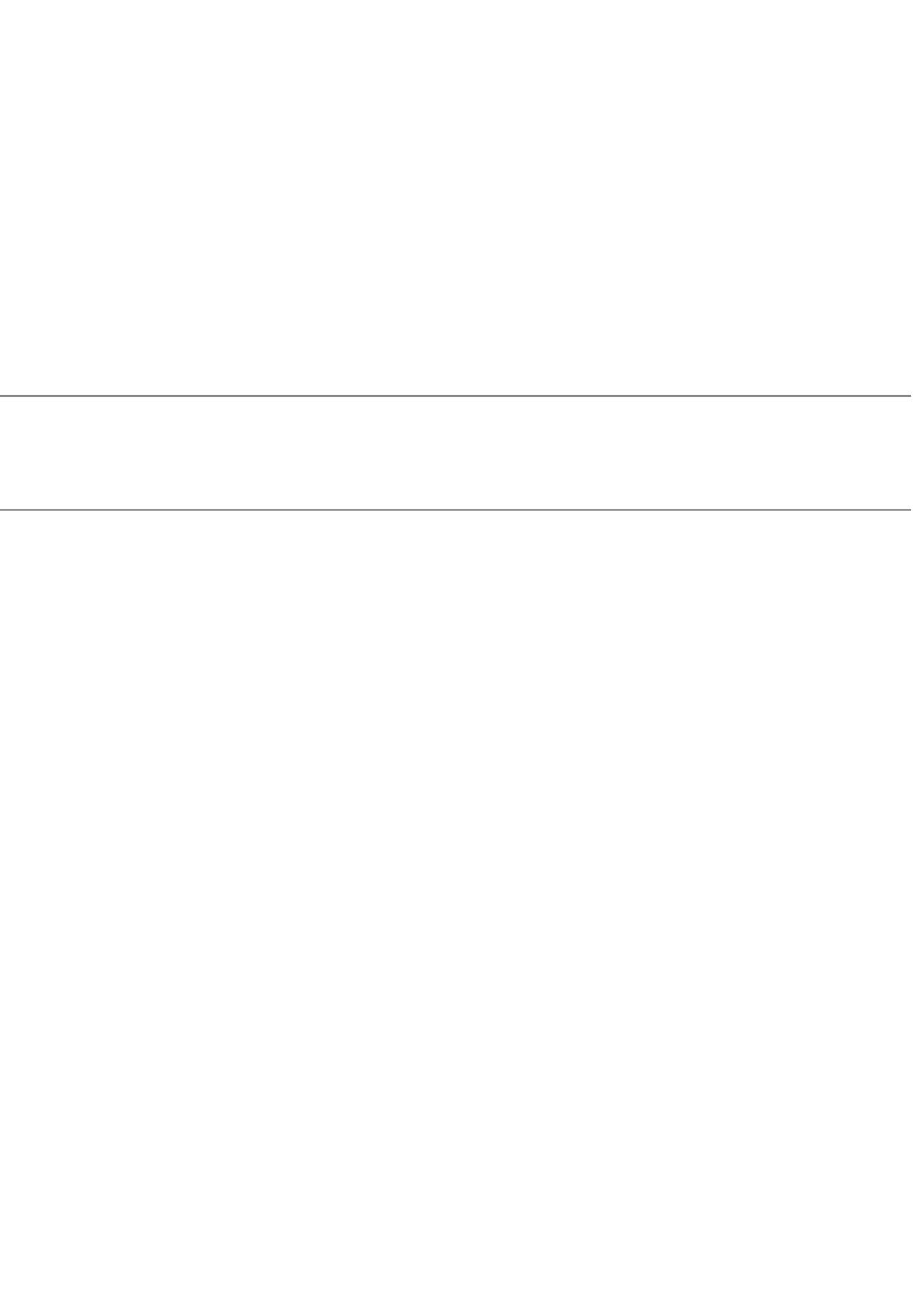
Together, these empirical chapters explore the potential of nudges to change behaviour while keeping an eye on people's a priori preferences. In **Chapter 6** the main findings of the studies described in the previous chapters are summarized and reflected upon in light of the research aims of this dissertation. The theoretical and practical implications are discussed, followed by specific recommendations for future research on nudges.

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## WELFARE IMPROVEMENT THROUGH NUDGING KNOWLEDGE (WINK)

Nudge interventions thus warrants scientific research. The current dissertation is part of the multidisciplinary consortium project: Welfare Improvement through Nudging Knowledge (WINK). Central in this project are three Ph.D. trajectories from Public administration, Philosophy and Psychology. Each disciplinary branch focusses on a specific aspect of nudge interventions, respectively; feasibility, ethics, and effectiveness, with the aim to use cross-pollination to further our understanding of nudges. The feasibility trajectory investigated how nudges, and more broadly behavioural insights, are embedded in current public policy (Feitsma, 2019). The ethics trajectory investigates the legitimacy of nudges, for example, by a philosophical analysis of concepts related to autonomy and freedom in the context of nudging (Vugts et al., 2018). This dissertation is the result of the psychology trajectory and focusses on the effectiveness and the role of a priori preferences as a boundary condition of nudges. These three disciplines are required to understand whether nudges live up to their potential to improve welfare. If one of these three elements is missing, i.e., implementable, respecting individuals' autonomy and successfully leading to behaviour change, it might result in Thaler and Sunstein's book going into history as just another utopian novel.





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# CHAPTER 2

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## **I'M STILL STANDING: A LONGITUDINAL STUDY ON THE EFFECT OF A DEFAULT NUDGE**

Tina A.G. Venema, Floor M. Kroese & Denise T.D. De Ridder (2018) I'm still standing: A longitudinal study on the effect of a default nudge, *Psychology & Health*, 33:5, 669-681,

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Acknowledgement of author contributions:

TV, FK and DR conceptualized the research ideas and developed the research designs. TV supervised data collection, analysed and interpreted the data, and drafted the manuscript.

FK and DR provided critical feedback on the manuscript. TV revised the manuscript in consultation with FK and DR. DR provided final approval of the version to be published.

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**ABSTRACT**

**Objective.** This study assessed the effect of a default nudge to reduce sedentary behaviour at work over time.

**Design and main outcome measures.** A field study was conducted at a governmental organisation. In the present study, the default setting of sit-stand desks (SSDs) was changed from sitting to standing height during a two-week intervention. Stand-up working rates were calculated based on observations that were done prior to, during, two weeks after and two months after the intervention. Additionally, a pre-measure survey ( $n = 606$ ) and post-measure survey ( $n = 354$ ) were completed. Intention and social norms concerning stand-up working were compared for the 183 employees who completed both pre- and post-assessments (45.4% female,  $M_{\text{age}} = 44.21$ ).

**Results.** Stand-up working rates raised from 1.82% in the baseline to 13.13% during the intervention. After the nudge was removed the percentage was 10.01% after two weeks and 7.78% after two months. A multilevel analysis indicated a significant increase in both intention and social norms after the nudge intervention.

**Conclusions.** This study shows that a default nudge can increase stand-up working rates in offices with SSDs at least until two months after the nudge intervention.

Obesity rates are increasing in Western societies. As a result cardiovascular diseases and diabetes mellitus type 2 are now a leading cause of death and health care costs (Wilmot et al., 2012; WHO, 2015). Sedentary behaviour is a great contributor to tipping the scale towards the wrong end (Hamilton, Healy, Dunstan, Zderic, & Owen, 2008; Jebb & Moore, 1999). A large survey amongst the Dutch working population showed that adults between 20 and 65 years sit, approximately 9.53 hours on an average workday (RIVM, 2016). This trend is also noticeable in other industrialised countries (Straker & Mathiassen, 2009). Research has suggested that achieving the daily recommended exercise of about 30 min a day does not counter the health damaging effects of a sedentary lifestyle (Ekelund et al., 2016; Owen, Healy, Matthews, & Dunstan, 2010). Reducing the time spent sitting could therefore have major health benefits. This fact has caught the attention of human resource departments around the world. Employers acknowledge the responsibility to provide their employees with at least the opportunity to reduce their sedentary behaviour at work. Google and Facebook are well-known examples for their investments in sit-stand desks (SSDs) (Carlton, 2011). However, research shows that after the novelty wears off SSDs are mostly used for sitting (Pronk, Katz, Lowry, & Payfer, 2012; Wilks, Mortimer, & Nylén, 2006). In this study, we examine whether a default nudge, that changes the standard setting of the SSD into standing height instead of sitting height, can decrease the time spent sitting at work.

The placement of SSDs is an attractive onetime investment for companies, since it allows employees to reduce their sitting time without having to leave their desks. Initial studies on the placement of SSDs as an intervention to decrease sedentary behaviour have reported promising results (Alkhajah et al., 2012; Chu et al., 2016; Dutta, Walton, & Pereira, 2015). However, a closer look at SSD effectiveness studies reveals that placing SSDs led only to a reduction in sitting for a brief period (Dutta et al., 2015; Pronk et al., 2012). For example, an evaluation study in four different companies that placed SSDs found that 59.8% of the employees used their SSD at standing height only once a month or less. The self-reported main reason (63%) for the non-use was that 'they just did not bother to use the function' (Wilks et al., 2006). It thus seems that merely providing office workers with the opportunity to work standing up is insufficient to change behaviour. Findings from a focus group study reveal that although people actually may have intentions to sit less during working hours, they foresee all kinds of barriers when it comes to acting upon these intentions (De Cocker et al., 2015). For example, one of the most cited barriers was that they would feel uneasy about standing (e.g. that colleagues would see them as show-offs; De Cocker et al., 2015). The so-called intention-behaviour gap is a phenomenon that is frequently observed in health behaviour (Sheeran, 2002; Sheeran & Webb, 2016). People often have intentions to perform a certain health behaviour but fail to do so in the face of obstacles, in this case sitting down is easier than overcoming the perceived barriers.

Altering the environment in such a way that the intended behaviour is acted upon almost automatically is one way to overcome this intention-behaviour gap (Sheeran,

2002; Sheeran & Webb, 2016). Adapting the environment to steer people towards the healthy option, without forbidding alternative options or changing economic incentives is referred to as nudging (Thaler & Sunstein, 2008). The key feature of nudging is that the desired behaviour is made easier by relying on peoples' tendency to use mental shortcuts (such as heuristics), instead of trying to overrule these automatic tendencies by appealing to peoples' rational goals, as is the case with persuasion and education interventions. In line with this suggestion, meta-analytic evidence has shown that information-based interventions, such as sending reminders to stand up, coaching programmes and providing information on health consequences of too much sitting (e.g., Evans et al., 2012), was less effective in decreasing sedentary behaviour at work than environmental interventions (Chau et al., 2010; Chu et al., 2016; Gardner, Smith, Lorencatto, Hamer, & Biddle, 2016). Nudges, in contrast, have been shown to be promising alternatives with studies reporting medium effect sizes in various domains, such as environmentally friendly behaviour (e.g., Pichert & Katsikopoulos, 2008; ( $\Phi = .26$ )), healthy eating (e.g., Kroese, Marchiori, & de Ridder, 2016; ( $p^{\eta^2} = .49$ )) and saving money (e.g., Choi, Laibson, Madrian, & Metrick, 2004). Now that many companies have already invested in SSDs, it seems opportune to test whether a default nudge can provide the last little 'push' into maximising the SSD potential to decrease sitting behaviour.

For this study a diagnostic approach was used to assess in what way the available arrangements affected the current unwanted sitting behaviour. It was noted that the SSDs were always at sitting height. In this study, we changed the default setting from sitting height to standing height during two weeks, hereby implementing a default nudge. Default nudges are assumed to be effective because they relieve people from the effort that is involved when they have to deal with obstacles that stand in the way of the desired behaviour, in this case deciding to sit down or stand up (Smith, Goldstein, & Johnson, 2013). Changing the default height of these SSDs can be considered as a prototypical example of a nudge; it makes use of people's inertia, while allowing the employee to place the desk back at sitting height if so desired. Testing the effectiveness of this default nudge in terms of general time spent working standing up was the first objective of the current study.

As a second objective, we aimed to investigate the effect of the default nudge over a longer period of time. One of the most pressing issues with nudges is that very little is known about the long-term effects (Marteau, Ogilvie, Roland, Suhrke, & Kelly, 2011). In order to improve health outcomes people need to reduce their sitting time for a longer period, not just for one day (Sherstha, Ijaz, Kukkonen-Harjula, Kumar, & Nwankwo, 2015). In the current study, we will examine the impact of a default nudge over a period of eight weeks to determine whether the nudge is still effective after the nudge intervention period.

The current study took place at a large governmental organisation that had invested in SSDs three years before the start of this study, yet it was noticed that these desks were hardly used for stand-up working. We examined whether changing the default setting

of the desks would engender employees to work more often in a stand-up position. Secondly, we examined if the default nudge would still have an impact after the nudge intervention period had ended.

Additionally, for exploratory purposes we included a number of psychological factors that are typically included in behaviour change interventions. Different from many traditional interventions, nudging approaches do not aim to target psychological factors like motivation or intention but rather directly affect automatic behaviour. Nonetheless, it may be interesting to explore whether psychological factors might be affected as a by-effect of the nudge, or whether certain constructs may predict how people respond to the nudge. For this purpose, we included intention, attitude, social norms and perceived behavioural control as classic concepts that are associated with behavioural change (Rhodes, Mark, & Temmel, 2012). Finally, we collected evaluations of the office workers with regard to their acceptance of the default nudge. Stand-up working rates were assessed through observations; psychological constructs and other variables of interest (e.g. demographics, see method section) were assessed through a survey in a sub-sample of employees.

## METHOD

**Procedure.** This study was conducted in a large governmental organisation. An important feature of this organisation is that the employees do not have allocated desks. Instead, this organisation has an open-plan flex-office in which employees can select any desk on their floor upon arriving at work. The six office floors that were available for the study had 836 desks in total, of which 110 were (electronical) SSDs.

During the study the occupation of the SSDs was observed eight times a day in four different time periods to allow us to detect changes over time in standing behaviour. The observation periods were two weeks during the baseline measure, two weeks during the intervention, one week during the two-week follow-up and one week during the two-month follow-up. The participating floors had a different number of SSDs ranging from 4 to 36. Next to observational data of the SSDs usage, paper surveys were distributed to all present employees at the participating floors every day during one week in two survey periods. The pre-measurement was conducted two weeks before the nudge intervention, to allow for one washout week. The post-measure was conducted in the week directly after the nudge intervention. Figure 1 depicts an overview of the timeline.

**Participants.** Six-hundred and six employees filled out the pre-measure survey (53.5% female,  $M_{age} = 44.61$ ,  $SD_{age} = 11.99$ ,  $M_{BMI} = 23.77$ ,  $SD_{BMI} = 3.31$ ). The pre-measure showed that the majority of the employees worked fulltime (61.9%). Three hundred and fifty-four employees filled out the post-measure survey in the week directly after the intervention (53.4% female,  $M_{age} = 44.54$ ,  $SD_{age} = 12.45$ ,  $M_{BMI} = 23.42$ ,  $SD_{BMI} = 3.00$ ). Comparative analyses were performed for the participants who had completed both

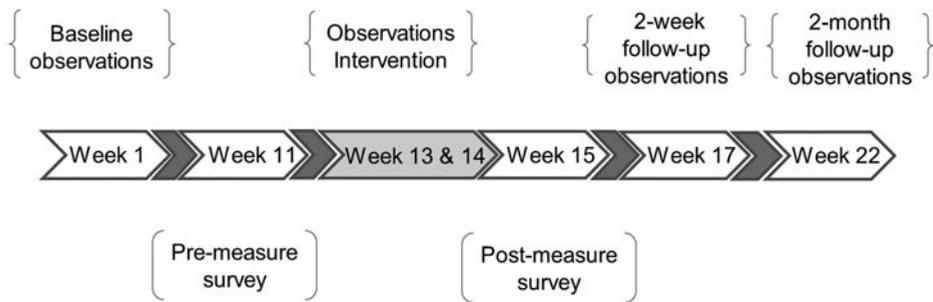


Figure 1. Overview of study timeline.

the pre- and post-measure ( $n = 183$ ). The post-measure could not be matched to the premeasure for 171 employees. This means that these 171 people were either not present in the office during the pre-measurement or did not fill out the pre-measurement for another reason. In total 767 individuals were surveyed. Informed consent was provided by the employees when filling out the survey. This study was approved by the Department of Social Sciences' Ethics Committee.

**The nudge intervention.** At the start of the two intervention weeks all SSDs were placed at stand-up height by the researchers. To ensure that all employees found the SSD in stand-up height during the day a sign was placed on top kindly asking the employees to leave the desk at standing height when they would leave the desk/office. The sign further depicted two images to give an indication of the appropriate ergonomic height to set the desk in both a sitting and standing height. The researchers placed any empty sitting height desks into standing height during their observation rounds.

**Observations.** The observations of the SSDs were done by tally for each floor. All department heads gave consent to do the observations. Each round the researchers noted whether an SSD was empty or in use. An SSD occupation rate was calculated by dividing the number of observed 'in use' desks by the total observations times 100. When in use (indicated by personal belongings on the desk) they noted whether the employee was present or absent. When the employee was present they noted whether this person was working standing up or sitting down and their gender. A stand-up working rate was calculated by dividing the number of standing employees by the number of observed present employees at the SSDs times 100.

#### Survey.

**Demographics.** The participants were asked to create a personal code so pre- and post-measures could be compared while anonymity was guaranteed. Next, participants filled out the floor, name of their department, gender, age, height, weight, education level, number of days present in the office in the last 7 days and average number of working hours per week.

*Intention.* Intention to engage in stand up working was measured with three items (e.g., 'I try to sit as little as possible when at work'; Prapavessis, Gaston, & DeJesus, 2015). All items were answered on a five-point Likert scale, ranging from 1 (= *Disagree*) to 5 (= *Agree*). Cronbach's alpha for the pre-measurement was .798 and for the post-measurement .782.

*Social norms.* Social norms were measured with five items, (e.g., 'It is expected from me that I stand during work') adapted from Prapavessis and colleagues (2015). All items were answered on a five-point Likert scale, ranging from 1 (= *Disagree*) to 5 (= *Agree*). Cronbach's alpha for the pre-measurement was .644 and for the post-measurement .699.

*Attitude.* Attitude was measured with four items adapted from Prapavessis and colleagues (2015), (e.g., 'What is your attitude with regard to stand-up working'). All items were answered on a five-point Likert scale, ranging from 1 (= *Negative*) to 5 (= *Positive*). Cronbach's alpha for the pre-measurement was .852 and for the post-measurement .832.

*Perceived behavioural control.* Perceived behavioural control was measured with three items, 'If I want to, I can work more or less time in a stand-up position', 'The amount of time spent in a stand-up position is controlled by me', 'How much control do you experience about the time spend working in a stand-up position?', adapted from Prapavessis and colleagues (2015). All items were answered on a five-point Likert scale, with the first two items ranging from 1 (= *Disagree*) to 5 (= *Agree*) and the last item ranging from 1 (= *A little*) to 5 (= *A lot*). Cronbach's alpha for the pre-measurement was .776 and for the post-measurement .803.

*Additional questions post-measure survey.* In the post-measurement, we assessed self-reported standing behaviour by asking the employees 'How often in the last two weeks did you spend part of the day working in a stand-up position?'. The answers were coded in 1 (= *did work standing*) and 0 (= *did not work standing*). Next, we asked them how often they stood during meetings. The default nudge was then explained to participants, after which they were asked to evaluate the nudge: 'Do you think it is acceptable to be unconsciously influenced in this way?'. They could answer 1 (= *yes*), 2 (= *no*) and 3 (= *no opinion*). Consecutively, they were probed for the reason behind their answer. Finally, the participants were thanked for their participation.

**Data analysis plan.** For the observational measures descriptive data are presented. The current study design did not allow for statistical analyses of trends over time due to the dependent nature of the (group-level) observations. To assess a change in intentions, attitude, social norms and perceived behavioural control a multilevel analysis was performed to accommodate for the nested data with three levels: floor, individuals and time. Since different floors had different number of SSDs, the exposure to the nudge varied depending on the floor the participant is from. The analyses were carried out using lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015; Sherstha

et al., 2015). Separate paired t-tests were performed with intention, attitude, social norm and perceived behavioural control as dependent variables and time point (pre-measure vs. post-measure) as independent variable, while controlling for floor and individual differences. All dependent variables were standardised. To explore whether the evaluations of the default nudge were dependent on participants' intentions to work standing up a multinomial regression with evaluation as dependent variable, post-measure intention as independent variable and floor as control variable was performed.

## RESULTS

**Descriptives from pre-measure.** The full pre-intervention sample ( $n = 606$ ) was used to get an apprehension of the employees' baseline intentions, attitudes, social norms and perceived behavioural control. Before the nudge intervention the employees in this organisation had on average low intentions to engage in stand up working ( $M = 1.93$ ,  $SD = .91$ ). The attitude towards stand-up working was on average neutral ( $M = 2.91$ ,  $SD = .95$ ). The social norm was not in favour of stand up working ( $M = 1.49$ ,  $SD = .48$ ). Before the nudge intervention the employees experienced considerable control over their working position, sitting or standing ( $M = 3.36$ ,  $SD = 1.06$ ).

### Observations.

*SSD occupation rate.* An occupation rate was calculated to assess whether the nudge intervention influenced the selection of the SSDs over normal desks as a workplace. The SSD occupation rate during the baseline measure was 74.16%. During the nudge intervention it was 75.25%. Two weeks after the intervention it was 74.31% and two months after the intervention the occupation rate was 71.71%. There is no indication to assume that the popularity of the SSDs changed, either positively or negatively, because of the nudge intervention.

*Stand-up rate SSD.* The first objective was to see if people would work more often standing up when the SSDs were placed at standing height by default. During the baseline measurement 1.82% of the employees were working standing up. During the nudge intervention this percentage rose to 13.13%. Our second objective was to examine the effect of the default nudge over time. Two weeks after the intervention period (i.e., when the SSDs were no longer placed at standing height by default) the stand-up rate was still 10.10%. Two months after the nudge intervention the stand-up rate was 7.82%, which is still considerably higher than the percentage at baseline. Figure 2 gives an overview of the stand-up rates. The observations indicate that the default nudge increased the stand up working rate and that there appears to be a lasting, although decaying, effect after the nudge had been removed.

*Survey data changes from baseline to follow up.* One hundred and eighty-three office workers (45.4% female) completed both the pre and post-measures. The mean age was 44.21 ( $SD = 12.53$ ) with a mean body mass index of 23.45 ( $SD = 2.88$ ). Fifty-two (29.4%) of these participants indicated that they had worked standing up during

the default nudge intervention period. Intention for stand-up working increased significantly from the pre-measure ( $M = 1.93$ ,  $SD = .97$ ) to the post-measure ( $M = 2.09$ ,  $SD = .98$ ,  $t(176) = 2.95$ , 95%  $CI [.05, .26]$ ). Also social norms increased significantly from the pre-measure ( $M = 1.45$ ,  $SD = .46$ ) to the post-measure ( $M = 1.59$ ,  $SD = .54$ ,  $t(176) = 4.34$ , 95%  $CI [.17, .44]$ ). Attitude towards stand-up working did not change ( $p > .335$ ) nor did ratings for perceived behavioural control ( $p > .140$ ).

*Acceptance of the default nudge intervention.* The full post-measure sample ( $n = 351$ ) was used to apprehend what the employees thought of the default nudge intervention. About 31.6% of the employees indicated in the post-measurement to have worked standing up in the past two weeks. 56.5% of the employees indicated to find it acceptable to be unconsciously influenced by the default nudge. One employee who answered 'yes' on the acceptability question wrote 'I think it is a good idea, I usually just sit down without thinking about it'. 11.0% found it not acceptable, one employee wrote: 'I think it is mostly annoying, I don't want to work standing up'. Finally, 25.4% indicated that they had no opinion about being nudged. One person who indicated to have no opinion wrote: 'I don't know how long to stand for'. The post-intervention survey thus indicates that the majority of the employees approved of the default nudge. A multinomial regression with non-acceptance as a reference group showed that intention to work standing up significantly predicts whether the employee would find the nudge acceptable,  $b = 1.09$ ,  $Wald \chi^2(1) = 15.79$ ,  $p < .001$ . The odds ratio tells us that as intention is one point higher the change in the odds of finding the nudge acceptable, compared to finding it not acceptable, is 2.97. Intention to work standing up also significantly predicted whether the employee would say to have no opinion about the nudge, compared to non-acceptance,  $b = .68$ ,  $Wald \chi^2(1) = 5.49$ ,  $p = .019$ .

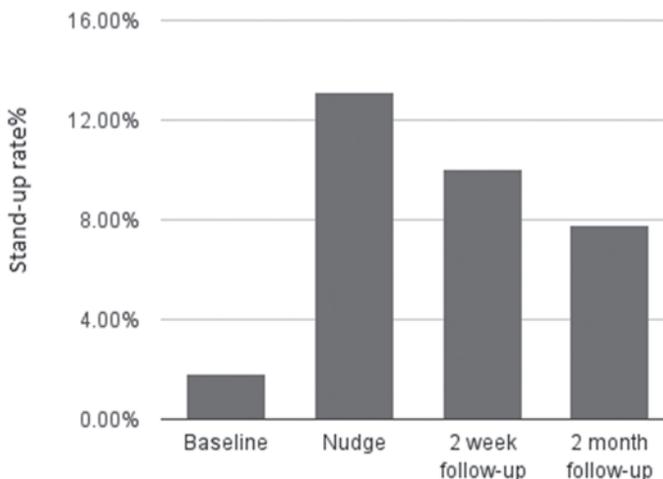


Figure 2. Stand-up rates over time.

The odds ratio tells us that as intention is one point higher the change in the odds of having no opinion about the nudge, compared to finding it not acceptable, is 1.97. In short, employees who have a higher intention to work in a standing position are more likely to accept the nudge. Likewise employees who have a lower intention are more likely to not accept the nudge.

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## DISCUSSION

The first objective of the current study was to investigate the effectiveness of a default nudge in encouraging stand-up working. Specifically, we implemented the default nudge by placing adjustable SSDs at standing height instead of sitting height. We observed that the default nudge increased the use of the SSDs for stand-up working. As a second objective, we examined whether this particular nudge would still have an impact after two months. Our results indicated that while the stand-up working rate slightly decreased, it was still approximately four times higher compared to baseline observations. These results suggest that the default nudge may have long-term effects. Finally, we assessed classic psychological variables typically associated with behavioural change for exploratory purposes. Results showed that employees' intentions to work standing up were considerably low before the start of the default nudge intervention. The survey results indicated that the intention to work standing up actually (though slightly) increased after the nudge intervention. Moreover, employees also perceived the social norm to work standing up more favourable after the implementation of the default nudge. Although nudging interventions in general do not aim to directly target psychological variables as such, the currently observed by-effects of the nudge on these variables may have interesting implications with regard to the underlying mechanisms of the achieved behavioural change, particular in terms of its sustainability over time. Together, the findings of the current study demonstrate the effectiveness and potential long-term effects of the default nudge, yielding both theoretical and practical contributions.

**Contributions.** The current study is one of the first to look at the impact of a default nudge on behaviour after the intervention period. This is particularly interesting considering that most known successes of default nudges are concerned with choices that are made once, for example, with regard to organ donation and selecting a pension plan (Johnson & Goldstein, 2003; Loewenstein, Bryce, Hagmann, & Rajpal, 2015). While nudges in general are praised as the ultimate tool to help people perform healthier behaviour there is paucity in empirical papers that study their long-term effects (Marteau et al., 2011). Nudges are in essence easy and cheap to implement, but if the nudge only works for a short period renewing the nudges to ensure the desired behaviour can actually break the bank. The results from this study showed promising effects also after the intervention period, thereby contributing to the rapidly emerging literature on nudging as a strategy for behaviour change.

On a practical level, this study demonstrates how companies that invested in SSDs can make easy adjustments to use the full SSD potential by applying a default nudge. Thereby, it is relevant to note that a majority of employees were positive about the nudge intervention. This aligns with prior research indicating that people are generally appreciative of nudges that help them perform health behaviours (Kroese et al., 2016; Junghans, Cheung, & De Ridder, 2015). Only a minority of 11% indicated to disapprove of the nudge intervention, which is low when placing this percentage in the context of nudge approval in general: a recent paper by Reisch and Sunstein (2016) indicated that 42% of their polled Europeans disapproved of the presented default nudges. Moreover, it is relevant to note that the employees who indicated to disapprove of the nudge intervention, also had lower intentions to work standing up, whereas people with higher intentions were more likely to approve of the nudge. This aligns with an important general premise of nudging interventions, which is that they should help people achieve their personal goals (i.e., enact their intentions) but not influence people against their will. Future studies could take a closer look at the interaction between pre-existing behavioural intentions and nudge effectiveness and approval.

**Limitations and future research.** Appreciating the promising conclusions of the current research, some limitations should be acknowledged. As a consequence of conducting an unobtrusive field study, we did not employ advanced activity measures such as accelerometers to assess employees' sitting and standing behaviour during the day. While such advanced measures have obvious advantages, an unintended by-effect of their application would be that participants are consciously aware of being in a study assessing behaviour, and that included participants may be particularly motivated to reduce their sedentary behaviour, as they would need to sign up for the study. Hence, to get an indication of naturally occurring behaviour, and to be able to include the total pool of employees, we chose to employ group-level observations. Another limitation of this field study is that it was not possible to have a control condition. However, the results were unlikely to be caused by other external influences since the organisation was informed that no other HR interventions should take place for the duration of the study. Also, the pre-measure was unlikely to have carry-over effects influencing the current results, since there was a week between the pre-measure survey and the intervention period with observations. Thus, we feel confident that the obtained results were indeed caused by the intervention.

Finally, the group-level observations could not be paired with the individual survey data. Therefore, it was not possible to investigate how the psychological variables were associated with behaviour on the level of individual employees, other than self-reported standing behaviour in the post-measurement. The self-reported results showed that approximately 30% of the surveyed employees used an SSD for stand-up working. This percentage is higher than the stand-up rate because the employees did not stand the whole day. Also in the comments the employees wrote that they did not know how long to stand for. Future studies could investigate whether providing

guideline regarding recommended standing duration would affect the effectiveness of the default nudge.

Another suggestion for future research would be to further investigate the underlying mechanisms scaffolding long-term effects of nudges. In this particular study, people were exposed to a default nudge every day during an intervention period of eight working days. Daily exposure to a default nudge might lead to habit formation. Habits can be formed by repeatedly performing a behaviour in the same environment (Lally, van Jaarsveld, Potts, & Wardle, 2010), and there is an indication that habits play an important role in sedentary behaviour (Conroy, Maher, Elavsky, Hyde, & Doerksen, 2013). In the case of stand-up working, people might need a nudge to engage in stand-up working initially, but after being repeatedly nudged into stand-up working a new healthy habit might be built. Also the supporting role of improved social norms, as a by-effect of the nudge could be contributing to the long-term effect (Huh, Vosgerau, & Morewedge, 2014). Future studies should look into habit formation as a potential explanation for long-term effects.

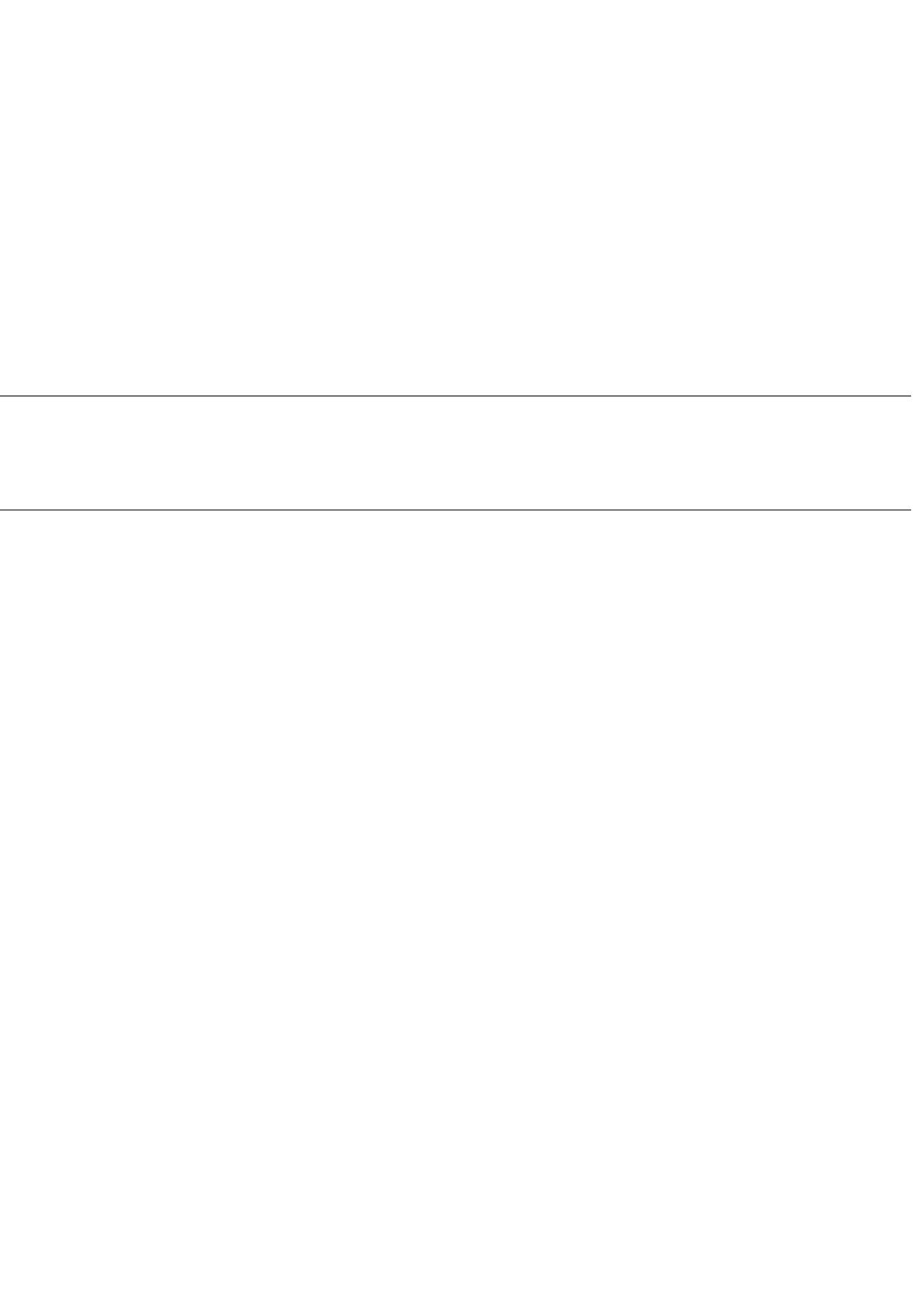
**Conclusions.** Altogether, this study demonstrated that a very subtle change that can be easily implemented can increase stand-up working rates in offices that have SSDs. Based on the current findings, a recommendation for managers is to place more sit-stand desks and put them by default in a standing position. By sitting less a small step in the right direction has been taken to reduce further increasing obesity rates and its severe consequences.

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## ACKNOWLEDGEMENTS

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# CHAPTER 3

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## **THE (BITTER) SWEET TASTE OF NUDGE EFFECTIVENESS: THE ROLE OF HABITS IN A PORTION SIZE NUDGE**

Venema, T.A.G., Kroese, F.M., Verplanken, B., & De Ridder, D. T. D. (Submitted for publication).  
The (bitter) sweet taste of nudge effectiveness: The role of habits in a portion size nudge.

Acknowledgement of author contributions:

TV developed the research designs in consultation with BV, FK and DR. TV collected the data, analysed the results, interpreted the data and drafted the manuscript. BV, FK and DR provided critical feedback on the manuscript.

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**ABSTRACT**

Seemingly insignificant daily practices, such as sugar usage in tea, can have a great accumulated impact on societal issues, such as obesity. That is why these behaviours are often the target of nudge interventions. However, such frequent behaviours are prone to be hardwired in habits, making nudge interventions less likely to be effective. The current study (N= 123) investigated whether a portion size nudge has the potential to work in accordance *with* (instead of against) existing habits. This portion size nudge aimed to make use of the habit to add a fixed number of teaspoons of sugar to a cup of tea. Participants added their habitual number of teaspoons of sugar, once with a normal size teaspoon and once, unbeknownst to them, with a smaller teaspoon. The results indicate that this nudge reduced sugar intake by 27%. Surprisingly, this effect was less pronounced when people had a strong habit. Implications for effective nudge interventions are discussed.

In the last two decades there has been more recognition that small, seemingly insignificant, behaviour changes accumulate and can have a profound impact on great societal issues, such as CO<sup>2</sup> emission, infectious diseases and obesity (e.g., Westhoek et al., 2014; Aiello, Coulborn, Perez, & Larson, 2008; Church et al., 2011). For example, it has been estimated that small changes in diet - switching from white bread to whole wheat bread, drinking water in between glasses of alcohol - is more effective in maintaining weight-loss in the long term than radical exercise programs or strict cuts of calories (e.g., Hall, Sacks, Chandramohan, Chow, Wang, Gortmaker, & Swinburn, 2011). These kinds of behaviours are typically the focus of 'nudge' interventions. Nudges are changes in the choice architecture (i.e., the environment in which people make decisions) that aim to steer a person's decision to a particular, sensible, choice, without restricting alternative options or changing financial incentives (Thaler & Sunstein, 2008). Research has shown that even though these small changes in diet are imperative for better health in the long run, the behaviours that need to be replaced are also prone to be hard-wired in habits (Pinder, Vermeulen, Cowan, & Beale, 2018). Habits are behaviours that have been frequently performed in a particular context to the extent that they have become automatized (Orbell & Verplanken, 2010; Wood & Runger, 2016). Recent studies show that nudges struggle to compete with habits (e.g., De Wijk, Maaskant, Polet, Holthuysen, Van Kleef, & Vingerhoeds, 2016; Okeke, Sobolev, Dell, & Estrin, 2018). The current study tests a novel approach to change these ostensibly innocent but important behaviours, in this case adding sugar to tea, by employing a nudge that could work *with* a habit of adding a certain number of teaspoons of sugar.

Nudge interventions have gained popularity as a governmental policy tool as a softer alternative to laws and regulations (e.g., Jones, Pykett, & Whitehead, 2013). Not only governments but also supermarkets, restaurants and convenience stores have begun to use behavioural insights to nudge customers to sensible choices, for example, by replacing chocolate bars at the cash register with healthy alternatives (e.g., Kroese, Marchiori, & De Ridder, 2015). Recent meta-analyses have suggested that such nudge interventions are generally effective. Yet effect sizes are small; signalling that there are boundary conditions for the effectiveness of nudges (Skov, Lourenco, Hansen, Mikkelsen, & Schofield, 2013; Arno & Thomas, 2016; Szaszi, Palinkas, Palfi, Szollosi, & Aczel, 2018). Habits appear to be one of those boundary conditions. For example, in a recent study, De Wijk and colleagues (2016) repositioned whole wheat bread in a supermarket to a more prominent position to encourage consumption. Their findings suggested that people went looking for the bread that they habitually bought and thus rendered the nudge ineffective. The current research investigates the potential of working *with* an already existing habit instead of working against it to encourage desirable behaviour (e.g., Verplanken & Wood, 2006). We argue that the portion size nudge would be a good candidate for this role.

A portion size nudge manipulates the amount of food or drink a portion contains in order to stimulate consumption (e.g., larger glasses for water) or discourage

consumption (e.g., smaller plates at an all-you-can-eat buffet). The consumer remains fully in charge of their intake; they can go for a second round in the buffet example, or not finish their glass in the water example. Technically speaking, changes in dishes and cutlery should be referred to as container sizes, rather than portions sizes, but since this distinction is not widely recognized we will use the more broadly understood term “portion size”. The nudge effect capitalises on the so-called portion size effect, i.e., the tendency to consume more when a provided portion increases, or vice versa (e.g., Steenhuis & Poelman, 2017). A meta-analysis shows that on average a doubling of a portion size leads to 35% more consumption (Zlatevska, Dubelaar, & Holden, 2014). The literature suggests several working mechanisms underlying the portion size effect. One account suggests that a serving size is an indication of the ‘appropriate’ amount to consume, i.e., a balance between greediness and showing appreciation for the provided food (Herman, Polivy, Pliner, & Vartanian, 2015). There are strong indications that this appropriateness explanation is not the result of reflective decision making. For example, it has been shown that when participants are provided with labels that indicate how the provided portion compares to the actual appropriate one (e.g., 50%, 100% or 150%), the portion size effect on consumption was unaffected (Cavanagh, Vartanian, Herman, & Polivy, 2014).

A compelling explanation of the appropriateness account is the *unit bias heuristic*, which holds that people view the given portion as a unit rather than a certain amount of grams or millilitres (Geier, Rozin, & Doros, 2006). The authors introduced and tested the proposition that people tend to view one unit of food (i.e., a piece of candy or slice of cake) as an appropriate amount. With granulated food (i.e., popcorn, liquids or sugar) the serving object would be seen as the unit, for example a handful, one spoon or one glass (e.g., Pechey, Attwood, Couturier, Munafò, Scott-Samuel, Woods, & Marteau, 2015). In one of their studies, Geier and colleagues placed a jar with M&M’s on a concierges desk with either a tablespoon or a spoon the size of a ‘quarter cup’ that were to be used for scooping. The size ratio of the scoops was 1:4. In both conditions people took presumably one unit, the scoop. The result was that people took more M&M’s, measured in grams, in the quarter cup condition compared to the table spoon condition. While the authors found supporting evidence for the unit bias heuristic, they noted that since the ratio of the consumed food was not equal to the change in serving unit, individual differences might play a role. We argue that the pervasiveness of the unit bias could be related to people’s habit strength for such a unit.

It has been suggested that habits are formed when people have a particular goal in a particular context (Lally & Gardner, 2013). The execution of this goal is rewarding, which in turn stimulates the repetition of this behaviour to the point that the presence of the original goal is no longer necessary to initiate the behaviour (Wood, Tam, & Witt, 2005; Verplanken & Aarts, 1999). Tea drinkers may thus have developed a habit of adding a certain number of teaspoons of sugar in order to reach a certain amount of sweetness of their drink. Thus, the act of making tea serves as a cue to initiate

the behaviour (e.g., adding two teaspoons of sugar) without having to consciously think about it (Wood & R unger, 2016). It is hypothesized that when the size of the teaspoon for scooping sugar is smaller, the amount of added sugar in grams would be less for people who have a strong habit for adding a specific number of units (i.e. teaspoons) of sugar to their tea. The absence of a deliberate decision might be underlying the portion size effect.

Thus when people have a strong habit for a certain number of units there no longer is a deliberate intention to achieve a certain sweetness that drives the behaviour, instead people would automatically add their habitual number of teaspoons. One way to test whether people rely on habits is to disrupt the cue-response relation by altering the context such that one is forced to think about the behaviour (e.g., Verplanken, Roy, & Whitmarsh, 2018). In a study on students who transferred to a new university, it was found that only those who perceived their new context as similar to the old context kept their strong habit for watching television; e.g., a turned on television when coming home acted as a cue that triggered the habit they had developed in their old university context (Wood, Tam, & Witt, 2005).

**Current study.** In the current study ‘context’ was defined as a tea drinker’s routine of preparing their tea, i.e., adding milk and sugar. Participants were assigned to one of two context conditions; one that invited the habitual way of preparing tea (i.e., adding milk and sugar to boiling hot water and a tea bag), versus one in which this habit routine was disrupted by asking participants to use tea that was freshly made and cooled down to room temperature instead of preparing their own tea with boiling water. In addition, the study included a within-participant nudge manipulation. Participants prepared tea twice using different spoon sizes for adding sugar, i.e., a standard size versus a non-standard smaller size, the latter representing the nudge.

Our first hypothesis is that participants in the nudge condition would add less sugar to their tea, when the teaspoon for the sugar was smaller compared to the control condition, demonstrating the portion size effect. The second hypothesis is that people who have a stronger habit to add a specific number of teaspoons (i.e. units) of sugar to their tea would show a larger difference in grams between the nudged spoon and the control spoon. To test the influence of the sugar adding habit, we compared the context in which a habit could easily be enacted (i.e., the hot tea condition) with context in which the habit was disrupted (i.e. the cold tea condition). In the latter condition, participants were expected to demonstrate non-habitual sugar adding behaviour, i.e., adding the amount of sugar they judged necessary to sweeten their tea to their satisfaction, regardless of habit strength and regardless of the size of the spoon.

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## METHOD

**Participants.** 673 participants were recruited on campus via posters and flyers. An online screening questionnaire was used to select only participants who use sugar

in their tea (49.8% did not meet this criterion). One hundred and thirty-six eligible participants dropped out during the online screening; they did not differ significantly in age, habit strength and gender from the 202 eligible participants who did finish the screening,  $p$ 's > .129. Twelve participants were excluded from analyses because they did not use any sugar in their tea during the experiment. The 123 participants (61.5% women) who completed both parts of the study were included in the analysis (see Figure 1 for the participant flow). They had a mean age of 21.42 ( $SD = 4.09$ ).

**Design.** This study has a mixed factorial design with teaspoon size (nudge vs. control) as a within-subject factor and context condition (hot tea vs. cold tea) as a between-subject factor. The dependent variable is the percentual difference between the amounts of sugar (in grams) that participants added to their tea in the nudge vs. control condition. The order of the teaspoon size and assignment to the hot or cold tea condition was counterbalanced based on order of registration for the lab part across participants. This study was ethically approved by the Department of Psychology Research Ethics Committee at the university where the research was conducted.

**Procedure.** Potential participants were invited to fill out an online screening for a study on “facial recognition and drinking tea”. According to the cover story “people’s perception of their conversational partners is influenced by the temperature of the beverage that they are holding”. The current study allegedly investigated whether

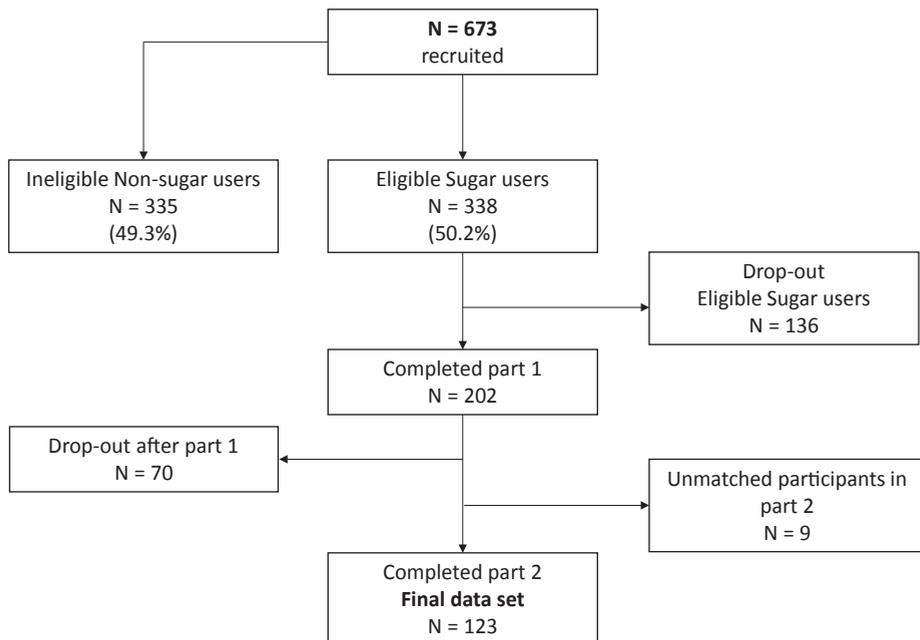


Figure 1. Flow of participants.

this altered perception also influences people's memory. At the end of the screening participants were required to create a personal code and they received a link to book an appointment for the actual experiment. They were then randomly assigned to the habit congruent (hot tea) or habit disruptive (cold tea) condition. Upon entering the lab, the experiment leader restated the cover story and participants provided informed consent. Participants were told that they had to prepare their tea twice, once in a glass cup and once in a ceramic cup, allegedly because the "warmth that could be felt through the cup might differ". The cups were of equal volume (200ml) and the order was counterbalanced. The experiment leader left the kitchen to set up the computer task in the adjacent room while the participant prepared their first cup of tea. Participants took their tea to the room and completed a facial recognition task. When they had finished they were told to come back to the kitchen and prepare their second cup of tea. After completing the second facial recognition task they were asked to fill out a final questionnaire and received a funnelled debriefing. Finally, they were thanked for their participation and were reimbursed with five pounds.

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## MEASURES AND MATERIALS

**Online questionnaire.** Participants electronically signed an informed consent form and were asked to fill out their age and gender. They then responded to questions about their tea making preferences. First, they were asked at what temperature they normally drink their tea, with the reference point of 60 degrees Celsius as average drinking temperature and 21 degrees as room temperature. Next, they were asked how they drink their tea (i.e., milk, sugar, artificial sweeteners, other or nothing). If participants indicated that they do not use sugar, they were thanked for their interest in the study and could not continue with the questionnaire. When participants indicated that they do drink tea with sugar, they were asked to specify how many teaspoons of sugar they normally add. To fit the cover story, they were also asked how much milk they add, expressed as a percentage of the total volume.

*Self-Reported Habit Index (SRHI).* Habit strength of adding the number of teaspoons of sugar indicated in the previous question was measured by the Self-Report Habit Index (SRHI; Verplanken & Orbell, 2003). Participants were asked "Adding [self-reported number] of teaspoons of sugar in my tea is something that..."; followed by 12 statements (e.g., "I do frequently"; "I do without thinking"; "that is typically me"), on a 7-point Likert scale ranging from disagree to agree. A higher score indicates a stronger habit. Cronbach's alpha was .94. In order to keep up the cover story, an SRHI was also presented for the percentage of milk. Participants then answered three questions that fitted with the cover story of facial recognition, were required to create a personal code and finally book an appointment for the lab part.

**The nudge.** The teaspoon in the control condition had the standard European size (5 ml). In the nudge condition a demitasse spoon (2.5 ml) was used. In each condition

the teaspoon was placed in the sugar bowl with the handle sticking out. In order to measure the amount of sugar added to the tea, the sugar bowl was weighted before and after each time a participant had made their cup of tea.

**Facial recognition task.** Participants were asked to remember the names, faces and professions of 16 women in the first trial and 16 other women in the second trial. Since this task was only used as a cover story, no data was collected.

**Final questionnaire.** In the final questionnaire an SRHI was assessed with the statement: “The way I just made my tea is...”, which served as a manipulation check of the habit disruption. Cronbach’s alpha was .94. Next, participants were probed for the conjecture of the study and received a funnelled debriefing. Finally, they were asked to what extent they had the intention to reduce the amount of sugar in their tea before they entered this study. The sugar reduction goal was indicated on a visual analogue scale ranging from 0 (*Not at all*) to 100 (*Very much*).

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## RESULTS

**Descriptives.** The preferred drinking temperature for tea was on average 61.18 degrees Celsius ( $SD = 15.08$ ). The average self-reported number of teaspoons of added sugar was 1.58 teaspoons (Min = 0.5, Max = 8), corresponding to approximately 25 kilocalories per cup of tea. The self-reported number of teaspoons was significantly correlated with participants’ actual behaviour (grams of sugar) in the control condition ( $r_s = .64$ ,  $p < .001$ ) and in the nudge condition,  $r_s = .61$ ,  $p < .001$ . The funnelled debriefing indicated that 13.8% of the participants noticed the size change of the teaspoons. Participants’ sugar reduction goal was on average low ( $M = 38.07$ ,  $SD = 28.68$ ).

**Randomization check.** A MANOVA was performed to check whether participants in the hot and cold tea conditions differed on age, habit strength and sugar reduction goal. Randomization was successful,  $p$ ’s  $> .304$ . A Chi-square test showed that men and women were equally distributed over the two conditions,  $p = .786$ .

**Manipulation check.** To assess whether the temperature of the tea had an influence on whether participants had made their tea conform to their habit, an independent t-test was performed on the SRHI measured after the experiment. There was a significant difference between the conditions,  $t(118) = 2.07$ ,  $p = .040$ , Cohens  $d = 0.38$ . Participants in the hot tea condition reported stronger habit enactment during the experiment ( $M = 4.77$ ,  $SD = 1.32$ ) than the participants in the cold tea condition,  $M = 4.21$ ,  $SD = 1.62$ . Indicating a successful manipulation of habit disruption.

### Main analysis.

**The nudge effect.** A paired t-test was performed to test whether the portion size nudge was effective, comparing the grams of sugar used in the nudge condition (i.e., the smaller spoon) to the grams of sugar used in the control condition. As expected, there was a significant effect of spoon size on sugar usage,  $t(129) = -6.17$ ,  $p < .001$ , Cohens  $d = 0.56$ . Participants used significantly more sugar with the normal sized

spoon ( $M_{\text{grams}} = 5.13$ ,  $SD = 4.81$ ) than with the smaller spoon,  $M_{\text{grams}} = 3.50$ ,  $SD = 2.64$ . Changing the normal sized teaspoon for a smaller teaspoon reduced participants' sugar usage by approximately 27 % ( $SD = 32.92$ ). Figure 2 provides a visual overview of the grams of sugar used in each condition.

*The effect of habit on the nudge effect.* It was hypothesized that people who have a strong habit to add a fixed number of teaspoons of sugar to their tea would be more susceptible to the effect of the portion size nudge. A reduction percentage between the nudge and control conditions was calculated<sup>1</sup>. The PROCESS macro (Hayes, 2017) was used to run a linear regression model with the percentual difference in sugar use as the outcome variable and mean centred habit strength, context condition and the Habit strength x Condition interaction as predictor variables. The nudge-control order was added as a control variable<sup>2</sup>. A bootstrap sample of 1.000 was used. The results show a main effect of order; if the nudge spoon was used first, then the difference between the two spoons was larger,  $b = -13.32$ , 95% CI [-24.94, -1.70],  $t = -2.27$ ,  $p = .025$ . There was no significant main effect of temperature condition ( $b = -1.31$ , 95% CI [-12.89, 10.28],  $t = -0.22$ ,  $p = .824$ ) nor was there a main effect of habit strength,  $b = -3.03$ , 95% CI [-8.86, 2.81],  $t = -1.03$ ,  $p = .306$ . However, the interaction effect was a significant predictor of the percentual difference between the smaller spoon and the normal spoon,  $b = 14.27$ , 95% CI [2.62, 25.92],  $t = 2.43$ ,  $p = .017$ .

As predicted, a simple slopes analysis (see Figure 3) showed that the slope for the cold tea condition was not significantly different from zero,  $p = .305$ , indicating that habit strength played no role in the effectiveness of the nudge when the context disrupted the enactment of the habit. The simple slope for the hot tea condition was significantly different from zero,  $b = -6.65$ , 95% CI [-12.27, -1.04],  $t = -2.35$ ,  $p = .021$ . However, the negative coefficient indicates that the percentual difference between

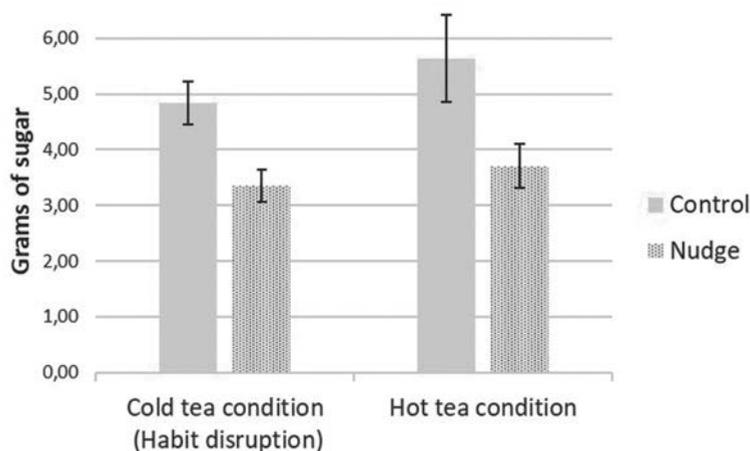


Figure 2. Sugar use in grams

the nudged teaspoon and the control teaspoon was smaller for participants with a stronger habit. This was contradictory to our hypothesis. A spotlight analysis (Spiller, Fitzsimons, Lynch, & McClelland, 2013) showed that the cold and hot conditions did not significantly differ from each other for below average habit strength,  $p = .113$ . However, when comparing the participants with above-average habit strength the results demonstrated that the effect of the nudge was significantly less pronounced when the habit was not disrupted (i.e., in the hot tea condition) compared to when the habit was disrupted (i.e., in the cold tea condition),  $t(55) = 2.14$ ,  $p = .036$ , Cohen's  $d = 0.55$ . Thus, when the context enables enactment of a habit to add a specific number of teaspoons of sugar, the portion size effect was less strong.

## DISCUSSION

The current study set out to test a nudge intervention that had the potential to work *with* existing habits of frequently occurring behaviours, instead of working against them. To this end, we tested whether the effect of a portion size nudge could be explained by peoples' habit strength for using a specific number of serving *units*. More specifically, we hypothesized that if people had a strong habit for adding a certain number of teaspoons of sugar to their tea, the actual amount of sugar (in grams) would be less if the spoon used for scooping would be smaller. In concord with previous work on portions sizes, it was found that when the size of the teaspoon for sugar scooping was reduced by half, the amount of added sugar was reduced by 27% with an effect size of 0.56 (Cohen's  $d$ ) for the difference. This is close to the difference estimate of 0.45 (Cohen's  $d$ ) that was found in a recent meta-analysis (Zlatevska et al., 2014). However, contrary to our hypothesis, it was found that when the context left the habit enactment undisturbed the nudge effect was actually *less* pronounced for people with a strong habit.

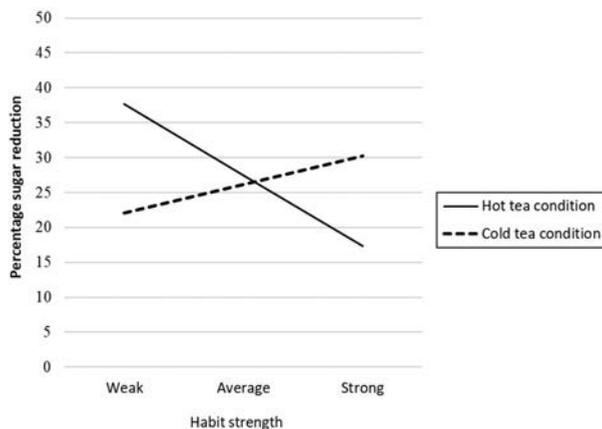


Figure 3. Simple slopes analysis of interaction habit strength and condition.

To explain these results we need to have a close look at the theoretical underpinnings of the portion size effect. We relied on the unit bias heuristic as a valuable account to explain this particular portion size effect. While this account states that people view portions (i.e., teaspoons) as whole units or entities (Geier et al., 2006), we found no clear support for this in the results of this study. The participants might not have viewed 2 teaspoons as two units but rather as an intuitive estimate of the quantity needed to arrive at the desired level of sweetness. Therefore, the habit index should then not be interpreted as an estimation of the habit strength of the number or units, but as a habit for having a certain degree of sweetness of the tea.

In support of this interpretation is the notion of “personal consumption norms” (e.g., Zlatevska & Spence, 2016; Herman & Polivy, 2005). These norms are understood as idiosyncratic quantities of food that serve as an anchor for estimating the appropriateness for the individual them self. To illustrate, two biscuits to accompany a cup of tea might seem “just right”. It has been suggested that these norms usually operate at a subconscious level, but can be enunciated when asked (Zlatevska & Spence, 2016). Related to our understanding of habits that operate with a unit bias (i.e., the unit bias would be more pronounced for people with a strong habit), it has been shown that the extent to which people consume food in accordance with their personal consumption norm depends on their commitment to this norm. People who are less committed to their norm have been shown to be more easily influenced by external factors (Herman & Polivy, 2005; Zlatevska & Spence, 2016), such as group size and, potentially, nudges. In contrast, people who are more committed to their personal consumption norm relied more on their “inner compass”. Thus, if participants viewed their self-reported number of teaspoons of sugar as an individual benchmark of appropriateness for the degree of sweetness, a stronger habit suggests higher commitment to this benchmark.

Also the order effect of the teaspoons on the percentual difference could be explained by an expected degree of sweetness. Although many participants did not notice the switch of the spoons, they might have overcompensated for the lack of sweetness of their first cup of tea by making larger heaps during the second time they made their tea. It has been repeatedly demonstrated in the habit literature (e.g., Wood, Tam, & Witt, 2005; Neal, Wood, & Quinn, 2006) that the cue-response link becomes automatized to the extent that the initial intention to achieve a certain outcome is no longer necessary. In other words, the outcome of a habitual behaviour, in this case the sweetness of the tea, would become detached from the intention (i.e., achieving a degree of sweetness) when strong habits are left undisturbed. However, in the current study it seems that people did make use of this feedback loop; by overcompensating the initial intention to have a particular degree of sweetness might have taken over the habit. This suggests that participants may have been more mindful during the tea making than was expected beforehand.

One limitation of the current study was that participants prepared their tea in a different setting than they usually would, i.e., not in their own kitchen, which might explain why participants were more attentive. Context stability has been found to be important for the development and expression of habits (Verplanken et al., 2018). Despite this ostensive different setting between lab and home, the comparison with the habit disruption condition provides some confidence in the findings of the influence of the habit strength on the effectiveness of the portion size nudge. This is probably due to the fact that the context that triggers the habit of adding sugar is “making tea”; which can be viewed as a routine or sequence of actions, of which adding sugar is one (e.g., Lally & Gardner, 2017; Ruh, Cooper, & Mareschal, 2010; Botvinick & Plaut, 2004).

This characteristic of sugar adding behaviour is important when considering the potential implications of the current findings for future research on nudge interventions. Many of the behaviours that are targeted by nudges can be seen as part of a routine (e.g., De Wijk et al., 2016). The findings of this study suggest that it would be worthwhile to test whether the effectiveness of nudge interventions depends on the flexibility of the separate parts of this routine. To illustrate, imagine a commuter who has a routine of buying something at the kiosk while waiting for the train. The mental representation of the product could differ in abstraction level from “something to drink” to very concretely “a medium sized cappuccino”. When intending to nudge the commuter to a cup of tea, chances of success would be expected to be higher for the people who have an abstract category of “beverage” in their minds than those who have a very concrete product in mind.

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## CONCLUSION

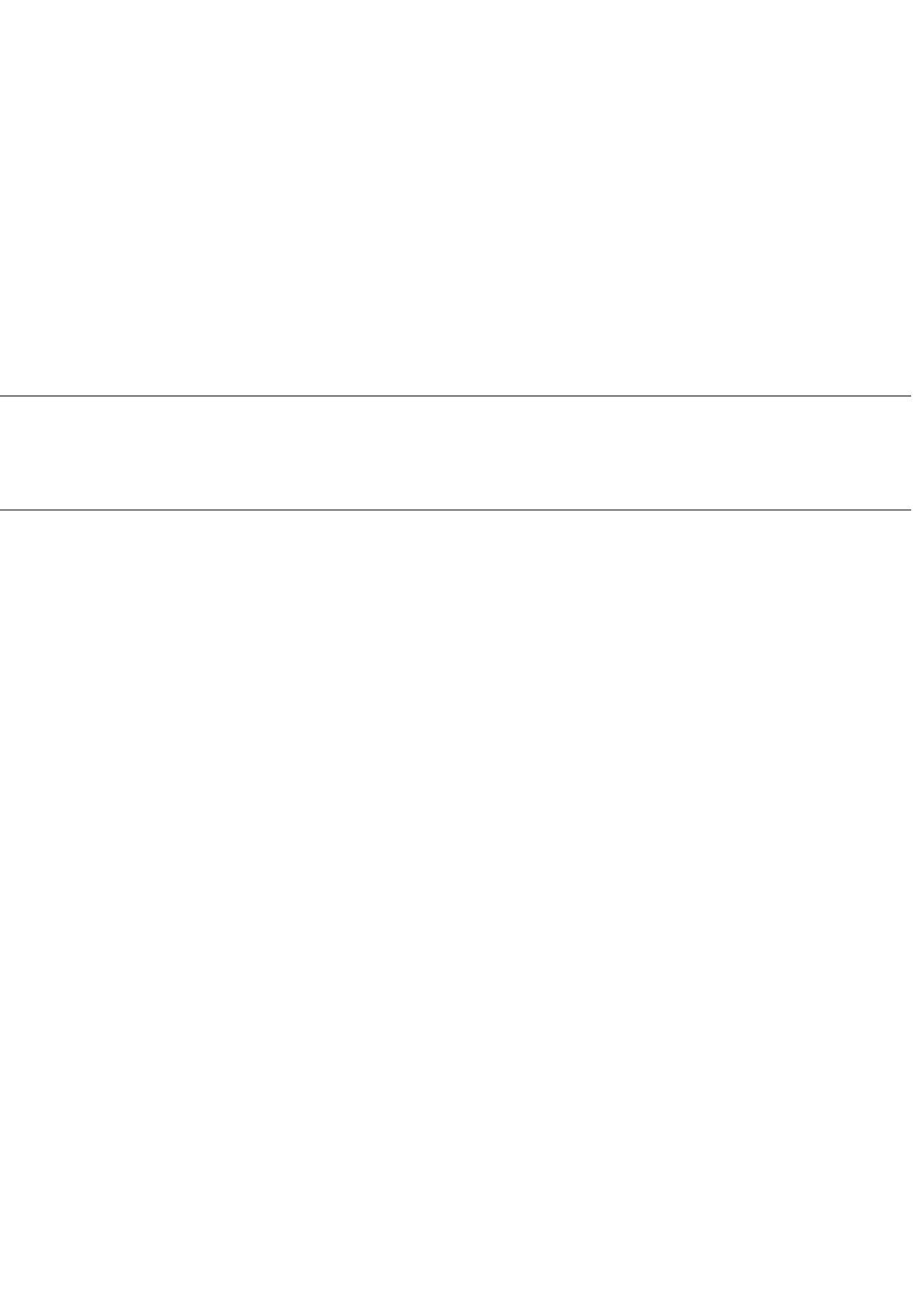
This study was set out to test whether the portion size nudge would be a way to work *with* (instead of against) already existing habits. Overall, the nudge was effective in reducing sugar usage. However the results showed that a strong habit, ironically, predicted a *less* pronounced effect of the nudge. Making the nudge’s victory over habits bitter-sweet.

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<sup>1</sup> Three extreme outliers were identified (more than 2 *SD*’s from the mean) and were excluded from analysis. Including these outliers made the whole model insignificant,  $p = .141$ .

<sup>2</sup> The three-way interaction between trial type (nudge spoon first vs. normal spoon first), condition (hot vs. cold) and the mean centred habit strength was not significant,  $p = .357$ .





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# CHAPTER 4

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## **THE ONE THAT I WANT: STRONG PREFERENCES RENDER THE CENTER-STAGE NUDGE REDUNDANT**

Venema, T.A.G., Kroese, F.M., De Vet, E., & De Ridder, D.T.D. (2019). The One that I want, strong preferences render the center-stage nudge ineffective. *Food Quality and Preferences*, 103744.

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TV, EV and DR developed the research design and idea. TV and EV collected the data. TV and FK analysed the data and interpreted the data. TV and FK drafted the manuscript. FK and DR provided critical feedback on the manuscript. TV revised the manuscript in consultation with FK, EV and DR. EV, FK and DR provided final approval of the version to be published

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**ABSTRACT**

In recent years there has been increased attention for nudging as a tool to alter consumer decisions. While nudges should in theory preserve freedom of choice by respecting consumers' preferences, empirical scrutiny of this claim is sparse. This research investigates the effectiveness of a center-stage nudge to encourage the consumption of a small portion size of soda. Specifically, in all studies we measure the extent to which strong preferences that are incongruent with the aim of the nudge (i.e., thirst and liking) and nudge congruent preferences (i.e., intentions to reduce soda consumption Study 1); Healthy diet goals (observed in Study 2; manipulated in Study 3) could be expressed when a choice is nudged. In three studies ( $n = 119$ ;  $n = 184$ ;  $n = 202$ ) it was found that strong preferences are not trumped by the nudge and in fact overrule the effectiveness of a center-stage nudge. These findings contribute to the debate about the ethical considerations that are voiced concerning nudge interventions, and urge choice architects to consider consumers' prior preferences as an important boundary condition of effective nudge interventions.

In the past decade, *nudges* - defined as changes in the choice architecture that facilitate desired choices without forbidding alternative options (Thaler & Sunstein, 2008) - have been frequently employed as a tool for facilitating behaviour change in a wide variety of public policy domains, ranging from sustainability to public health (e.g., Benartzi et al., 2017; Dolan, Hallsworth, Halpern, King, Metcalfe, & Vlaev, 2012; Johnson & Goldstein, 2003; Liebig & Rommel, 2014). Whereas nudges have been the subject of many scientific investigations (Szasz, Palinkas, Palfi, Szollosi, & Aczel, 2018), few studies have addressed specific mediators or moderators of nudge effectiveness (Arno & Thomas, 2016; Marchiori, Adriaanse, & De Ridder, 2017). This lack of insight into when and how nudges result in desired behaviour precludes an understanding of the boundary conditions of nudge effectiveness, which may eventually result in missed opportunities to enhance the impact of nudge interventions. In a series of three studies, we examine one specific boundary condition that is crucial for the understanding of how nudges operate and when they are (or are not) effective: the extent to which nudges align with personal preferences of the nudgee. We do so by investigating how existing preferences impact the effect of a *center-stage nudge* (i.e., a nudge that exploits people's tendency to select the middle option in an array) that encourages choices for smaller portions of soft drinks.

The reduction of soft drink consumption has been identified as an important public health target because a high intake of soft drinks is considered a serious risk factor in the development of overweight (Malik, Schulze, & Hu, 2006). Previous attempts to address this issue, such as pricing strategies and banning large portion sizes, have met with strong opposition from both industry and consumers themselves (Crino, Sacks, & Wu, 2016). An alternative approach lies in facilitating the choice for reduced portion sizes of soft drinks (Vermeer, Steenhuis, & Poelman, 2014; Popkin, Armstrong, Bray, Caballero, Frei, & Willett, 2006). A nudge that employs the presentation of different portion sizes to encourage a choice for smaller portions of soft drinks is a promising avenue for reduced consumption, as most convenience stores offer multiple size options of the same product (Pham, 2014; Bucher, Collins, Rollow, McCaffrey..., & Perez-Cuelo, 2016). Usually, different options are presented ascending from small to large as viewed from the perspective of the customer. Our objective is to test whether rearranging the display of portion sizes - with the smaller healthier option in the middle instead of on the left - will lead to an increase in the selection of the smaller portion size, as is suggested by research on the *center-stage effect*. Importantly, we will test whether the effectiveness of this nudge depends on whether people have nudge congruent preferences (i.e., a goal to consume fewer calories) or nudge incongruent preferences (i.e., liking of soft drinks or the visceral drive of thirst).

Research on the *center-stage effect* has revealed that, insofar all options can be considered simultaneously in a horizontal array, people have a tendency to select the option that is placed in the middle (Valenzuela & Raghuram, 2009; Atalay, Bodur, & Rasolofiarison, 2012). This effect has been demonstrated for a wide range of consumer

choices, such as products (e.g. pens, chewing gum) and services (e.g., toilet cubicles) (Christenfeld, 1995; Shaw, Bergen, Brown, & Gallagher, 2000). The documented tendency to choose the middle option can be implemented as a *center-stage nudge* by placing the sensible choice in the middle, as has been shown in a recent study indicating that the display of a low-calorie granola bar in the middle of other high-calorie options leads to a more frequent selection of this bar compared to when it was placed on the left (Keller, Markert, & Bucher, 2015). Whereas this study has provided initial evidence for the potential of the center-stage nudge in promoting healthy choices, we argue that the effect might depend on whether or not people have a strong preference to select a healthy choice. This notion is important in view of understanding the boundary conditions of nudge effectiveness, as neglecting to account for the impact of preferences can lead to a biased estimation of the nudge effect (e.g., Arno & Thomas, 2016). The effect of nudges might be underestimated because of individuals whose personal preferences do not align with the aim of the nudge and might be overestimated because people already hold a strong preference for healthy consumption. The current series of studies is the first to empirically investigate the role of preferences in nudge effectiveness.

Both from a psychological and an ethical point of view, a good match between a persons' preferences and the targeted behaviour of the nudge is mandatory. From a psychological perspective, nudges are an important device that may help to bridge the so called 'intention – behaviour gap' between what people want to do and what they actually do (Sheeran, 2002). Nudges may support people acting upon their goals which they might otherwise forget or ignore in the heat of the moment. At the same time, nudges should not completely overrule strong desires for alternative options, as otherwise they would violate the essential requirement of the nudging concept that they facilitate autonomous decision making without any infringements upon peoples' freedom of choice (e.g., Vugts, Van den Hoven, De Vet, & Verweij, 2018).

The general idea behind nudging is that people are encouraged to make a choice that is line with their own best interests, but should be able to choose differently without much effort or cost when they have another choice in mind. To the best of our knowledge, there is only one empirical study addressing this issue explicitly, demonstrating that a default nudge that automatically transferred people's tax refunds into a savings account proved ineffective when people had already made other plans to spend their refunds (Bronchetti, Dee, Huffman, & Magenheimer, 2013). Whilst this initial finding that nudge incongruent preferences (i.e., wanting to spend the money on something other than saving) renders the nudge ineffective calls for more empirical support, it is also unclear what will happen when people already hold strong preferences that *do* align with the nudge. Is the nudge then still effective or is it redundant because people do not need the nudge to act upon their preferences? Recent research suggests the latter. In a study examining the effect of a default nudge to promote green energy, the nudge was a good predictor of the choice for green energy for participants with weak and medium environmental attitude strength, but lead to a relatively lower

increase in choices for a green energy provider when participants had very strong environmental attitudes (Vetter & Kutzner, 2016). Based on this preliminary finding, we expect that a nudge will be redundant for people with strong nudge congruent preferences. Moreover, we expect that strong nudge-incongruent preferences will also render the nudge ineffective.

**Overview of current studies.** The present series of three studies will examine the role of personal preferences on the effectiveness of a center-stage nudge for choosing smaller portion sizes of soft drinks. In all studies, participants were invited to choose from three different cup sizes, small (200 ml), medium (300 ml) or large (400 ml), filled with either Coke (42 kcal per 100 ml) or Orange soda (33 kcal per 100 ml) to accommodate personal taste preferences. In the experimental nudge condition, the desired healthier choice – the smallest cup with the lowest number of calories - was placed in the middle of the array to accomplish a center-stage nudge. In the control condition, the smallest cup was placed on the left side of the choice arrangement, as is normally the case when exposing options varying in size (small to large from left to right; Dickinson & Intraub, 2009). In the first study we assessed the effect of the center-stage nudge while accounting for participants' susceptibility to the influence of a nudge by manipulating state self-control. In doing so, we aim to create optimal conditions for testing nudge effectiveness as it has been suggested that low self-control may promote responsiveness to nudges (Cheung, Kroese, Fennis, & De Ridder, 2017; Hunter, Hollands, Couturier, & Marteau, 2017; Salmon, Fennis, de Ridder, Adriaanse, & De Vet, 2014). In Study 1 nudge congruent preferences were operationalized as the specific intention to reduce soft drink consumption. In the second study we aimed to replicate the findings from study 1 with an alternative operationalization of the nudge congruent preference; instead of concrete intentions to reduce soda consumption we inquired to what extent participants strove to adhere to a healthy consumption pattern. Study 3 presents a more stringent test of the role of these preferences in center-stage effectiveness by manipulating the perceived importance of adhering to a healthy diet goal. Liking of a particular food product has been shown to be a good predictor of portion size selection (Brunstrom & Shakeshaft, 2009). Therefore, in all three studies nudge incongruent preferences were operationalized as liking of the chosen soda and thirst. It was hypothesized that the effect of the center-stage nudge would be overruled by personal preferences, such that people with strong nudge-incongruent preferences would opt for larger cup sizes while people with strong nudge-congruent preferences would opt for smaller cup sizes regardless of the presence of a nudge.

## STUDY 1

In this study we examined the center-stage effect on cup size selection, while accounting for the mindset that participants are in. It has been suggested that people are more prone to be influenced by nudges, when they experience low self-control (i.e., are

tired, distracted or otherwise temporarily less capable or willing of making calculated decisions) (e.g., Hunter, Hollands, Couturier, & Marteau, 2018; Salmon et al., 2014).

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## METHOD

**Participants.** One hundred and nineteen participants (67.2% female) were recruited on university campus via posters and flyers. One female participant was excluded because she was not allowed to drink any carbonated drinks. The mean age was 21.91 years ( $SD = 3.90$ ).

**Design and procedure.** The experiment had a 2 State Self-control (high vs. low) by 2 Nudge condition<sup>1</sup> (nudge vs. control) between subjects factorial design. Upon arrival in the lab, participants signed the informed consent form for a study advertised as “The influence of glucose on recovery after a cognitively strenuous task”. They commenced by filling out a paper questionnaire about their current state of mind, intended to assess levels of thirst. They then proceeded with an E-crossing task (Baumeister, Bratslavsky, Muraven & Tice, 1998) with the aim of manipulating the level of state self-control. This task was presented to participants as the cognitively strenuous task. After completing this task, participants indicated their preferred soda (Orange soda or Coke) and their preferred cup size. The experimenter provided them with the soda in the cup size of their choice and a magazine while explaining that they had a five minute break for consumption of the soft drink. After five minutes the experimenter re-entered their cubicle with the “recovery questionnaire”, which was used as a manipulation check for state self-control and an assessment of participants’ intentions to reduce their soft drink consumption. Subsequently participants were probed for the conjecture of the study. Finally, participants were thanked and compensated for their participation (course credit or €4), and were told that a debriefing was available upon request by sending an email to the researcher.

### Materials

*State of mind questionnaire.* Participants were required to indicate on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*) to what extent they felt thirsty. To assess this unobtrusively, this item was hidden between items that assessed how hungry, cheerful, tired, bored, concentrated, self-confident, energetic, anxious or sad they felt.

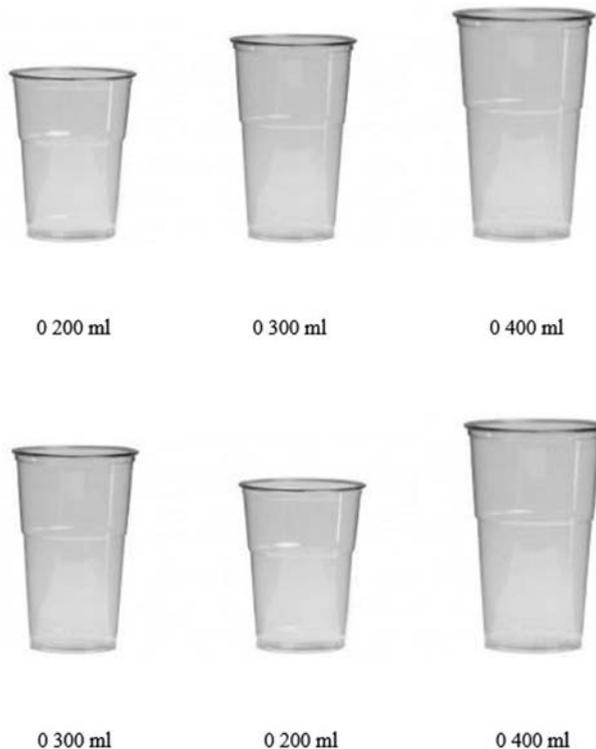
*E-cross task.* To manipulate state self-control, an e-cross task was administered. In both conditions participants were first told to cross all “e’s” in a practice text. In the second part, participants in the high state self-control condition were told to continue as previously instructed, whereas participants in the low state self-control condition were told to only cross the “e” when the word did not contain any other vowels or was two or more spaces removed from a vowel. This task has been successfully used in previous studies to manipulate state self-control (e.g., Wan & Sternthal, 2008; Baumeister, et al., 1998).

*Center-stage nudge.* The three cup sizes were presented as images of plastic cups varying in size and the content in millilitres was written below the images, respectively 200ml, 300ml and 400ml. The cups in the control condition were presented in ascending order size, small, medium, large, and in the nudge condition the smallest option was presented in the middle (see Figure 1).

*Recovery questionnaire.* The recovery questionnaire presented participants with three questions that served as a **manipulation check**: “I feel exhausted”, “I thought that the second part of the task was more difficult” and “I thought the task was taxing”, that were answered on a 5-point Likert scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*). As Cronbach’s alpha (.470) was below standards, we will use single items instead of a scale.

In addition, this questionnaire was used to assess participants’ intention to reduce their soft drink intake, answered on a scale ranging from 1 (*totally disagree*) to 5 (*totally agree*), as a measure of **nudge-congruent preferences**. In addition, it assessed their liking of soft drinks, answered on a 6-point Likert scale ranging from 1 (*do not like at all*) to 6 (*like it very much*). Liking of soft drinks was combined with thirst

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**Figure 1.** Presentation of the cups in the control condition (top row) and the nudge condition (bottom row).

in a composite measure (i.e., the mean of both standardized values, cf. Duckworth & Seligman, 2006) of *nudge-incongruent preferences*. These items were hidden in other questions that were in line with the cover story but irrelevant for the purpose of the study (e.g., motivation to do well on the task).

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## RESULTS

**Randomization check.** Separate ANOVAs with Nudge condition and State Self-Control condition as independent variables showed no main or interaction effects on intention to reduce soft drink consumption, thirst, or liking of soft drinks,  $p$ 's > .156. Neither did gender differ across conditions,  $\chi^2(3) = 1.26, p = .738$ , indicating successful randomization.

**Manipulation check.** To assess whether the state self-control manipulation was successful, a MANOVA was performed with the three manipulation check items (i.e., exhaustion, difficulty of the task, the extent to which the task was taxing) as dependent variables and state self-control condition as a predictor. The analysis revealed a significant difference between conditions, where -as anticipated- participants in the low state self-control condition scored higher than participants in the high state self-control condition,  $F(3, 113) = 30.79, p < .001$ . Thus, we may conclude that the manipulation of state self-control was successful.

**Main analysis.** Frequencies of selected cup sizes in each condition are reported in Table 1. To test the effectiveness of the nudge, a binary logistic regression was performed, with cup size choice as dependent variable coded into healthy (small size) and unhealthy (medium or large size) choice. In the first step, only Nudge Condition was entered as a predictor, to establish a baseline effect of the center-stage nudge. In the second step State Self-Control Condition, nudge-congruent preferences, nudge-incongruent preferences, and gender were added. Finally, Step 3 included an interaction term between Nudge Condition and State Self-Control Condition. The first step showed that, overall, the nudge significantly affected the likelihood of choosing the smallest drink: participants in the nudge condition were 2.35 times more likely to select the healthy choice compared to participants in the control condition,  $b = .85, \text{Wald } \chi^2(1) = 5.17, p = .023$ . Adding the other predictors in Step 2 revealed that, while the effect of the nudge remained significant ( $p = .021$ ), cup size choice was also determined by nudge-incongruent preferences (i.e., liking and thirst;  $p = .040$ ) and gender ( $p = .005$ ), showing that thirsty and male participants were less likely to select the small cup size. We found no significant effect of nudge-congruent preferences (i.e., intention to reduce soft drink consumption,  $p = .104$ ). Adding the interaction term between Nudge Condition and State Self-Control Condition in Step 3 did not yield a significant improvement of the model; the interaction was not significant ( $p = .263$ ). Table 2 reports the analysis results for Step 2.

**Table 1.** Distribution of choices for soft drink portion size per condition Study 1.

	State self-control	200 ml	300 ml	400 ml
Control condition	Low	11 (36.7%)	13 (43.3%)	6 (20.0%)
	High	12 (40.0%)	11 (36.7%)	7 (23.3%)
	Total	23	24	13
Nudge condition	Low	20 (66.7%)	8 (26.7%)	2 (6.7%)
	High	15 (51.7%)	13 (44.8%)	1 (3.4%)
	Total	35	21	3

**Table 2 .** Logistic regression model to predict healthy soft drink portion size Study 1.

	<i>b</i>	Wald ( <i>df</i> )	<i>p</i>	OR
Constant	2.75	10.52 (1)	.001	.064
Nudge Condition	.95	5.33 (1)	.021	2.57
Self-Control Condition	.19	0.21 (1)	.647	1.20
Congruent preferences	-.63	4.22 (1)	.040	0.54
Incongruent preferences	.26	2.65(1)	.104	1.30
Gender	1.26	10.52 (1)	.005	3.54

*Note.* The dependent variable was coded as 1 = unhealthy; 2 = healthy. Control Condition, Low Self-Control Condition, and Male were used as reference groups for Nudge Condition, Self-Control Condition and Gender, respectively. Nagelkerke  $R^2 = .225$

## DISCUSSION STUDY 1

The results of Study 1 suggest that the center-stage nudge was effective in encouraging the healthy soft drink size but did not overrule nudge-incongruent preferences, which remained a significant predictor of the choice. That is, if people were thirsty or liked soda a lot they were more likely to select larger soft drink cups, regardless of the presence of the nudge. Contrary to our expectations, the intention to reduce soft drink intake did not have a significant effect on cup size selection. The absence of this effect might be due to our assessment of intentions. Apart from measuring it directly after the behaviour, which might have biased the answer (e.g., Festinger, 1962), the intention to reduce soft drinks can be considered quite specific. Moreover, intentions are generally found to be poor predictors of actual behaviour (Sheeran, 2002) and may be waxing and waning over time (Conroy, Elavsky, Hyde, & Doerksen, 2011). In Study 2 we will therefore examine the role of healthy diet goals and apply a priming procedure to make sure that participants' healthy diet goals would indeed be currently active. State self-control did not affect the choice in study 1; these findings are in line with the work by

Missbach and König (2016), who (using a different manipulation) also found no effect of state self-control on the effectiveness of a center-stage nudge. Therefore we will not further examine the role of self-control in nudge effectiveness.

## STUDY 2

In Study 2 the effectiveness of a center-stage nudge on the choice for smaller cup sizes of soft drinks was examined while considering healthy diet goals as a measure of nudge-congruent preferences. It was expected that a strong health goal would result in a preference for the smallest portion size, regardless of the presence of a nudge. Considering that such more superordinate goals may sometimes linger in the back of people's minds we subtly reminded them by priming this goal, thereby increasing their so-called mental accessibility (e.g., Janiszewski & Wyer, 2014) which is known to be an important predictor when it comes to actual behavioural choices (e.g., Dik, & Aarts, 2007). As an additional benefit, this task served the purpose of the alleged cognitively strenuous task that was part of the cover story.

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## METHOD

**Participants.** One hundred and eighty-four students were recruited in the university buildings via posters and flyers. When they agreed to participate, participants were required to send an email to the researcher in order to receive a participant number and a link for the first online part of the study ( $N = 178$ ). Participants were only included in the analyses if they also completed the second part of the study in the lab, resulting in a final sample of  $n = 153$  (67.3% female) with a mean age of 21.56 years ( $SD = 3.08$ ) and an average Body Mass Index (BMI) of 21.98 ( $SD = 3.92$ ). Participants who completed both parts of the study did not differ significantly on health goal strength, age or gender from the 25 participants who did not complete the second part,  $p$ 's  $> .108$ .

**Design.** The experiment had a factorial design with Condition (nudge vs. control) as a between subjects factor. Participants were randomly assigned to one of the conditions when the experimenter received their participation email, resulting in 72 participants in the nudge condition and 81 participants in the control condition.

**Procedure.** Participants first filled out an online questionnaire assessing their healthy diet goals, after which they were invited to come to the lab. Upon arrival, participants signed an informed consent form for a study presented as examining 'recovery after a cognitively strenuous task'. They commenced by filling out a paper questionnaire about their current state of mind, intended to assess thirst. Next, they performed a lexical decision task to prime the mental accessibility of their health goal. This task was framed as the cognitively strenuous task. Consecutively, they indicated their preference for Orange soda or Coke, and their preferred cup size (small, medium or large). The researcher then entered to collect the questionnaire and returned with the soft drink in the cup size of their choice. Subsequently, to corroborate the cover

story participants were invited to enjoy their soft drink while watching an eight-minute film clip, to create a naturalistic consumption setting (Vereecken, Todd, Roberts, Mulvihill, & Maes, 2006) and were asked to fill out a second questionnaire that assessed demographics. After completion, they were probed for their understanding of the aim of the study. All participants reported the cover story as the aim of the study. Finally, participants were thanked and compensated for their participation (course credit or €4), and were told that debriefing was available upon request.

### Materials

*Online questionnaire.* During the first part of the study, an adjusted version of the Personal Striving questionnaire (Emmons, 1991) was administered to assess to what extent participants strived to adhere to a healthy diet goal. This was done with the items (“I try to eat healthily every day”; “I try to avoid eating unhealthily every day”). Participants were explained that personal strivings refer to ongoing goals that they try to achieve through their behaviour. Personal strivings have been used and validated in many studies as an operational account of motivations and goals (for example, King, 1995; Simons, Christopher, & Mclaurry, 2004). To avoid suspicion, participants’ strivings in six other domains were also assessed, such as finance (e.g., “I try to avoid spending too much”) and appearance (e.g., “I try to look good every day”). In total, participants indicated for eight strivings how much they applied to them on a 0 (*not at all*) to 100 (*totally*) visual analogue scale. A higher score indicates that the striving is more applicable to that person, and hence stronger. Both health strivings were significantly correlated,  $r = .59$ ,  $p < .001$ . The variable General Health Goal was computed as the mean score of these two strivings and reflected participants’ *nudge-congruent preferences*.

*State of mind questionnaire.* Thirst was assessed the same as in Study 1.

*Center-stage nudge.* This was the same as in Study 1.

*Lexical decision task.* To prime the mental accessibility of the health goal a lexical decision task was conducted. The lexical decision task was programmed in Inquisit® software in a frame from Lepore and Brown (2002). Participants were instructed to press the “Z” key on the keyboard when they saw a non-word and to press the “M” key when they saw a word. Participants had four practice trials with two neutral words and two nonwords. After the practice rounds and a repetition of the instructions 52 trials with 26 nonwords, 21 neutral words and 5 critical words were presented to the participant in random order. A fixation cross was shown for two seconds before a (non-) word appeared. Then the word or non-word appeared for one and a half seconds. The critical words were the Dutch translations of “Healthy”, “Vital”, “Slim” “Health-conscious” and “Fit”. The neutral words were related to the categories banking, driving and tools. Reaction times were not analysed since the task was not included as an assessment instrument, but rather with the purpose to a) function as a cognitive strenuous task to match the cover story; and b) prime the accessibility of participants’ health goal to most optimally test our hypothesis.

**Demographics.** Participants' age, gender, height, weight, and education level was assessed. Moreover, participants' general liking and frequency of consumption for the chosen soft drink was assessed on a 6-point Likert scale, ranging from 1 (*do not like at all/ never*) to 6 (*like it very much/ everyday*). Again, liking and thirst (assessed at baseline) were combined in a measure of *nudge-incongruent preferences*.

## RESULTS

**Randomization check.** Separate ANOVAs were performed to examine whether participants across both conditions differed in age, BMI, thirst, general health goal, liking, and consumption frequency of the chosen soft drink. The conditions differed significantly on thirst,  $F(1, 152) = 5.00, p = .027$ , Cohen's  $d = 0.37$ , with participants in the nudge condition being thirstier ( $M = 3.20, SD = 1.01$ ) than participants in the control condition ( $M = 2.83, SD = 1.00$ ). No other significant differences were present ( $p's > .298$ ). Chi-square tests revealed that gender and soda type choice (i.e., Coke or Orange soda) did not differ significantly between the conditions,  $p's > .201$ .

**Main analysis.** Table 3 presents an overview of the choices for different cup sizes in each condition, showing that in both the control condition and the nudge condition the majority of participants opted for the smallest cup. A similar logistic regression analysis (see Table 4) as in study 1 was performed, with cup size choice as the dependent variable coded into healthy (small cup) or unhealthy (medium or large cup) choice.

**Table 3.** Distribution of choices for soft drink portion size per condition Study 2.

	200 ml	300 ml	400 ml
Control condition	48 (66.7%)	17 (23.3%)	7 (9.7%)
Nudge condition	54 (66.7%)	20 (24.7%)	7 (8.6%)

**Table 4.** Logistic regression model soft drink portion size Study 2.

	B	Wald (df)	p	OR	95% CI OR
Constant	0.10	0.05 (1)	.816	1.11	
Condition	0.43	0.95 (1)	.331	1.54	[0.65, 3.65]
Incongruent preferences	-1.51	14.45 (1)	<.001	0.22	[0.10, 0.49]
Congruent preferences	1.03	18.76 (1)	<.001	2.81	[1.76, 4.48]
Gender	0.95	4.10 (1)	.043	2.60	[1.03, 6.53]

*Note.* The dependent variable was coded as 1 = unhealthy; 2 = healthy. Condition was coded with control condition as a reference group. Gender was coded with male as reference group. Nagelkerke  $R^2 = .405$

The first step showed no significant effect of the nudge ( $p = .331$ ). In Step 2, strong effects of nudge-incongruent preferences ( $b = -1.51$ , Wald  $\chi^2(1) = 14.15$ ,  $Exp(B) = 0.22$ ,  $p < .001$ ) and nudge-congruent preferences ( $b = 1.03$ , Wald  $\chi^2(1) = 18.76$ ,  $Exp(B) = 2.81$ ,  $p < .001$ ) were found. Step 3 showed that female participants were two and half times more likely than male participants to select the healthy portion size,  $b = 0.95$ , Wald  $\chi^2(1) = 4.10$ ,  $Exp(B) = 2.60$ ,  $p = .043$ .

## DISCUSSION STUDY 2

The second study showed that participants overall chose the healthier, smaller, cup size more often regardless of the presentation order of the cups. Our findings lend support to the idea that this may be due to a pre-existing preference for a smaller cup based on health considerations, as participants with stronger healthy diet goals more often opted for the small cup irrespective of being exposed to the center-stage nudge or the regular display of cup sizes. By the same token, participants with strong nudge-incongruent preferences (i.e., those who were thirsty and liked soft drinks a lot) were less likely to choose a smaller cup regardless of the presence of a nudge, thus also revealing a strong effect of preferences albeit in the opposite direction. Thus, we conclude that participants still acted in line with their preferences and that, in this regard, their freedom of choice indeed remained intact. That being said, it should be noted that we could not yet establish that the center-stage nudge would *help* to guide decisions of people who do have a health goal that is not currently on the top of their minds. This is a relevant piece of information since this is where the nudge should have its largest potential. Study 3 was designed to test the idea that a nudge would not be effective (i.e., redundant) among participants with an active health goal, but would be effective among participants with a less active health goal.

## STUDY 3

The aim of Study 3 was to replicate the findings of Study 2 with a more direct test of the potential auxiliary effect of the nudge with regard to the enactment of personal preferences by manipulating the focality of people's healthy diet goals. It was expected that, similar to the previous studies, participants' healthy diet goals (i.e., nudge-congruent preferences) would influence their behaviour regardless of the presence of a nudge, but only when these were focal (i.e., on the top of their minds) when people chose their cup size. In contrast, when healthy diet goals are less focal we expected that the nudge would have a beneficial effect such that it would help people select smaller cup sizes compared to when no nudge was present. Improving on a practical matter of the first two studies, participants in Study 3 were asked to go and get their cup of soft drink themselves, making sure they had an accurate idea of what each cup size looked like (rather than indicating their choice on paper before actually seeing the different sizes). This study was preregistered at [as.predicted.org](http://as.predicted.org) [<http://aspredicted.org/blind.php?x=e4mj3p>].

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## METHOD

**Participants.** Participants were recruited in the university buildings via posters and flyers for a study that allegedly measured the effect of caffeinated soda on cognitive performance. Two hundred and two participants (71.8% female) took part in this study. The mean age was 22.93 ( $SD = 4.81$ ) and participants had an average BMI of 22.51 ( $SD = 2.89$ ).

**Design.** This study had a 2 Nudge condition (nudge vs. control) by 2 Focal Health Goal (yes vs. no) factorial between subjects design. Participants were randomly assigned to one of the four conditions when they signed up for the study, resulting in 50 participants in the Nudge/Focal Goal condition, 51 in the Nudge/Non-Focal goal condition, 49 in the Control/Focal Goal condition, and 52 in the Control/Non-Focal Goal condition.

**Procedure.** Upon arriving in the lab all participants were told that they were allocated to the non-caffeine condition. Participants were seated in a cubicle and filled out demographics, the state of mind questionnaire and the focal goal manipulation. Then they were lead to a separate room where they were asked to pick a glass of Orange soda and bring it back to their cubicle. Once seated they completed two cognitive tasks while drinking the soda. Upon completion participants were asked how frequently they drink Orange soda, how much they like Orange soda and how important they find it to eat healthily. Finally, participants were thanked and compensated (€4 or course credit) and told that they could receive a debriefing by sending an email to the experimenter.

**Materials.** The same state of mind questionnaire was used as in Study 1 and Study 2 to unobtrusively measure participants' thirst. Frequency of Orange soda consumption was inquired on a scale ranging from 0 (*every day*) to 6 (*never*). Liking of Orange soda was asked on a 6 point-Likert scale ranging from 1 (*not at all tasty*) to 6 (*very tasty*). The importance of a healthy diet was assessed after the cognitive tasks on a scale from 1 (*not at all important*) to 6 (*very important*). Similar to Study 1 and 2, a composite score of liking and thirst was created as a measure of *nudge-incongruent preferences*.

**Focal Goal manipulation.** We aimed to influence participants' focal goal by manipulating the importance of the health goal relative to other goals. Participants were asked to rank five goals from 1 (*most important*) to 5 (*least important*). In the Focal Health goal condition the goal of "eating healthy" was contrasted against trivial goals, such as keeping one's house clean or going to the hairdresser regularly. In the non-focal goal condition, it was contrasted against substantial goals, such as finding love or gaining new life experiences (Wedell, Hicklin, & Smarandescu, 2007). Healthy eating was presented as the fourth goal in both conditions. A pilot study ( $N = 145$ ) validated the focal goal manipulation.

## RESULTS

**Randomization check.** Separate ANOVA's were performed with age, BMI, thirst, liking, and consumption frequency of Orange soda as dependent variables and condition as the predictor variable. There were no differences between the four conditions,  $p$ 's > .125. The four conditions also did not differ significantly on gender,  $p = .680$ , indicating a successful randomization.

**Manipulation check Focal goal.** A Mann-Whitney test was performed to examine whether the manipulation of the relative importance ('focality') of the health goal was successful. As expected, participants in the focal goal condition ranked the health goal as significantly more important ( $M_{\text{rank}} = 53.90$ ) than participants in the non-focal goal condition,  $M_{\text{rank}} = 147.25$ ,  $U = 9.81$ ,  $z = 11.89$ ,  $p < .001$ ,  $r = .84$ .

**Main analysis.** Table 5 presents an overview of the cup size choices per condition and reveals that the smallest cup size was chosen most often, regardless of the presence of a nudge or activation of the health goal. To examine this pattern in more detail, a stepwise binary logistic regression was performed, with cup size choice as the dependent variable, coded into healthy (small cup) and unhealthy (medium and large cup) choice. In the first step Nudge condition was added as a predictor, followed by Focal goal condition and the interaction between Nudge and Focal Goal in Step 2. Neither step yielded a significant model ( $p$ 's > .625). In Step 3 of the analysis, nudge-congruent and nudge-incongruent preferences were added, together with Gender. Step 3 revealed significant effects of nudge-congruent and nudge-incongruent preferences as well as gender. Table 6 provides an overview of the complete model. There was no main effect of the Nudge condition; solely repositioning the cups did not influence the choice for a healthy or unhealthy portion size,  $p = .796$ . Nor was there a significant main effect of the Focal goal condition,  $p = .982$ . Unexpectedly, the interaction effect between Nudge condition and Focal Goal condition was not significant either,  $p = .825$ . However, consistent with Study 1 and 2, personal preferences predicted cup choice: stronger nudge-incongruent preferences increased the likelihood of selecting

Table 5. Distribution of choices for soft drink portion size per condition in Study 3.

Goal Focality		200 ml	300 ml	400 ml
Control condition	Focal	26 (53.1%)	18 (36.7%)	5 (10.2%)
	Non-focal	27 (52.0%)	25 (48.1%)	0 (0.0%)
	Total	53	43	5
Nudge condition	Focal	28 (56%)	19 (38.0%)	3 (6.0%)
	Non-focal	29 (56.9%)	17 (33.3%)	5 (9.8%)
	Total	57	36	8

**Table 6.** Logistic regression model soft drink portion size Study 3.

	B	Wald (df)	p	Exp(B)	95% CI OR
Constant	-0.43	1.09 (1)	.298	0.65	
Nudge condition	0.12	0.07 (1)	.796	1.13	[0.45, 2.83]
Focal goal condition	0.01	0.00 (1)	.982	1.02	[0.41, 2.50]
Nudge X Focal goal	-0.12	0.04 (1)	.852	0.89	[0.25, 3.19]
Incongruent preferences	-1.27	25.00 (1)	<.001	0.28	[0.17, 0.46]
Congruent preferences	0.41	5.72 (1)	.017	1.51	[1.08, 2.12]
Gender	0.89	6.07 (1)	.014	2.44	[1.20, 4.95]

*Note.* The dependent variable was coded as 1 = unhealthy; 2 = healthy. Control Condition, Non-active condition, and Male were used as reference groups for Nudge Condition, Focal goal Condition and Gender, respectively. Nagelkerke  $R^2 = .332$ .

an unhealthy portion size ( $b = -1.27$ , Wald  $\chi^2(1) = 25.00$ ,  $Exp(B) = 0.28$ ,  $p < .001$ ); stronger nudge-congruent preferences significantly increased the likelihood of selection the healthy option,  $b = .41$ , Wald  $\chi^2(1) = 5.72$ ,  $Exp(B) = 1.51$ ,  $p = .017$ . Lastly, Gender was a significant predictor ( $b = .89$ , Wald  $\chi^2(1) = 6.07$ ,  $Exp(B) = 2.44$ ,  $p = .014$ ), men were more likely to select larger portion sizes.

## GENERAL DISCUSSION

The current investigation focused on how existing preferences interfere with the effectiveness of a center-stage nudge. We proposed that nudges would be redundant when people already have strong preferences that are congruent with the nudge. Conversely, when people have nudge-incongruent preferences they should not be influenced by the nudge, since that would violate their autonomy. Three studies showed that participants' nudge-congruent and nudge-incongruent preferences indeed consistently predicted their cup size choices, regardless of the presence of a nudge that aimed to promote the choice for the smallest cup. Specifically, participants who valued a healthy diet (i.e., a nudge-congruent preference) tended to choose the smallest cup size, and the presence of a nudge did not further enhance this tendency; the nudge was redundant. Whereas participants who liked soft drinks a lot and/or were very thirsty (i.e., nudge-incongruent preferences) tended to choose larger cup sizes, and the presence of a nudge did not reduce this tendency; the nudge did not interfere with their personal preferences.

Unexpectedly, we did not find that the effectiveness of the nudge was moderated by the focality of people's healthy diet goals, as tested in Study 3. That is, we predicted that the nudge would be redundant when people had focal healthy diet goals, but would effectively influence people's choices when their healthy diet goals were temporarily

less focal. In hindsight, however, the used manipulation of goal focality may not have been the most appropriate, since focality of the goal might not be only reason why people sometimes fail to act in line with their goals (Sheeran, 2002). Even though the manipulation was successful in bringing a healthy diet goal to mind, the urge to quench thirst might be stronger. Future research should look at the potential of nudges to resolve these conflicting preferences.

The finding that people's personal preferences guide their behaviour even in the presence of a nudge is important in light of ethical discussions about nudging. Nudge critics have expressed concerns that nudges would be manipulative in the sense that they would steer people's behaviour in directions they would not want (e.g., Schubert, 2017). Such concerns are of course legitimate and cannot be waived by the mere statement that nudges are not intended to interfere with people's preferences. Instead, empirical testing of such claims is essential to gain further insight into whether, when and how nudges affect behaviour. The current studies add to a growing body of empirical literature on the boundary conditions of nudge effectiveness that in turn could fuel ethical debates.

Besides relating to ethical concerns, the role of preferences in nudge effectiveness also has relevant implications for policy makers. Our research suggests not only that nudges will not steer behaviour in a direction that goes against people's preferences, it also implies that nudges will be redundant when people already have strong preferences that are in line with the nudged behaviour. This is important to consider when deciding which behaviour to nudge, at what location and for whom. A nudge may not be the right instrument if the behaviour or the setting is tied to strong preferences. For example, a nudge to promote healthy choices might be effective in a supermarket setting where people are still deciding what to eat that night, while the same nudge might be ineffective in a theme park where people just want to treat themselves to something nice (and unhealthy). Similarly, a nudge that would stimulate the choice for the only plant-based dish in a canteen may work when omnivorous customers are hungry and want to eat, but would be redundant for people who already adhere to a vegetarian diet. Thus, the potential of nudges would be largest when people do not have strong prior preferences (see Venema, Kroese, Benjamins, & De Ridder, under review).

While providing relevant empirical evidence to an important research question, some limitations of the current studies should also be taken into account. While it is noteworthy that participants' choices were real (i.e., not hypothetical) as they actually consumed the drink of their choice, the unnatural (lab) setting of the studies would probably still be the most important limitation. Selecting a drink is not something people would normally do by indicating their preference on a paper questionnaire (Studies 1 and 2) and it could be the case that – even though they were unaware that the drink selection was part of the study – participants felt observed and consequently were more inclined to go for the (modest, socially desirable) smaller cup than they would otherwise. However, we would expect results to be even stronger in more natural

settings. It is quite plausible that, when participants decide to have a drink in a natural context, they would be driven by their personal preferences (thirst, liking of the drinks) to an even larger extent. On the other hand, for consumers with weaker preferences the potential effect of the nudge may well be larger in more natural settings, seeing that the room for improvement in the current study was quite small due to the large number of people that opted for the smallest cup size in all conditions.

Future research is needed to further scrutinize how personal preferences affect nudge effectiveness. This is a challenging area of research as preferences may not be stable over time and across different contexts. Attempts to capture current personal preferences within the nudge setting may preclude observing true naturalistic behaviour. It would be worthwhile to find ways to reliably *infer* personal preferences (e.g., by looking at past behaviour) and study how they affect nudge effectiveness. In addition, it would be interesting to systematically compare nudge effectiveness in domains where people do (e.g., healthy eating) or do not (e.g., selecting insurances) tend to have strong preferences. Our hypothesis would be that nudges are particularly effective in settings where people do not have strong preferences, for example due to indifference or conflicting preferences.

**Conclusion.** Altogether, the current studies demonstrate that nudge interventions are respecting people's personal preferences in the sense that both nudge-congruent and nudge-incongruent preferences still determined behaviour regardless of the presence of a nudge. Besides contributing to theoretical knowledge of how and when nudges work, this empirical evidence may be valuable in ethical discussions about nudges as well as in policy considerations about where and when to implement nudge interventions.

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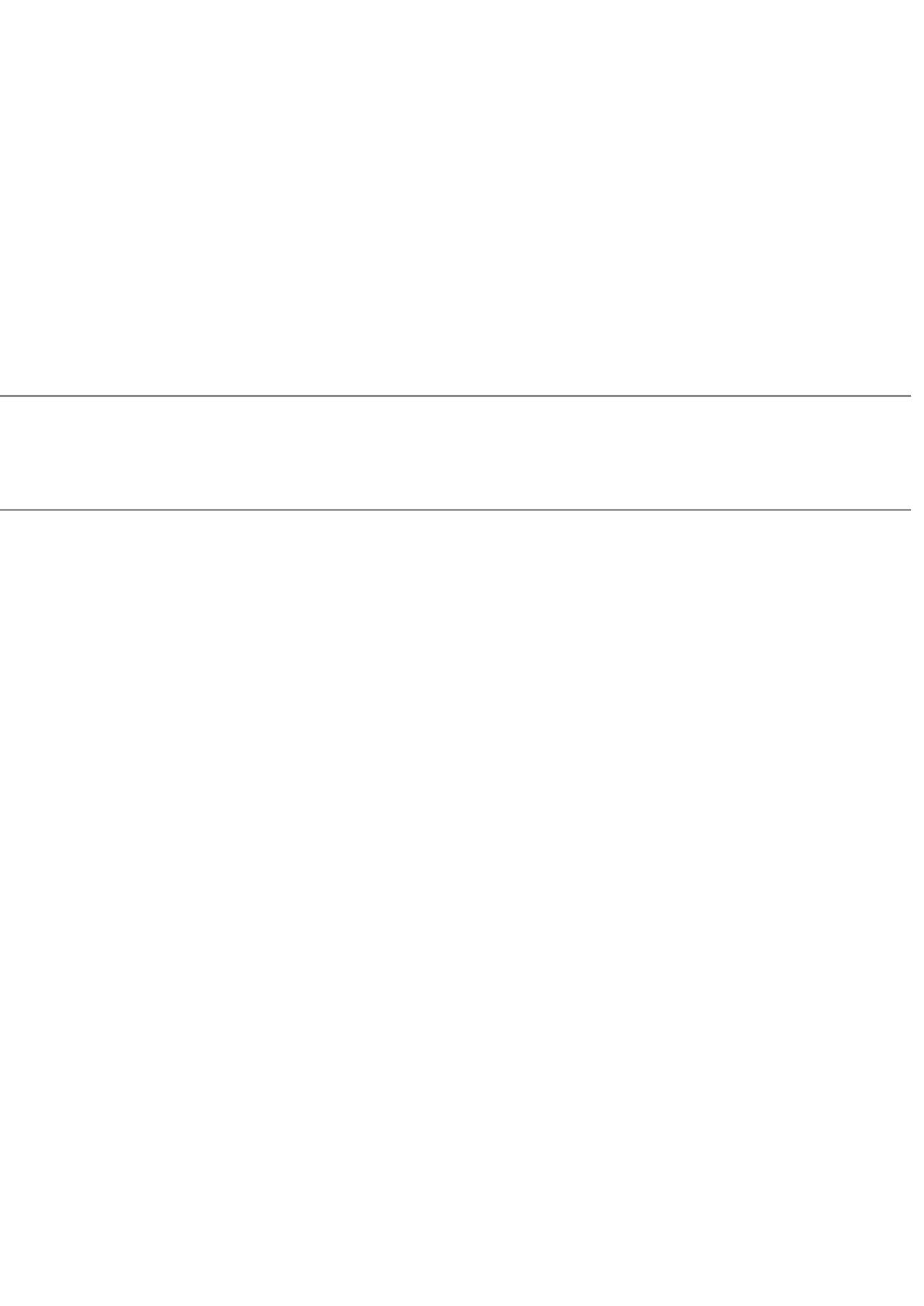
## ACKNOWLEDGEMENTS

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<sup>1</sup> A third condition was exploratorily added (50 participants) that had the same set-up as the control condition, only now the labels read 100, 200 and 300 ml instead of 200, 300 and 400 ml. However, since this falls out of the scope for the current article it was not further analyzed.





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# CHAPTER 5

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## **WHEN IN DOUBT, FOLLOW THE CROWD? RESPONSIVENESS TO SOCIAL PROOF NUDGES IN THE ABSENCE OF CLEAR PREFERENCES**

Venema, T.A.G., Kroese, F.M., Benjamins, J.S., & De Ridder, D.T.D. (Submitted for publication).

When in doubt, follow the crowd? Responsiveness to social proof nudges in the absence of clear preferences.

Acknowledgement of author contributions:

TV, DR, and FK conceptualized the research ideas and TV and JB developed the research designs. TV collected the data. TV analysed the data and interpreted the data in consultation with FK, JB and DR. TV drafted the manuscript. FK, JB and DR provided critical feedback on the manuscript.

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**ABSTRACT**

Although nudges are designed to facilitate sensible choices without interfering with people's prior preferences, the intuitive notion that nudges should be particularly effective when people do not have strong preferences has received little empirical evidence. The current article addresses this question by presenting 2 studies that test the hypothesis that a social proof nudge is particularly effective when people have no clear prior preference, either because they are indifferent (in a colour-categorization task; Study 1,  $N = 255$ ) or because they experience a choice conflict (making shopping decisions about meat products; Study 2,  $N = 100$ ). In addition, we examine the presumed facilitation effect of the social proof nudges by using a mouse tracker paradigm that implicitly assessed experienced uncertainty during choice making. Results showed that the nudge was effective; the facilitation effect (i.e., reduced choice uncertainty) was observed only when there were conflicting preferences, not under indifference. It is important to further study moderators of nudge effectiveness.

With the realization that many societal issues such as climate change, obesity and personal debt are caused by a series of minor, but imprudent individual decisions, governments have become increasingly interested in ‘nudges’ as a policy instrument to promote advantageous choices (Jones, Pykett & Whitehead, 2013; Lourenco, Ciriolo, Almeida, & Troussard, 2016). Nudges are deliberate changes in the “choice architecture” (i.e., the context in which choices are presented) with the aim to facilitate the desirable choice without forbidding alternatives, or changing financial incentives (Thaler & Sunstein, 2008). What distinguishes nudges from other types of policy instruments, such as educational campaigns, is that nudge interventions recognize that people have a lot on their minds and, despite well-meaning intentions, make choices that are disadvantageous for themselves and/or society. For example, to promote healthier choices, governments may advocate traffic light labels on food packaging, to facilitate easy processing of percentages of sugar, fat and salt in relation to the Guideline Daily Amount (GDA) (Trudel, Murray, Kim, & Chen, 2015). Meta-analyses and systematic reviews consistently report that the vast majority of nudge interventions are effective in shifting behaviour in a desirable direction (e.g., Szaszi, Palinkas, Palfi, Szollosi, & Aczel, 2018; Broers, De Breucker, Van den Broucke, & Luminet, 2017; Skov, Lourenco, Hansen, Mikkelsen, & Schofield, 2013; Hummel & Maedche, 2019). However, the effect sizes are small, indicating that nudges affect some, but not all individuals (Olejník & Algina, 2000). Seminal studies have demonstrated that nudges are less effective when people already have a strong preference for a particular choice option (e.g., Bronchetti, Dee, Huffman, & Magenheimer, 2013; Venema, Kroese, De Vet, & De Ridder, 2019; Theotokis & Manganari, 2015). The present study aims to investigate the notion that nudges will be particularly effective in the *absence of a clear preference* for a particular choice option. Moreover, we test the hypothesis that in the absence of a clear preference nudges will facilitate the choice, i.e., makes the decision easier.

Despite the intuitive notion that nudges should have no impact on decisions when people already know what they want, most empirical research on nudges test the effectiveness on a group level, thereby missing the opportunity to scrutinize this important aspect of nudge theory: “libertarian paternalism” (Thaler & Sunstein, 2008). Nudging is based on the idea that certain choices are better than others to improve well-being in the long run, hence ‘paternalism’, but only insofar people themselves are in agreement with the goals represented by these choices (see also Van de Veer, 1986). The ‘libertarian’ aspect requires that these choices are not enforced, but rather suggested. In fact, nudges are specifically designed for people who have adopted goals, but fail to act upon them. To illustrate, a prompt that encourages people to take the stairs instead of the elevator should be effective for people who think they should be more active, but not for people with walking difficulties.

The theoretical assumption that nudges should not be effective when they do not align with people’s preferences has been demonstrated in a few promising studies. For example, it was found that an opt-out default nudge that automatically transferred

people's tax refunds into a savings account to encourage saving money was not effective for people who already had plans to spend their refunds (Bronchetti et al., 2013). Similarly, it was shown that a positioning nudge that rearranged the presentation of small, medium and large cups of sugary beverages to encourage the selection of the smallest portion size was not effective for thirsty individuals, who regardless of the position went for the largest glass (Venema et al., 2019). These findings indicate that, indeed, if people have a strong preference that does not align with the aim of the nudge, the nudge will not be effective. However, the pioneering work on preferences and nudges also shows that if people have strong preferences that actually *are* in line with the goal and underlying values of the nudge, it is not effective either. For example, it has been shown that a default nudge to encourage towel reuse was less effective for people who were already concerned about the environment (Theotokis & Manganari, 2015). In a similar vein, the traffic light nudge to promote healthy food choices proved less effective for dieters than for non-dieters (Trudel et al., 2015). This indicates that if a person has strong nudge-congruent preferences there is no additional effect of the nudge; it became redundant. Strong prior preferences, either in favour of or against the nudged option, thus rendered the nudge ineffective. An important follow-up to this work, then, is to examine whether, and why, nudges are particularly effective when people are undecided, i.e., in *the absence of a clear preference*.

In the present article we will distinguish two situations in which people are undecided. Drawing inspiration from the vast literature on attitudes, we propose indifference as the first type. Indifference is characterized by a lack of perceived importance of the consequences of a decision. When people are indifferent they have no preference for a particular choice option, also referred to as *neutral* in the attitude literature (e.g., Kaplan, 1972). We distinguish conflicting preferences as the second type of situation. This type is quite the opposite in regard to the meaning of the decision; while the decision is deemed unimportant when indifferent, the decision is highly important when experiencing conflicting preferences. Conflicting preferences can make a decision difficult and unpleasant, and resolving or reducing the conflict is therefore important (Van Harreveld, Van der Pligt, & Liver, 2009). Both indifference and conflicting preferences are characterized by not knowing what to choose (i.e., undecidedness) and are expected to be optimal situations for an effective nudge. However, only under conflicting preferences is a nudge expected to make the decision easier.

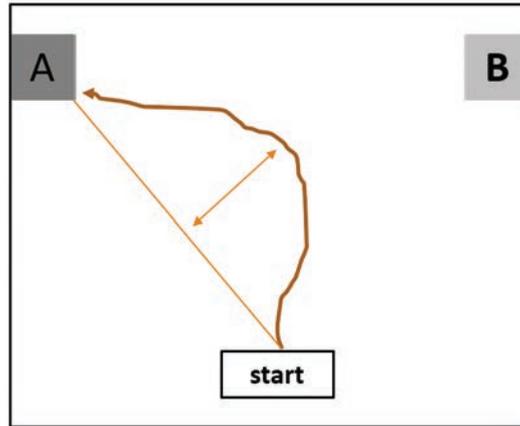
Although the current research is the first to directly test these notions, there is one recent paper that illustrates the effectiveness of a nudge under indifference. In this study the default printer setting was set from single to double-sided printing (Egebark & Ekström, 2016). A survey under all users showed that although they knew that double-sided printing is better for the environment, more than half of the users indicated that they did not care whether the default printer setting was single or double-sided. The change of the default setting resulted in a 15 percent reduction of paper use. This

study illustrates that even when people are not particularly invested in the outcome, i.e., have a neutral stance, a nudge intervention might result in a desirable behaviour change.

While the empirical work on nudges and indifference is still in its infancy, there is a more substantive body of research on the effect of environmental factors, such as nudges, on conflicting preferences (Kruglanski, Shah, Fishbach, Friedman, Chun & Sleeth-Keppler, 2002; Griskevicius, Goldstein, Mortensen, Cialdini & Kenrick, 2006; Tesser, Campbell & Mickler, 1983). It has been suggested that environmental cues can tip the scale in favour of one of the preferences and thereby reduce the conflict. This is well illustrated by a field experiment situated in a butcher shop, where customers were offered free samples of snacks while they were exposed to the smell of grilled chicken. While all customers were exposed to the smell that probably elicited a preference to take a snack, this setting only created a conflict for, so-called, restrained eaters, who also have the incompatible preference to refrain from snacking. In the experimental condition a clearly visible poster was placed on the entrance door that advertised a recipe for a 'slim dish'. It was found that customers who had a goal to restrain their eating ate significantly less when confronted with this environmental cue that reminded them of their goal, compared to the condition where there was no poster (Papies & Hamstra, 2010). This study illustrates that an environmental cue, in the choice context, seems to resolve conflicting preferences in favour of the sensible option.

While these studies demonstrate that a nudge can indeed be effective in the absence of a clear preference, it remains unclear whether the nudge actually facilitates the decision, i.e., makes it easier. Considering that indecisiveness is not regarded as a positive trait in most western societies (Yates, Ji, Oka, Lee, Shinotsuka & Sieck, 2010), rendering people reluctant to admit uncertainty about their choice, a more implicit measure is required to test the idea that a nudge facilitates a choice by reducing uncertainty.

To this end the current studies employ a mouse-tracker paradigm (e.g., Freeman & Ambady, 2010; Stillman, Shen, & Ferguson, 2018). This paradigm allows to measure implicit decision making processes as they unfold (Gillebaart, Schneider, & De Ridder, 2016). In this paradigm participants typically make a binary choice regarding an object by moving their mouse to one of the two choice options that are shown at the upper corners of the screen. The mouse-tracker calculates, amongst other measures, how much the participant strays from the most direct path possible from the object to their choice (maximum deviation). Figure 1 illustrates a prototypical mouse-tracker trial. Maximum deviation is often used as an objective approximation of how decisive the participant is in their choice, with a larger maximum deviation indicating more uncertainty (Gillebaart et al., 2016; Schneider, Van Harreveld, Rotteveel, Topolinski, Van der Pligt, Schwarz & Koole, 2015). The current studies will be the first to employ mouse-tracker tasks to gain online insight into the underlying processes of decision-making in the presence of a nudge.



**Figure 1.** Visual illustration Mouse-tracker trial.

The arrow indicates the maximum deviation from the most direct path possible to the chosen option.

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## OVERVIEW OF STUDIES

We conducted two experimental studies with the aim to test the effectiveness of a nudge in the absence of a clear preference. In study 1 participants categorized a range of coloured squares into either green or blue. The effectiveness of the nudge, i.e., steering participants' choices to blue or green, was tested for the colours that are neither clearly blue nor green, hereby simulating a situation in which people are undecided (i.e., experience no clear preference) when the consequences of the decision are relatively unimportant and thus mimicking indifference. In study 2 the effect of a nudge under conflicting preferences was investigated: (non-vegetarian) participants had to accept or reject meat products in a grocery shopping task. The consumption of meat is known to invoke conflicting preferences because people might simultaneously endorse reasons to choose meat (because they like the taste) as well as reject meat (because they know that meat consumption is harmful for animals and the environment) (Loughnan, Haslam, & Bastian, 2010). The magnitude of this conflict is stronger for some than others. The effectiveness of the nudge was tested for participants who experience conflicting preferences, and as a result are expected to be undecided about their choice.

Both studies employed a social proof nudge (e.g., Salmon, Fennis, De Ridder, Adriaanse & De Vet, 2014; Goldstein, Cialdini, Griskevicius, 2008) to steer participants' choices. The social proof nudge is based on the principle that decisions or behaviour of other people can be observed by a clue in the environment. Commercial enterprises use this principle in various forms. For example, to encourage sustainable behaviour, a hotel might display a social proof message in the bathroom, stating that previous guests reused their towels (Goldstein et al., 2008). In the current studies we adopted the example by Salmon and colleagues (2014) by telling participants in the social proof

conditions that the responses of (alleged) previous participants would be shown in a bar graph during the task. Our first hypothesis is that the nudge will be effective in steering the choice when people have no clear prior preference, i.e., are undecided. Secondly, we hypothesize that, in the case that there is no clear preference, a nudge facilitates the decision, as indicated by reduced uncertainty compared to a control setting (i.e., lower maximum deviation scores on the mouse tracker task), but only for conflicting preferences (Study 2), not under indifference (Study 1).

## STUDY 1

Study 1 simulated a choice situation in which people have no clear preference because they are indifferent about the choice options. Participants were asked to judge whether a presented colour square is either blue or green. In some of the trials the decision for blue or green was easy because participants could be certain about their answer (i.e., the colour is clearly blue or green). In the critical trials of interest, however, participants were expected to be *uncertain* about their decision because the colour was ambiguous. In these trials, the effectiveness of the social proof nudge was tested. Based on two pilot studies, 7 critical stimuli were selected for which participants would have no clear preferences (these could be described as “ocean/aqua” or “turquoise”). For exploratory purposes we measured state self-control, general doubt tendencies and participants’ identification with the social proof reference group, as these factors might influence the effectiveness of the nudge (e.g., Salmon et al., 2014; Goldstein et al., 2008).

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## METHOD

**Design and procedure.** The present study used a mixed design with trial type (critical vs. non-critical) as a within-subject factor and condition (social proof blue vs. social proof green vs. control) as a between-subject factor. The study was approved by the Faculty of Social Sciences’ ethics committee. Participants were randomly assigned to one of the three conditions. After providing consent participants filled out the state self-control scale. Then they continued with the mouse-tracker task, followed by the General Doubt Questionnaire and a funnelled debriefing that included manipulation checks of the nudge. Participants were asked for their age, gender, colour-blindness and handedness. Upon finishing participants were thanked and prompted to leave any comments or questions.

**Participants.** 277 Mturk workers with an approval rate higher than 97% participated in this study and were compensated with 0.37 dollar cents. Data from 22 participants were excluded from analysis; 20 participants because their mouse-tracker data could not be matched to the questionnaire data and two participants because they indicated to be colour-blind. Two hundred and fifty-five participants (44.7% female) were included in the analysis, with 84 participants in the control condition, 86 in the social proof blue and 85 in the social proof green condition. The majority of the participants were right-handed (93.4%) and the average age was 36.31 years ( $SD = 11.50$ ).

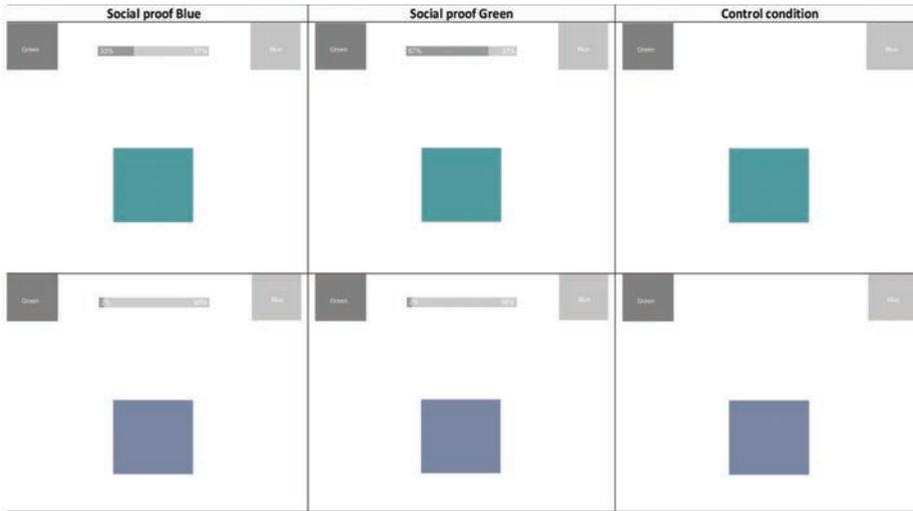
## Materials

**State Self-Control Scale (SSCS).** The SSCS (Twenge, Muraven & Tice, 2004) was assessed as an approximation of the available cognitive resources, since individuals low in state self-control might be particularly prone to be responsive to nudges (e.g., Brownstein, 2003; Salmon et al., 2014). The state self-control scale consists of 10 items, e.g., “I would want to quit any difficult task that I was given”. Participants responded on a 7-point Likert scale ranging from 1 (*not true*) to 7 (*very true*). The items 5 and 7 were reverse coded, the average was calculated to provide a state self-control score. A lower score indicates higher state self-control. Cronbach’s  $\alpha$  was .88.

**Mouse-tracker task.** The mouse-tracker was programmed in JavaScript and implemented on the LimeSurvey platform (version 2.05+ build 141229). Participants categorized 33 colour stimuli from the Farnsworth- Munsell 100-Hue test (Cranwell, Pearce, Loveridge, & Hurlbert, 2015) as either “green” or “blue” by moving their mouse to the choice-box (“green” corresponding to the left box, “blue” corresponding to the right box). The non-critical trials consisted of 26 stimuli (12 green and 14 blue). The dependent variable “Choice Likelihood” was constructed by coding the choice for green as 1 and the choice for blue as 0 for the critical trials and averaging the scores. A score of 0.71, for example, corresponds to choosing 5 out of 7 times for green in the critical trials. All stimuli were presented in a random order. To assess uncertainty an average maximum deviation was calculated for all trials.

**Nudge.** The social proof nudge was designed as a bar graph at the top of the screen that allegedly represented the choices of previous participants (Figure 2). Participants in the social proof conditions were explicitly told that the bar represented a summary of the answers of previous participants. Both social proof conditions had the same bar graphs for the non-critical trials, with the ratings ranging from 85% to 99% in favour of the unambiguous colour (i.e., in favour of green for the green trials and in favour of blue for the blue trials). The two social proof nudge conditions (green and blue) only differed from each other in the critical trials. Each of the seven critical trials was paired with a “previous rating” between 62% and 82%. This rating was the same in both conditions only in the social proof green the rating was in favour of green, and in the social proof blue condition it was in favour of blue. In the control condition none of the trials had bar graph at the top of the screen.

**General Doubt questionnaire (GDQ).** The GDQ measured the daily doubt experience of participants. This measure was assessed for exploratory purposes. It consisted of eight statements about doubt, which participants evaluated to the extent it applied to them, (e.g., “I find it difficult to make decisions”, “I can choose well when faced with multiple decisions “[rev. coded]). Participants responded on a 5-point Likert scale ranging from 1 (*false*) to 5 (*true*). The items 3, 5 and 7 were reverse coded. The GDQ had a Cronbach’s  $\alpha$  of .90. A higher score indicates that the participant generally doubts more when making decisions.



**Figure 2.** Visual representation of study design in Study 1.

The columns represent the 3 between subject conditions with the nudge. The top row is an example of a critical trial, the bottom row is an example of a non-critical trial (in this case blue).

**Funnelled debriefing.** First, all participants were asked whether they had seen the answers of previous participants during the choice task, and if so, found them useful, answered by yes or no. Next, identification with other Mturk workers was assessed with two items. Participants indicated to what extent they saw themselves as a member of the Mturk Workers community and to what extent they identified with Mturk workers on a visual analogue scale ranging from 0 (*not at all*) to a 100 (*very much*). The two items were highly correlated,  $r = .78, p < .001$ . An identification variable was calculated by the average of the two items.

## RESULTS

**Randomization check.** Separate one-way ANOVA's showed that participants across the three conditions did not differ in age, SSCS, identification with other Mturk workers nor on the GDQ, all  $p$ 's  $> .141$ . A Chi-square test showed that gender and handedness did not differ per condition,  $p$ 's  $> .172$ , indicating successful randomization.

**Manipulation check.** To check if the critical trials indeed invoked more uncertainty than the non-critical trials, maximum deviation scores were compared in the control (no nudge) condition. A paired t-test indicated that participants exhibited more uncertainty, as measured with maximum deviation, towards the critical stimuli ( $M = 144.44, SD = 79.85$ ) than towards the non-critical stimuli, ( $M = 120.83, SD = 63.02$ ),  $t(83) = 4.16, p < .001$ . The successful manipulation of uncertainty had a medium effect size,  $d = 0.46$ .

As for the nudge manipulation, approximately half of the participants in the social proof conditions indicated to have seen the social proof bar, 51.1% in the social proof blue condition and 51.8% in the social proof green condition. Surprisingly, participants in the social proof green condition (62.8%) found the presence of the nudge significantly more helpful than the participants in the social proof blue condition (37.8%),  $\chi^2(1) = 5.50, p = .019$ . Given the large proportion of participants who had not noticed the social proof nudge, it was decided to run the main analyses twice, once with all the participants and once without the participants who failed to notice the social proof nudge. The participants who failed to see the social proof bar did not differ significantly from the participants who *did* see the bar in age, sex, handedness, SSCS and identification with other Mturk workers, all  $p$ 's  $> .167$ . There was a marginally significant effect for the GDQ,  $p = .065$ ; the participants who had seen the social proof had slightly higher scores on the GDQ compared the control and drop-out participants.

#### **Main analysis.**

*Effect of social proof nudge on choice.* It was hypothesized that in the absence of a clear preference the nudge would influence the outcome. First, a one-way ANOVA was run with Choice Likelihood as the dependent variable and condition as predictor variable. When all participants were included, regardless of having seen the nudge, the effect of condition was marginally significant,  $F(2, 254) = 2.43, p = .090, h^2_{\text{partial}} = 0.02$ . Excluding the participants who had not noticed the nudge led to a significant effect of condition on the choice,  $F(2, 169) = 5.36, p = .006, h^2_{\text{partial}} = 0.06$ . Pairwise comparisons with Bonferroni correction showed that participants in the social proof green condition ( $M = 0.74, SD = 0.22$ ) were significantly more likely to choose green than participants in the control condition,  $M = 0.57, SD = 0.33, p = .004$ , Cohen's  $d = 0.65$ . Participants in the social proof blue condition ( $M = 0.63, SD = 0.30$ ) did not differ significantly from the control condition,  $p = .766$ , Cohen's  $d = 0.20$ . The nudge was effective in steering the choice to green, but not to blue (see figure 3).

*Facilitation by the nudge.* It was explored whether the social proof nudge would yield a facilitation effect, indicated by a lower maximum deviation (i.e., lower uncertainty) in the critical trials in the nudge conditions, compared to the control condition. First, when including all participants, a one-way ANOVA with maximum deviation in the critical trials as outcome variable and condition as predictor indicated no significant difference between the conditions,  $F(1, 253) = 0.90, p = .408, h^2_{\text{partial}} = 0.01$ . Excluding the participants who had not noticed the nudge led to a marginally significant effect of condition on maximum deviation,  $F(2, 169) = 2.71, p = .069, h^2_{\text{partial}} = 0.03$ . Under indifference a nudge does not seem to influence the uncertainty that the stimuli invoked (see figure 3).

**Exploratory analysis.** To understand why some participants found the nudge helpful, a one-way ANOVA was ran with maximum deviation for the critical trials as outcome variable and helpfulness (yes vs. no) as predictor. Helpfulness was significantly related to the amount of uncertainty that was experienced in the critical trials,

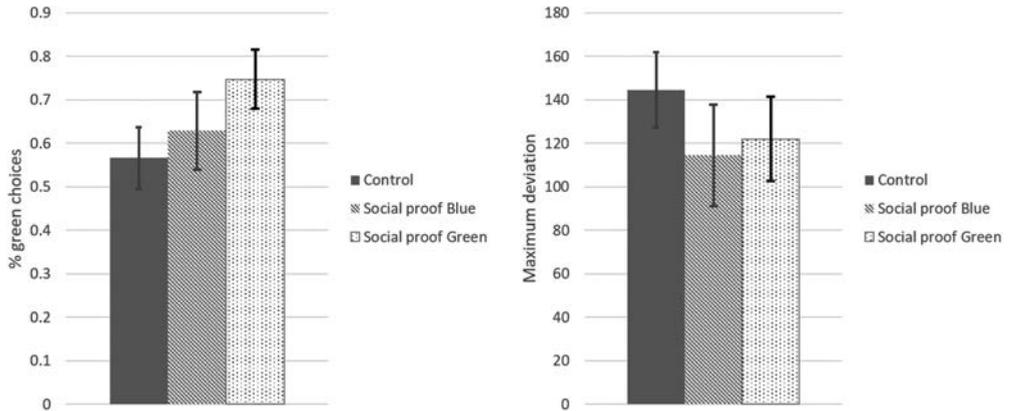


Figure 3. Results Study 1.

Left represents the effect of the nudge on the percentage of green choices in the critical trials. Right represents the effect of the nudge on the maximum deviation (i.e., experienced uncertainty). In these bar graphs the participants who did not see the nudge in the social proof conditions were omitted.

$F(1, 90) = 10.51, p = .002, h^2_{\text{partial}} = 0.11$ . Participants who considered the nudge helpful had experienced higher uncertainty ( $M = 143.58, SD = 73.38$ ) than the participants who did not find it helpful,  $M = 97.07, SD = 62.64$ . Thus even though the nudge did not influence uncertainty, uncertainty did influence the perceived helpfulness of the nudge.

## DISCUSSION

The aim of Study 1 was to test the effectiveness of a nudge when people are indifferent about choice options and, exploratorily, whether a nudge makes uncertain decisions easier. It was demonstrated that the social proof nudge influenced participants' choices when they had no clear preference (i.e., in the critical trials) in the direction of green, but not towards blue. One possible explanation for this discrepant finding could be that, despite two pilot studies, the critical stimuli on average were more optically green than blue, leading to participants having a slight response tendency for green. This idea is corroborated by the choices from participants in the control condition who were also more likely to choose green over blue and by the finding that participants in the social proof blue condition rated the nudge as less helpful compared to participants in the social proof green condition. Taking this methodological issue into account, we conclude that the first hypothesis, that a nudge is effective in the absence of a clear preference because of indifference, was partially supported. We found no indication of a facilitation effect under indifference. While Study 1 pertained to choices that had little personal relevance, Study 2 tests the effectiveness and facilitation effect of a nudge under conflicting preferences, where personal relevance is high.

## STUDY 2

In study 2 we made use of the *meat-paradox* phenomenon (Loughnan et al., 2010) to invoke conflicting preferences in a choice situation. The consumption of meat has been well documented in the literature as causing ambivalent feelings (e.g., Buttlar & Walther, 2018; Berndsen & Van der Pligt, 2004). On the one hand, people like the taste of meat and on the other hand, they experience discomfort when thinking about what happened to the animals or the consequences for the environment. Because the magnitude of this conflict differs per individual, a within-subjects design was used to investigate the effectiveness of the nudge in steering the choice towards refraining from meat consumption.

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## METHOD

**Participants.** An a priori power analysis using G\*Power3.1, indicated a minimal sample size of 84 to achieve statistical power of .80 to detect a small effect size ( $d$ ) of 0.10 for a within-subjects design (Faul, Erdfelder, Lang, & Buchner, 2007). One-hundred and twenty participants were recruited via leaflets and posters on the university campus and through social media for a study advertised as online grocery shopping. Twenty participants were excluded from the analyses because they adhered to a vegetarian or vegan diet, leaving a final sample size of 100 participants (77% women; mean age 22.10 years,  $SD = 4.28$ ). Participants received either partial course credit or two euros in exchange for their participation.

**Procedure and design.** This study had a within-subjects design (control vs. social proof nudge) with percentage of chosen meat products as the dependent variable. Participants were told that the aim of the study was to select supermarket products for an alleged future experiment, and that they would be presented with 100 new products and 100 previously tested products that needed validation. After providing informed consent participants filled out a questionnaire that assessed demographics (gender, age, height, weight, diet type and education level). Frequency of meat consumption was assessed to corroborate the diet type. Consecutively, self-reported ambivalence and attitude towards meat were assessed. To conceal the true aim of the study, self-reported ambivalence and attitude questions were also included for snacks and non-organic fruit/vegetables. Familiarity with the supermarket and current hunger and thirst were assessed before participants proceeded to the shopping task. This shopping task was an adaptation of the mouse tracker task in study 1. In this study participants indicated in the mouse-tracker program for each of a 100 “new” products whether they would ‘select’ or ‘reject’ that product. This first block of “new” products served as the control condition. They then proceeded to the second block in which they again indicated ‘select’ or ‘reject’ for 100 products that were allegedly tested before. The ratings of these alleged previous participants were shown in the top half of the screen as a percentage bar to serve as a social proof. Participants were explicitly told that the bar represented

a summary of the answers of previous participants in this condition. After the second block participants were probed for the conjecture of the study and received a funnelled debriefing that served as a manipulation check. The study was approved by the Faculty of Social Sciences' ethics committee.

### Measures

**Self-reported ambivalence.** The extent to which respondents' feelings toward eating meat were conflicted was measured with three items on an 11-point scale ranging from 0 (*feel no conflict at all, feel no indecision at all, and completely one-sided reactions*) to 10 (*feel maximum conflict, feel maximum indecision, and completely mixed reactions*) (Priester & Petty, 1996; Berndsen & Van der Pligt, 2004). Cronbach's alpha was .82.

**Attitudes towards meat.** Attitudes were assessed to corroborate the self-reported ambivalence. Previous studies have shown that conflicting feelings about meat correlate highly with negative attitudes (Berndsen & Van der Pligt, 2004). Five semantic differential scales were used as measurement ranging from 0 to 100 and had the labels bad-good, unpleasant-pleasant, against-in favour of, unfavourable-favourable, and negative-positive (Berndsen & Van der Pligt, 2004). Cronbach's alpha was .90. The variable attitude was constructed by calculating the mean of the five items. A higher score indicates a more positive attitude towards eating meat. The average attitude score was  $M = 53.94$ ,  $SD = 19.30$ .

### Materials

**Mouse-tracker task.** In each block participants decided for one hundred products (40% meat and 60% non-meat filler trials) whether they would reject or select that product by moving the mouse to one of these two options. In each trial, an image of the product was shown that revealed no nutritional or price information. The products in the control and social proof condition were matched such that they were highly similar but still different, for example, lasagne Bolognese in the control condition and lasagne with minced beef in the social proof condition, see Figure 4 for an example trial. Within each block all product trials were presented in a random order.

**The nudge.** In the social proof condition all critical trials (the meat products) were accompanied by a social proof bar that displayed 82% reject versus 18% select. For the purpose of a coherent cover story, products in the non-critical trials (the non-meat products) were also presented with a social proof bar displaying a distribution of percentages such that participants should be encouraged to reject roughly half of the products (i.e., respectively reject- select 10 - 90%; 32 - 68%; 54 - 46%; 66 - 34%). The dependent variable was the percentage of chosen meat products per block<sup>1</sup>.

## RESULTS

**Descriptives.** Participants in Study 2 had an average self-reported ambivalence score of 4.13 ( $SD = 2.29$ ). To visualize the effect on the chosen meat products and the uncertainty

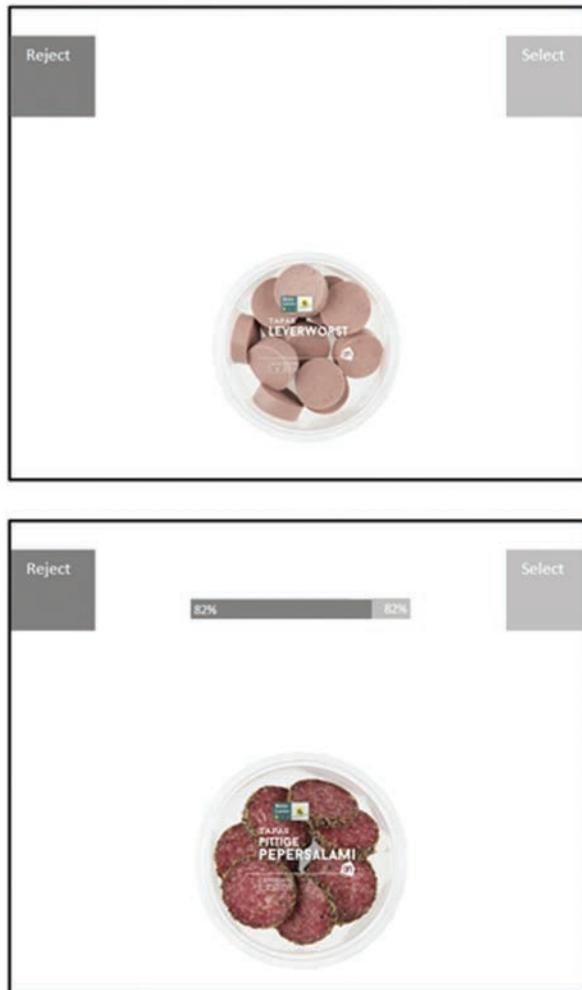


Figure 4. Example trial Study 2.

The top row is an example of the control condition. The bottom row is an example of the matched product in the nudge condition.

a median split was performed on self-reported ambivalence, see also Berndsen and Van der Pligt, 2004. This resulted in 47 participants in the low conflict group, who subjectively experienced relatively few conflicting preferences ( $M_{\text{self-reported ambivalence}} = 2.06$ ,  $SD = 1.40$ ) and 51 participants in the high conflict group, who experienced relatively a lot of conflicting preferences regarding meat consumption,  $M_{\text{self-reported ambivalence}} = 5.96$ ,  $SD = 1.00$ . Congruent with previous research [33], attitudes towards meat were related to the extent of conflicted feelings; the low conflict group ( $M_{\text{attitudes}} = 66.96$ ,  $SD = 15.89$ )

had significantly more positive attitudes towards meat consumption than the high conflict group,  $M_{attitudes} = 42.39$ ,  $SD = 14.05$ ,  $t(98) = 8.22$ ,  $p < .001$ .

### Main analysis

*Effect of social proof nudge on meat choice.* To test the first hypothesis that a nudge is effective in steering a decision when people have no clear preference because of conflicting preferences, a repeated measures ANOVA was performed, comparing the percentage of chosen meat products in the control condition to the percentage in the nudge condition. Self-reported ambivalence was standardized and entered as a between subjects predictor. There was a main effect of condition; in the nudge condition participants chose significantly fewer meat products (27.83%,  $SD = 19.81$ ) than in the control condition (30.41%,  $SD = 17.93$ ),  $F(1, 96) = 10.49$ ,  $p = .002$ ,  $h^2_{partial} = 0.10$ . There was also a main effect of self-reported ambivalence across conditions,  $F(1, 96) = 14.12$ ,  $p < .001$ ,  $h^2_{partial} = 0.13$ . Figure 5 shows the average choice for the meat products in percentages across conditions; a median split for self-reported ambivalence showed that highly conflicted individuals selected 22.36% of the meat products, whereas less conflicted individuals selected on average 36.18% of the meat products. Importantly, there was a significant interaction between Condition and Self-reported ambivalence; the effect of the nudge was more pronounced when participants experienced higher subjective ambivalence about consuming meat; resulting in fewer meat choices,  $F(1, 96) = 8.71$ ,  $p = .004$ ,  $h^2_{partial} = 0.08$ . These results are in support of our hypothesis that a nudge is indeed effective for people who have no clear preference for one choice option, specified as conflicting preferences.

*Facilitation effect of the nudge.* To test our second hypothesis that a social proof nudge facilitates decision-making a repeated measures ANOVA was performed

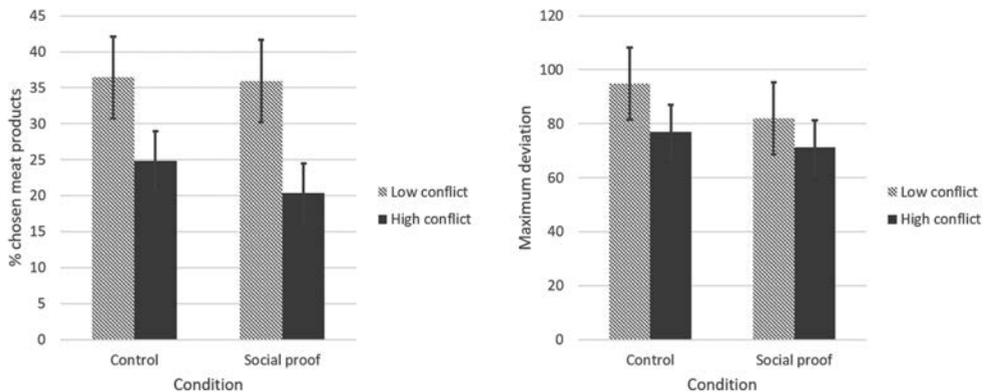


Figure 5. Results Study 2.

Left visualizes the effect of the nudge on the percentage of meat choices. Right visualizes the effect of the nudge on the maximum deviation (i.e., experienced uncertainty). For these graphs a median split was performed on self-reported ambivalence, distinguishing low and high conflicted participants.

comparing the maximum deviation scores for the meat trials between the control and the nudge condition. The self-reported ambivalence was standardized and entered as a between subjects predictor. There was a main effect of condition, participants showed less uncertainty in the nudge condition ( $M = 76.35$ ,  $SD = 36.20$ ) than in the control condition,  $M = 85.54$ ,  $SD = 41.34$ ,  $F(1, 96) = 12.15$ ,  $p = .001$ ,  $h^2_{\text{partial}} = 0.11$ . There was no significant main effect for self-reported ambivalence,  $p = .134$ . Also the Condition x Self-reported ambivalence interaction effect was not significant,  $p = .178$ ,  $h^2_{\text{partial}} = 0.02$ , indicating that the nudge facilitated the decision for both highly and less self-reported conflicted individuals (see Figure 5).

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## DISCUSSION

In the second study the social proof nudge was shown to be effective in reducing the number of chosen meat products; participants chose less meat products in the presence of a social proof nudge compared to the situation in which there was no nudge. Moreover, we found that this nudge effect was stronger for people who reported to be more conflicted about eating meat (i.e., who had less clear prior preferences). These results provided support for the first hypothesis that a nudge influences decisions when people have no clear preferences. An important limitation related to study 2 was that order of the blocks was not randomized. The main reason for not counterbalancing the blocks was that the control condition might become “contaminated” by the carry-over effect of the implied social norm to reject meat in the nudge condition. With regard to the second hypothesis (i.e. that a nudge facilitates the choice by reducing uncertainty) it was found that in the presence of a social proof nudge participants showed less uncertainty. However, the reduction in uncertainty by the nudge was unrelated to participants’ self-reported conflicting preferences (i.e., self-reported ambivalence).

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## GENERAL DISCUSSION

Building on prior research showing that nudges are ineffective when decision makers have strong antecedent preferences, we tested the hypothesis that a nudge would be particularly effective in the *absence* of a clear preference. The absence of a clear preference was conceptualized as indifference in Study 1, and as conflicting preferences in Study 2. Moreover, we tested the hypothesis that a nudge would facilitate the choice by reducing people’s uncertainty, as implicitly assessed by measuring their mouse movements while they made their choices. In line with the first hypothesis, both studies demonstrated that the social proof nudge was effective in guiding people’s choices when they did not have a clear prior preference; steering colour categorization towards green in Study 1 and steering the decision concerning meat products towards “reject” in Study 2. The second hypothesis was tested and supported in Study 2. As expected, the nudge did not reduce the uncertainty that the critical trials invoked in Study 1. In Study 2,

on the other hand, the nudge did reduce uncertainty when deciding to select or reject meat products. Together, the results from these studies suggest that a nudge is effective in guiding people's choices particularly when they do not know what to choose and that a nudge has the potential to reduce uncertainty resulting from conflicting preferences.

Even though peoples' preferences influence behaviour all the time (e.g., Papies & Hamstra, 2010; Klöckner & Verplanken, 2018; Friese, Wänke & Plessner, 2006) they have received scant empirical attention in the literature regarding nudges. In the current article we proposed two situations in which people might be undecided and have no clear preference that trumps the effectiveness of a nudge; indifference and conflicting preferences. The findings in Study 1 suggest that there might be third situation. In the first study we unexpectedly found that the nudge was only effective in promoting choices for 'green', while the same nudge did not work to steer people toward choosing 'blue' when categorizing ambiguous colours. One potential explanation is that the critical trials invoked a slight preference for green, thereby perhaps inducing the phenomenon of *doubt* than rather than indifference. Doubt is characterized by having a slight preference or inclination for one particular option but lacking the confidence to base a decision on it (Koriat, Lichtenstein, & Fischhoff, 1980). When viewing the results from Study 1 as caused by doubt, i.e., a slight preference for green, it can explain why participants in the social proof green condition more often found the nudge helpful than those in the social proof blue condition; it helped confirm their initial idea.

The effectiveness of a social proof nudge relies on people showing conformity behaviour, that is, do what other people apparently did. Deutsch and Gerard (1955) distinguished two powerful motives that lead people to conform; the desire to be liked (i.e., normative social influence) and the desire to be right, (i.e., informational social influence). Since participants are not held accountable for their choices in the current studies, the normative social influence account is the least likely to be applicable (see also, Lamberton, Naylor, & Haws, 2013). Instead, the informational social influence account can best explain the results of the current studies. In the first study one could argue that there is an objective "correct" choice (e.g., Kelly, 1943). In the second study, the "correct" choice might depend on the individuals' perceived social reality, i.e., to what extent the choice for selecting a meat product would be *morally* correct. The effect of the nudge in Study 2 was stronger for participants who experienced high self-reported ambivalence to meat, i.e., they were more likely to conform to the implied descriptive norm to reject meat. While taste preferences would be unaffected by a social proof nudge, information about the decisions of others might weigh in as a moral compass for people who feel ambivalent about eating meat. People who experience low ambivalence, on the other hand, may not have the *desire to be right* since the decision is not perceived as having a "correct" or "incorrect" response. When people truly do not care about a decision they are unlikely to experience a desire to be right. The *absence* of a desire to be right could provide an explanation as to why some participants in Study

I did not notice the social proof bar; there was no need to look for extra information. Future studies should investigate whether indifferent individuals would be responsive to nudges that do not provide information, but instead rely on affordances, such as positioning nudges. Summarizing, the effectiveness of the social proof nudge in both studies can be explained because the nudge served as a source of information when there is uncertainty about the correct answer.

In the current studies reduced uncertainty was used to operationalize a potential facilitation effect of the nudge. Even though we did not find an indication that the nudge reduced uncertainty in Study 1, we did observe that the participants who indicated to find the nudge helpful had considerably higher uncertainty scores on the critical trials compared to the participants who found the nudge not helpful (i.e., for the participants who had noticed the nudge). This is in support of the informational account as a working mechanism of the social proof nudge. In Study 2, on the other hand, we observed an overall facilitation effect of the nudge (i.e., reduced uncertainty). As most participants reported to feel at least somewhat conflicted about eating meat, it might be that the range of self-reported ambivalence was too small to find a difference between people who did and did not experience conflict, as we would theoretically predict. Based on the current studies we can carefully conclude that the extent to which people might feel uncertainty in relation to a choice is a relevant factor to take into account when designing nudge interventions.

For many types of nudges the facilitation effect is assumed to be the essential working mechanism. For example, when nutrition information is presented using a traffic light system, it becomes presumably easier to understand; or a staircase that is made more salient may become easier to find. Vigilance about these assumptions is warranted however. To illustrate, despite the intention to simplify nutritional information, consumer studies have shown that traffic labels do not necessarily make it easier to judge the healthiness of products (Feunekes, Gortemaker, Willems, Lion, & Van den Kommer, 2008). For many other nudges, the assumed working mechanism has not even been explicitly tested at all. In the current studies we employed the mouse-tracker paradigm to assess whether a nudge made a decision easier, with the main advantage that it provides an insight in the difficulty of the decision even when people are not consciously reflecting on this decision (e.g., Gillebaart et al., 2016). However, mouse-tracker measurements are not feasible for all types of nudges since it requires a computer task setting. Finding ways to critically test the assumptions related to nudging remains key in optimizing nudge interventions.

Although it is unlikely that any choice architect thinks that people would be better off on the long-run if they would choose blue over green in a computer task, Study 1 is an operationalization of a situation in which the decision maker is only marginally interested in the outcome of the decision; which can be the case, for example, in water conservation behaviour (Onyenankeya, Caldwell, & Okoh, 2015). In this day and age many decisions, for example about sustainable consumption, are still regarded as “first

world problems” (Mani, Mullainathan, Shafir, & Zhao, 2013). Acknowledging that a considerable part of the population has more immediate concerns, future research should invest in finding and testing effective nudges that help people make desirable decisions even when people have no concern for the consequences, without infringing on their prior preferences.

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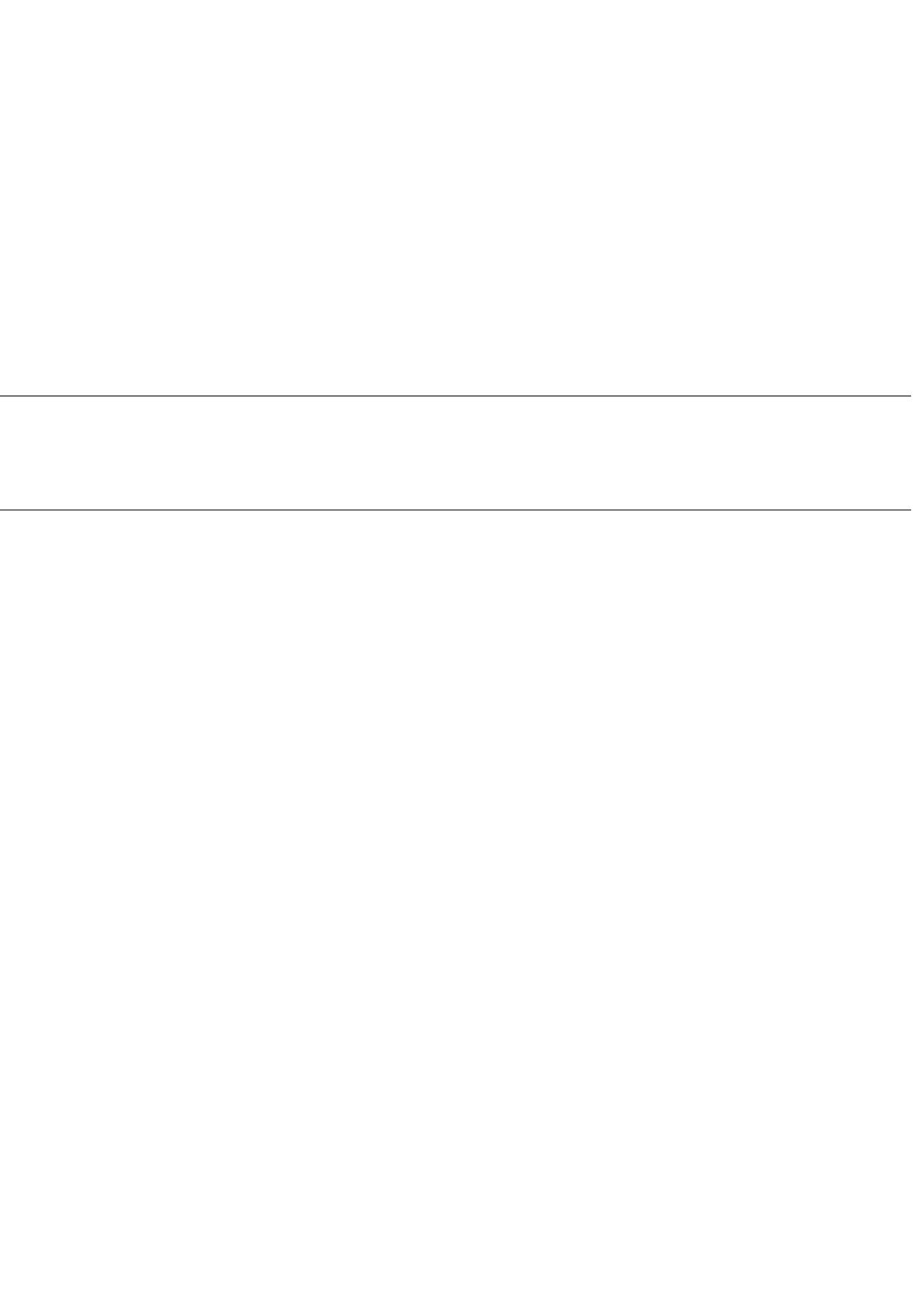
## CONCLUSION

Increasing our understanding of how people’s a priori preferences influence the effectiveness of nudges allows for better nudge interventions that are more specifically directed toward certain target groups and/or certain types of choices. One implication in this regard would be that certain behaviour might be more ‘nudgeable’ in certain populations or settings. For example, while repositioning healthy snacks might work to stimulate healthy choices at the train station, because people want to eat *something* to curb their hunger, a similar intervention might not be effective in a movie theatre if people would have stronger preferences to treat themselves to something more hedonically pleasing, i.e. something unhealthy. These studies are contributing to the literature not only because they have demonstrated that a nudge is effective in steering the decision in the absence of a clear preference, but also because they are one of the first to test the facilitation effect of nudges with a novel method. While nudging has shown to be effective in influencing a decision, the current work implicates an important role for other interventions, such as education, that shape preferences in the first place. The combination may be key to a less uncertain future for nudge interventions (Mols, Haslam, Jetten, & Steffens, 2015).

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# CHAPTER 6

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SUMMARY AND GENERAL DISCUSSION



“...It is not a question of starting. The start has been made. It’s a question of what’s to be done from now on...”

B.F. Skinner, Walden Two (1976) p. 257

Ever since their introduction in 2008, nudges have sparked the interest of policy makers, the general public and researchers from various disciplinary backgrounds (e.g., Hausman & Welch, 2010; Hansen & Jespersen, 2013; Thaler & Sunstein, 2008). Nudge interventions alter the choice architecture (i.e., the way choice options are presented) to encourage the most sensible choice option without obstructing alternative options or changing financial incentives (Thaler & Sunstein, 2008). Nudges do not require a person’s full attention or reasoning capacity; instead, they rely on the mental shortcuts and automatic processes with which people effortlessly navigate their daily lives. By making small adjustments in the choice architecture, nudges promise to act as a behaviour change tool that helps people make decisions that align with their own goals and values. Key examples include the placement of healthy products at eye-level in a supermarket, to increase the likelihood of their selection (e.g., Foster et al., 2014); devices that automatically turn off after 20 minutes of inactivity to save energy (e.g., Hirst, Reed, Kaplan, & Miller, 2013); and signs in hotel rooms stating that ‘83.4 per cent of previous guests reused their towel’ to encourage sustainable behaviour (e.g., Goldstein, Cialdini & Griskevicius, 2008). Nudge critics warn that because of the shrouded nature of nudges, people might be steered towards behaviours or decisional options that go against their will. Thus far, the issue of whether nudges support or infringe on people’s a priori preferences (i.e., goals, desires, intentions, values) has been discussed mostly in hypothetical scenarios and in theoretical terms. Both nudge proponents and opponents plead their cases based on the assumption that nudges are indeed effective in changing behaviour. The overall aim of this dissertation was to empirically explore the role of people’s a priori preferences in the effectiveness of nudge interventions.

This final chapter summarizes and discusses the main findings from the previous empirical chapters in light of the overall research aim, then presents reflection on both theoretical and practical implications. Lastly, the limitations of the present work are addressed, with specific recommendations for future research.

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## PREFERENCE

To have a preference is to favour one choice option over alternatives. Although the interpretation of preferences differs slightly per discipline (see Grüne-Yanoff & Hansson, 2008), it is commonly understood that people express their *in situ* preference for something when they make a decision. There is considerable debate on how these expressed preferences (i.e., behavioural choices) come about (e.g., Warren, McGraw,

& Van Boven, 2011; Simonson, 2008; Bettman, Luce, & Payne, 2008). Some posit that people hold stable inherent preferences informed by their goals and values and that the choices people make are thus primarily a means to a self-determined end (e.g., Kopetz, Kruglanski, Arens, Etkin, & Johnson, 2012). Throughout this dissertation these relatively stable preferences are referred to as *a priori preferences*. Others, however, emphasize that people's expressed preferences are constructed in the environment in which the choice is made, because the preference for one choice option is relative to available alternative options. In other words, this latter perspective emphasizes that people's decisions are influenced primarily by the context in which the decision is made (e.g., Lichtenstein & Slovic, 2006). Thaler and Sunstein used this latter view to defend the legitimacy of nudges: they state that people are constantly influenced by their environment all the time anyway, and they argue that nudges aim to use this influence 'to make the decision maker better off' (Thaler & Sunstein 2008; Sunstein, 2015).

To illustrate these different views on what determines a choice, imagine someone choosing a bar of chocolate over an apple in a cafeteria. This person might do this because he or she is a true chocoholic (i.e., due to a priori preferences) or because the apples in question are tucked away in the corner (i.e., due to contextual factors). Now, imagine that the cafeteria owner rearranges the choice architecture in such a way that the choice for apples is more appealing. Will this person now choose an apple instead of a chocolate bar despite their chocolism? To participate in and contribute to the ongoing debates surrounding nudges, it is important to know whether a choice is made primarily because of a priori preferences or because of the environment in which the choice is made (Hausman & Welch, 2010). As is generally the case with intrinsic versus extrinsic influence debates, reality often proves to be a nuanced mix of the two (e.g., Kenrick & Funder, 1988). Gaining more insight about where this nuance lies is key to understanding whether or not nudges infringe on people's stable a priori preferences. The role that a priori preferences play in the effectiveness of nudges was therefore the focus of this dissertation.

Measuring a priori preferences is not straightforward; they might be absent or weak, ill-defined, or not even consciously accessible (Grüne-Yanoff & Hansson, 2008; Goldin, 2015; Dijksterhuis & Van Olden, 2006). Therefore, we deduced and assessed participants' a priori preferences in several ways across the empirical chapters; in Chapter 2 we observed sit-stand behaviour as it occurred *before* the nudge intervention and through self-reported intentions. In Chapter 3 we measured participants' habit strength for adding a specific number of teaspoons of sugar to their tea. In Chapter 4 we measured motivation for different features pertaining to a soda portion size choice, and in Chapter 5 we aimed to experimentally manipulate the *absence* of clear preferences (i.e., indifference and conflicting preferences) regarding colour selection and choices for meat products. This wide variety of assessments of a priori preferences allowed us to formulate robust conclusions that are independent of specific assessment requirements.

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## SUMMARY OF EMPIRICAL FINDINGS

In **Chapter 2**, consisting of a field study investigating the long-term effectiveness of a nudge to promote stand-up working, we observed that before the nudge intervention, when the sit-stand desks were by default positioned at sitting height, municipality employees used the available desks less than two per cent of the time for stand-up working. When we adopt the view that decisions are a reflection of people's stable preferences, we might infer that these employees have low a priori preferences for stand-up working. Results from a baseline survey indeed indicated that on average employees had low-to-moderate intentions to work in a standing position. However, in support of the view that people's expressed preferences (i.e., their behavioural choices) are constructed by the choice architecture, we found that when the desks were by default placed at standing height, employees' stand-up working rates increased up to seven times, demonstrating that the choice architecture influenced behaviour. Interestingly, the intentions to work in a standing position were also significantly higher after the intervention was completed, even when the desks were no longer at standing level by default. Follow-up observations showed that after two months, the stand-up working rates were still approximately four times higher as compared to before the intervention. This initial field study thus suggests that the nudge intervention helped to reinforce intentions (i.e., make the a priori preferences stronger) and helped to put these intentions into action.

In **Chapter 3** we directly tested how a priori preferences, measured as habit strength, influenced the effectiveness of a nudge. Habits are behaviours (or cognitions) that have been repeatedly performed in a particular context to the extent that they are automatically initiated in response to a cue in that context (Orbell & Verplanken, 2010; Wood & R nger, 2016). It could therefore be argued that habits are a proxy of automatized a priori preferences. The results from this study demonstrated that when we triggered the habitual behaviour of adding sugar to tea, participants with stronger habits were less influenced by a portion size nudge that aimed to reduce their sugar usage. This demonstrates that strong a priori preferences might serve as a boundary condition for the influence of a nudge on behaviour.

In **Chapter 4** we further tested this boundary effect by measuring how well a priori preferences would predict the decisional outcome when faced with a nudge. In this chapter, a center-stage nudge was chosen to encourage participants to select the smallest of three glasses of soda. A priori preferences were operationalized as motivation for different features of the decision at hand: thirst, liking of the soda, intention to reduce soda consumption and general healthy consumption goals. Across all three studies, results demonstrated that preferences that were *incongruent* with the aim of the nudge (i.e., thirst and liking of soda) were a strong predictor for the selection of the alternative, non-nudged options, regardless of the presence of the nudge. These findings support the definitional promise of nudges, stipulating that people should remain free to select alternative options if they so desire (Thaler

& Sunstein, 2008). Moreover, the studies in Chapter 4 demonstrated that accounting for *nudge-congruent* preferences is also important when assessing the effectiveness of a nudge, since the tenacity of healthy consumption goals was a stronger predictor of the selection of the smallest glass of soda than the nudge condition. Together, the three studies in Chapter 4 suggest that if people know what they want, i.e., if they hold strong a priori preferences either aligned or not aligned with the nudge, a nudge is less likely to be effective in steering behaviour.

Elaborating on these findings, Chapter 5 set out to test if a nudge might be effective particularly in the *absence* of clear a priori preferences. In this chapter we initially distinguished two situations in which people might experience no clear preference: when people are indifferent to the choice at hand and when they experience conflicting preferences. In Study 1, indifference was experimentally induced by a colour categorization task: the outcome of a decision (blue or green) was presumed to be trivial to the participant. The results from Study 1 demonstrated that when participants did not notice the nudge, i.e., paid no attention to the choice architecture, it had no effect on their decisions. This suggests that when people are truly indifferent, they will not be influenced by a social proof nudge. In Study 2, conflicting preferences were operationalized by the degree of experienced ambivalence concerning meat consumption. The results from Study 2 demonstrated that stronger conflicting preferences, i.e., feeling ambivalent, made the nudge more influential in steering the choice. Findings from Study 1 brought into play a third situation in which people might experience an absence of clear preferences: doubt. In hindsight, we think that the social proof nudge was effective in steering the choice towards green because participants had a slight preference for this option, but were uncertain about it, i.e., they were in doubt. It was shown that the nudge was evaluated as more helpful when it confirmed their slight preference. The results from Chapter 5 thus suggest that when people are at least somewhat involved in the decision, but have no distinct a priori preference, the nudge is likely to influence behaviour.

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## THEORETICAL CONTRIBUTIONS

Thus far, scholars have mostly discussed the important issue of people's a priori preferences in relation to nudges only in hypothetical scenarios and theoretical terms; the overall aim of this dissertation, however, was to present studies that will stand as some of the first to contribute to the scholarly conversation with *empirical* findings about the role of people's a priori preferences in the effectiveness of nudge interventions. We have measured and tested the role of a priori preferences in the effectiveness of different nudges. Our findings suggest that a priori preferences first and foremost have a role as a boundary condition and suggest that in some cases their absence might even be a necessary precondition for nudge effectiveness.

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## A PRIORI PREFERENCES AS BOUNDARY CONDITION OF NUDGE EFFECTIVENESS

Nudge critics have warned that nudges might infringe on people's autonomy to choose freely. While the availability of alternative options is stipulated specifically in the definition of nudges (Thaler & Sunstein, 2008), it has been argued that the mere availability of an alternative does not guarantee that people actually can and will select these alternative options (Hausman & Welch, 2010). The findings in this dissertation, however, provide empirical support for the notion that people *do* use their freedom of choice to forgo the nudged option and select the alternative option if they desire. In Chapter 2, for example, we saw that even during the intervention period, the majority of municipality employees used the Sit-Stand Desks for sitting because they did not care to stand. In Chapter 3, we saw that participants who had a strong habit for drinking their tea with a certain degree of sweetness simply took larger, heaping scoops—or simply used more scoops—when faced with a smaller, nudged, teaspoon. In Chapter 4, thirsty participants who enjoyed drinking Fanta or cola selected one of the larger portion sizes, and in Chapter 5, participants selected meat products when they so desired, despite the nudge suggesting to reject them. These results demonstrate that nudge-*incongruent* preferences, i.e., a priori preferences for the alternative options, are a boundary condition for the influence of a nudge on people's behaviour.

The findings in this dissertation indicate that strong *nudge-congruent* a priori preferences also serve as a boundary condition for the effectiveness of nudges. Since nudge-congruent a priori preferences have the same decisional outcome as the one the nudge intervention aims to stimulate, it renders the nudge intervention redundant for these individuals. For example, the employees discussed in Chapter 2 who regularly worked in a stand-up position before the nudge intervention continued doing so during the intervention period. Likewise, the studies in Chapter 4 demonstrated that participants with strong healthy consumption goals were likely to select the smallest portion of soda, rendering the nudge obsolete. These findings are consistent with earlier publications showing that nudge interventions were ineffective when the targeted population held strong nudge-congruent preferences (e.g., Trudel, Murray, Kim, & Chen, 2015; Theotokis & Manganari, 2015). The theoretical importance of this is that it helps to narrow down the exact population that can reasonably be expected to be susceptible to nudge interventions.

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## NO PREFERENCE, NO PROBLEM – PREDICTING WHEN NUDGES WILL INFLUENCE BEHAVIOUR

The current dissertation underscores the idea that nudge researchers and policy makers should be aware that nudge interventions, in terms of effectiveness, target 'the inconsistent choosers' (Goldin, 2015), i.e., those individuals who do not have strong a priori preferences and who are therefore more influenced by the choice

architecture. This has three important implications for interpreting the effectiveness of nudge interventions, as illustrated in Figure 1. The first implication is that the accuracy of the effect size of a nudge is directly related to the number of inconsistent choosers in a sample. Relatively more inconsistent choosers in a sample will provide a more accurate estimation of the effectiveness; see row A. The second important implication is that although the number of individuals with strong nudge-*incongruent* a priori preferences form a clear ceiling for the hoped-for end result of a nudge intervention, these individuals do not influence effect size estimations of nudge interventions; see row B. The third important implication is that individuals with strong nudge-*congruent* a priori preferences *do* influence the effect size accuracy. The larger the group of individuals who are already making the sensible choice due to their a priori preferences, the more the influence of a nudge intervention will be underestimated; see row C. Taking stock of a priori preferences before the start of a nudge intervention can thus provide a more realistic assessment of the potential effectiveness of a nudge.

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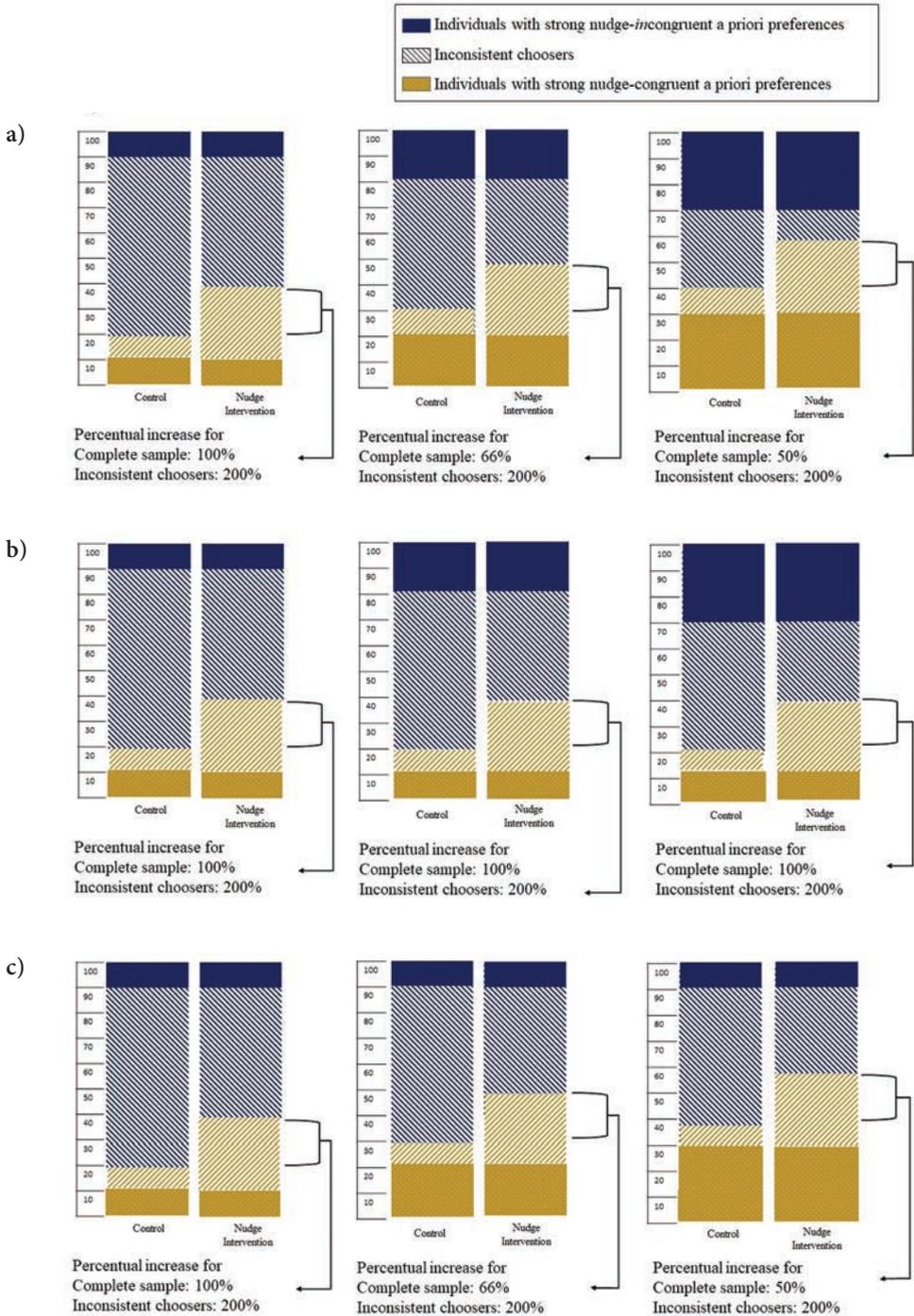
## NUDGE EFFECTIVENESS

In the previous paragraph we specifically wrote *potential* effectiveness of a nudge to distinguish from the actual effectiveness of a nudge. The intense debates on nudges all work from the underlying assumption that nudges are effective in steering behaviour. The findings in this dissertation challenge this critical assumption. We have demonstrated that strong a priori preferences form a boundary condition for the effectiveness of nudges (i.e., the extent to which they influence behaviour). However, the effectiveness of a nudge is not solely dependent on the a priori preferences that people have; in other words, the mere absence of strong a priori preferences does not guarantee that any nudge will be effective in changing behaviour. Nudges generally rely on the mental shortcuts and automatic processes with which people effortlessly navigate their daily lives. Some of these routes will be more universal and applicable than others, influencing the effectiveness of a nudge to change the behaviour of the inconsistent choosers. For example, a proximity nudge that requires people to exert more physical effort to reach an unhealthy snack might be more influential in a nursing home than in a kindergarten class, since spanning, say, 40 cm might be more physically arduous for the elderly than for children (e.g., Maas, de Ridder, de Vet, & de Wit, 2012). Similarly, distinctly printing the number of calories per serving on a package might only be influential when the decision maker knows how to interpret the number that the calories represent (Breck, Cantor, Martinez, & Elbel, 2014).

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## THE DUEL OF THE DUAL SYSTEMS

Because of the prominent place of Kahneman's version of the dual-systems theory in the book *nudge* (Thaler & Sunstein, 2008; Kahneman, 2011), researchers around the globe have used the dual-systems theory as a framework to categorize and explain



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Figure 1. Visual illustration of considering a priori preferences when interpreting effect sizes. In these hypothetical scenarios, 20 out of 100 individuals changed their choice because of the nudge. The y-axis represents the 100 hypothetical individuals. The yellow bottom part of each graph represents the selection of the sensible choice option.

the effectiveness of nudges (e.g., Hansen & Jaspersen, 2010; Hunter, Hollands, Couturier, & Marteau, 2017; Baldwin, 2014; Sunstein, 2016). This theory states that there are two types of systems with which people can make a decision. System 1 uses processes that are fast, automatic, effortless, impulsive, intuitive and subconscious. System 2, on the other hand, uses processes that are slow, deliberate, effortful, contemplative, rational and conscious. The view that people make a decision either with system 1 or system 2 processes has led, for example, to attempts to categorize different nudge types in matching either system 1 or system 2 (e.g., Sunstein, 2016; Hansen & Jaspersen, 2010; Hunter, Hollands, Couturier, & Marteau, 2017). To illustrate, Sunstein (2016) proposed that defaults are system 1 nudges, because they are assumed to target automatic processes, whereas providing statistical information has been proposed to be a system 2 nudge because it requires deliberate processing (Sunstein, 2016). However, despite the classification as a system 1 nudge, the working mechanisms of default nudges have been demonstrated to draw on *both* systems: inertia or loss aversion are explanations based on system 1, but people also stick with the default because they want to save time or because they see the default as a recommendation from the authorities (i.e., rational system 2 explanations) (Pichert & Katsikopoulos, 2008). In fact, there has been little empirical proof that these distinct systems pose implications for the effectiveness of nudges (Lin, Osman, & Ashcroft, 2017; Marjanovic, 2017).

Not only has relying on the dual process framework caused ample confusion in defining what is and what is not a nudge (Berhet & Ouvreard, 2019), the presumed uncontrollability of system 1 is the source of many ethical debates on nudges. One key component of the dual systems theory is that people tend to rely on system 1 processes, for example by using heuristics (i.e., rules of thumb) when they are not *able* to use system 2 processes (Kahneman & Frederick, 2002; Stanovich, 1999). Although it was not the main aim of this dissertation, we did test this assumption in Chapter 4 and Chapter 5; in both chapters, the nudges are based on heuristics (the center-stage and social proof nudge, respectively), and we assessed and experimentally manipulated participants' self-control levels in relation to the effectiveness of the nudge. A temporary dip in cognitive capacity can occur because people do not have the time, motivation, or energy (all pertaining to low self-control) to make a deliberate decision (Baumeister, Bratslavsky, Muraven & Tice, 1998; Gigerenzer & Goldstein, 1996); thus, when people are in a state of low self-control (i.e., system 1 modus), nudges based on heuristics should be more effective than when people are in a state of high self-control. However, consistent with previous studies (e.g., Missbach & König, 2016; Evans, Dillon, Goldin, & Krueger, 2011), we found no evidence to support the idea that people low in self-control rely more on heuristics and are therefore more susceptible to nudges.

Developments in the dual systems literature indicate that a strict separation in two systems is actually not warranted (Melnikoff, & Bargh, 2018). Over the years many alternative versions of the dual systems theory have arisen, for example, instead of system 1 being a default processing modus it has been proposed that the two systems

work in parallel (e.g., Handley & Trippas, 2015; Slovic, 1996) and instead of two separate systems a continuum of the characteristics, such as fast–slow, unconscious–conscious, has been proposed (e.g., Osman, 2004; Hammond, 1996). Now, more than a decade after the introduction of nudges, empirical research on nudges has moved from the first research generation (i.e., that focused on establishing that nudges are effective) to the second research generation focusing on the boundary conditions of nudges (Zanna & Fazio, 1982). All things considered, it might be suggested that the dual systems framework in its original form and its underlying assumptions is not suitable to move research on nudges to the third research generation: explaining *why* nudges sort an effect (e.g., Bauer & Reisch, 2019; Zanna & Fazio, 1982).

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## PRACTICAL IMPLICATIONS

What can policymakers do with the information that a priori preferences are important in nudge effectiveness? For one, assessing citizens' a priori preferences can help in deciding whether a nudge would be a suitable policy tool: if citizens have weak a priori preferences, nudge interventions might prove successful. As has been demonstrated in this dissertation, assessing a priori preferences can be done in several ways. Only measuring people's intentions is likely to provide an overestimation of people's a priori preferences for the sensible choice, due to the intention-behaviour gap (Sheeran, 2002). Combining information about people's intentions with actual behavioural observations can provide a more accurate estimate of how large, or small, this gap is. This gap reflects the number of inconsistent choosers, and thus the likelihood of a successful outcome of a nudge intervention. The findings in Chapter 2 demonstrate that observed behaviour is a combination of a priori preferences and the influence of the environment. Governments and institutions that perform randomized controlled trials to judge the effectiveness of their nudge interventions are advised to assess citizens' a priori preferences to improve their effect size estimation.

One important implication of our findings is that when a newly implemented policy does not lead to the desired results, this does not necessarily signal that the public does not support the aim of the policy, i.e., that people have strong *incongruent* a priori preferences. A closer look at the choice architecture that comes with the “failed” policy might indicate that it has not adequately targeted the inconsistent choosers. A perfect example is the policy that Dutch municipalities use to reduce household paper waste: they offer a mailbox sticker to indicate that inhabitants do not wish to receive any junk mail (e.g., unaddressed brochures and flyers). A study executed by the municipality of Utrecht showed that only 25% of their citizens had requested and placed such a sticker on their mailbox. An inquiry in a citizen panel indicated that 49% of the people who did not have a sticker on their mailbox discarded the unaddressed mail unread (Bewoners panel Maartpeiling, 2018). Instead of assuming that the majority of Dutch citizens want to receive junkmail, the municipalities of Rotterdam, Amsterdam and Utrecht

adjusted the choice architecture of their policy by changing the default. Now citizens that *do* want to receive unaddressed brochures and flyers are required to put forth the effort to place a sticker on their mailbox. Preliminary results from the municipality of Amsterdam showed that the amount of paper waste was reduced from 50% to 23% due to the change in default (Municipality of Amsterdam, 2019). Note that the aim of the sticker policy is the same: reducing paper waste. Matching people's a priori preferences, e.g., through citizen panels, to the actual behaviour provides an indication of what the inconsistent choosers do under the current choice architecture and provides an opportunity to optimize the policy.

The third practical implication is that nudge interventions should not replace educational campaigns, which on their own have not shown to result in massive behavioural change, but might be key in the formation of these a priori preferences. Behaviour change interventions that combine information provision with adjustments to the choice architecture to facilitate the sensible behaviour have thus far shown promise. For example, interventions to increase influenza vaccination rates benefit from a combination of information provision and nudge strategies such as pre-booked appointments (Borgey et al, 2019; Lehmann, Chapman, Franssen, Kok, & Ruiter, 2016; Chapman, Li, Leventhal, & Leventhal, 2016). Based on the findings in Chapter 5, one explanation for this success might be that because individuals with strong nudge-incongruent preferences could be brought in a state of ambivalence (i.e., conflicting preferences) due to the information that is incompatible with their views. A nudge intervention might help then resolve this ambivalence in favour of the desirable choice.

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## LIMITATIONS

Although this dissertation makes theoretical and practical contributions to the understanding of nudge effectiveness in light of people's a priori preferences, some limitations should be addressed. The first pertains to the trade-off between meaningful or real-life behaviour and the extent of experimental control. For example, in Chapter 2 we observed the naturally occurring behaviour of municipality workers, but due to the practical setting it was impossible to directly relate individually assessed variables, such as intentions, to the observed behaviour, thereby sacrificing some extent of experimental control for observing naturalistic behaviour. In Chapter 5, however, the sacrifice was made on the part of the meaningfulness of the observed behaviour. In this Chapter, participants made an abstract choice of categorizing colours into either green or blue, but we could accurately assess how decisional certainty influenced the effectiveness of a nudge. Even though generalizations from one choice context to another should be made with care, together this variety of studies contributes to a better understanding of how people make decisions.

The second limitation also pertains to variety. Throughout the chapters, we measured and experimentally manipulated a priori preferences in different ways.

The overall pattern across the empirical chapters demonstrates that people's a priori preferences are a boundary condition for the effectiveness of nudges, but the firmness of this boundary requires more research. For example, strong habits in Chapter 3 did not render the portion size nudge ineffective; the portion size nudge was only *less pronounced* when participants held strong habits. Also in Chapter 5, the social proof nudge reduced the overall number of chosen meat products and this effect was *most pronounced* for participants who were ambivalent about eating meat. However, the participants who were less ambivalent also chose fewer meat products when the nudge was present. Future research should replicate one operationalization of a priori preferences for multiple types of nudges.

As mentioned in the introduction, we argue that using nudges as an umbrella-term can contribute to a deeper understanding of the working mechanisms of all different types of nudges, since known boundary conditions in one type of nudge might prove equally applicable to other types of nudges. One limitation that needs to be mentioned is that we did not directly compare different types of nudges applied to the same behaviour, simply because comparing the effectiveness of different types of nudges was not the aim this dissertation; instead, we build on the notion that all nudges pertain to choices for which people might have strong a priori preferences. Besides, not all types of nudges are suitable for all types of choice architecture.

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## AVENUES FOR FUTURE RESEARCH

Provided that a priori preferences play a role in the effectiveness of nudge interventions, investigating how stable preferences are shaped would be a promising avenue for future research. It has been suggested that stable preferences may come about because of consistent influences from external factors (Dhar & Novemsky, 2008). Nudges might shape people's preferences from weak to strong due to positive experiences as a result of making "the sensible choice"; for example, in Chapter 2 we saw that both the intentions and social norms for stand-up working increased after the two-week intervention. The nudge might facilitate behaviour by removing previously seen barriers. To illustrate, people who by default receive a vegetarian option and find that the food is tastier than they would have expected might select this option, also without a nudge, in the future (Friis et al., 2017). More research is necessary on how people evaluate their choice after they have been exposed to the nudge, i.e., how satisfied are they with their choice? Provided that many people have the tendency to ascribe positive outcomes to their own agentic decisions and negative outcomes to external factors (Weiner, 2000), it might occur that nudges that invoked positive outcomes become more internalized, which in turn leads to stronger preferences for that particular choice option.

While this dissertation posits that preferences form an important boundary condition for the effectiveness of nudges, it is also plausible that a general interest in the decision, i.e. not being indifferent, is precondition for nudge effectiveness.

Previous research has compellingly demonstrated that people's preferences guide their attention (e.g., Roskos-Ewoldsen & Fazio, 1992). It has been shown that people were *only* influenced by a subliminal prime when it was relevant to their objectives, i.e., a soda brand only influenced participants' choices for a soda when they were thirsty (Karremans, Stroebe, & Claus, 2006). Information on social norms has been demonstrated to be more influential when the modelled group is more relevant to the decision-maker (e.g. Goldstein, et al., 2008). The studies in this dissertation did not set out to test this particular hypothesis, and apart from Chapter 2, all participants were asked to make a choice or perform a behaviour. Because of this instruction, we could not test how a priori preferences guide attention. Future research can elaborate on this notion by including the more naturalistic option that people can also opt to choose nothing when presented with a range of choice options.

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## CONCLUSION

As the opening quote of this chapter stated: *The start has been made. It's a question of what's to be done from now on.* The findings in this dissertation show that people are not that easily influenced by nudges and that more accurate estimations can be made by accounting for people's a priori preferences when investigating the effectiveness of nudge interventions. This dissertation is the result of the second research generation on nudges; future research generations that will focus on why nudges influence behaviour should take note that the original theory on which nudges are based (i.e., the dual systems theory) has evolved since the introduction of nudges. Policymakers might take away from this dissertation that nudges particularly steer those individuals who do not have a set course and that policies that help to shape people's preferences might be worthy investments. Empirical research demonstrated that nudges are neither the panacea nor a mass manipulation tool that some have portrayed them to be; instead, nudges are a behaviour change tool that offers great potential within its boundary conditions.



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## DUTCH SUMMARY (NEDERLANDSE SAMENVATTING)

Nudges hebben, sinds de publicatie van het gelijknamige boek van Thaler en Sunstein in 2008, de belangstelling gewekt van talloze beleidsmakers en academici uit verschillende disciplines (e.g., Hausman & Welch, 2010; Selinger & Whyte, 2011; Szaszi, Palinkas, Palfi, Szollosi & Aczel, 2018). Nudge-interventies veranderen de keuzearchitectuur (de omgeving waarin keuzes worden gemaakt) om de verstandige keuzeoptie te stimuleren zonder de keuze voor alternatieve opties te belemmeren of financiële prikkels te veranderen (Thaler & Sunstein, 2008). Nudges vereisen niet de volledige aandacht of cognitieve capaciteit van een beslisser; in plaats daarvan maken ze gebruik van de automatische processen en snelle beslisregels (heuristieken) waarmee mensen moeiteloos door hun dagelijks leven navigeren. Door kleine aanpassingen in de keuzearchitectuur helpen nudges mensen om keuzes te maken die aansluiten bij hun eigen doelen en waarden, oftewel hun voorkeuren. Typische voorbeelden van nudges zijn het op ooghoogte plaatsen van gezonde producten in een supermarkt om de kans te vergroten dat mensen deze kiezen (Foster et al., 2014); apparaten die automatisch worden uitgeschakeld na 20 minuten inactiviteit om energie te besparen (Hirst, Reed, Kaplan, & Miller, 2013); en kaartjes in hotelkamers waarop staat “83,4% van onze hotelgasten hergebruiken hun handdoek” met als doel om duurzaam gedrag te stimuleren (Goldstein, Cialdini & Griskevicius, 2008). De reacties op nudges zijn echter niet alleen positief. Sommige critici waarschuwen dat vanwege het subtiele karakter van nudges mensen kunnen worden aangezet tot keuzes waar ze zelf niet achterstaan (Hausman & Welch, 2010). De vraag of nudges de bestaande voorkeuren van mensen ondersteunen of juist manipuleren is in de nudge literatuur tot dusver voornamelijk een theoretische exercitie geweest, waarbij de argumenten werden gebaseerd op hypothetische scenario's (e.g., Sugden, 2015; Sunstein, 2016; Glod, 2015; Baldwin, 2014; Hausman & Welch, 2010; Bonell, McKee, Fletcher, Wilkson & Haines, 2011). Het overkoepelende doel van dit proefschrift was om die reden *empirisch* te onderzoeken wat de rol van bestaande voorkeuren is in de effectiviteit van nudge-interventies.

Doorgaans worden voorkeuren afgeleid uit de keuzes die mensen maken. Echter omdat de omgeving ook invloed uitoefent op deze keuzes, is dit geen goede manier om *reeds bestaande* voorkeuren af te leiden (oftewel, wat mensen het liefste hadden gehad). Om te weten of nudges daadwerkelijk bestaande voorkeuren beïnvloeden, en vice versa, is het noodzakelijk om deze expliciet in kaart te brengen. Er bestaat echter geen gouden standaard om voorkeuren vast te stellen omdat zelf gerapporteerde voorkeuren worden beïnvloed door de keuzecontext en bestaande voorkeuren bovendien zwak, slecht gedefinieerd of zelfs onbewust kunnen zijn (Grüne-Yanoff & Hansson, 2008; Goldin, 2015; Dijksterhuis & Van Olden, 2006). Daarom hebben we in de empirische hoofdstukken de bestaande voorkeuren van participanten op verschillende manieren proberen vast te stellen; in het veldonderzoek in Hoofdstuk 2 hebben we bijvoorbeeld zowel gedragsobservaties als zelf gerapporteerde intenties

vergeleken vóór en na de nudge-interventie. In Hoofdstuk 3 hebben we bestaande voorkeuren geoperationaliseerd als gewoontes. Gewoontes zijn gedragingen (of gedachten) die herhaaldelijk in een bepaalde context zijn uitgevoerd tot het punt dat ze automatisch worden geïnitieerd als reactie op een 'cue' in die context (Orbell & Verplanken, 2010; Wood & Rünger, 2016). Men zou daarom kunnen stellen dat gewoontes een geautomatiseerde versie van bestaande voorkeuren zijn. In Hoofdstuk 4 hebben we verschillende aspecten gemeten die de voorkeur voor een specifieke portiegrootte frisdrank zouden kunnen beïnvloeden, waarbij we onderscheid maakten tussen aspecten die wel of juist niet congruent waren met de door de nudge beoogde keuze. In Hoofdstuk 5 hebben we onderzocht hoe de *afwezigheid* van een bestaande voorkeur de effectiviteit van een nudge beïnvloedt (wat bijvoorbeeld het geval is bij onverschilligheid en bij conflicterende voorkeuren). Deze grote verscheidenheid aan operationalisaties van bestaande voorkeuren stelde ons in staat om robuuste conclusies te formuleren die onafhankelijk zijn van specifieke meetinstrumenten en het soort keuze.

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## SAMENVATTING VAN EMPIRISCHE BEVINDINGEN

In het eerste empirische hoofdstuk beschrijven we een veldonderzoek dat werd uitgevoerd in het stadskantoor van de gemeente Utrecht. In dit onderzoek hebben we onderzocht of zit-sta bureaus vaker gebruikt zouden worden voor staand werken als deze standaard (default) op sta-hoogte werden gezet. Medewerkers konden het bureau gemakkelijk weer naar beneden zetten met een druk op de knop als ze wilden zitten. Voorafgaande aan de nudge-interventie bleek dat de bureaus slechts 1.3% van de tijd voor staand werken werden gebruikt. Bovendien had maar een klein deel van de medewerkers het voornemen om staand te werken. Echter, tijdens de nudge-interventie werden de bureaus 13.13% van de tijd gebruikt voor staand werken. Een interessante bevinding was dat na afloop van de interventie bleek dat de intenties om vaker staand te werken ook significant toegenomen waren. Bovendien bleek dat de nudges ook op de lange termijn effect hadden: twee maanden na afloop van de interventie werden de bureaus nog steeds bijna viermaal zo vaak gebruikt voor staand werken vergeleken met de periode voorafgaand aan de interventie. Al met al suggereren de resultaten van dit veldonderzoek dat zwakke intenties (als een maat voor bestaande voorkeuren) met behulp van een nudge vertaald kunnen worden in daadwerkelijk gedrag.

In Hoofdstuk 3 hebben we onderzocht of de effectiviteit van een portiegrootte-nudge beïnvloed werd door de sterkte van een gewoonte. Dit onderzoek vond plaats in Bath (Verenigd Koninkrijk). Met een knipoog naar culturele stereotypes hebben we het gebruik van suiker in de thee als te nudgen gedrag gekozen. Voordat participanten het lab in kwamen hadden we op subtiële wijze hun gewoontesterkte uitgevraagd voor het *aantal* schepjes suiker dat ze normaliter in hun thee doen. Eenmaal in

het lab maakten alle participanten twee keer een kopje thee voor zichzelf, één keer met een gewone theelepel in de suikerpot en één keer, zonder dat ze het wisten, met een theelepel die de helft kleiner was. De resultaten lieten zien dat participanten zonder, of met een zwakke, gewoonte beduidend minder suiker in hun thee hadden gedaan als ze de kleine theelepel hadden gebruikt, duidend op een effectieve nudge. Echter, participanten met een sterke gewoonte hadden een significant minder groot verschil in de hoeveelheid suiker tussen beide kopjes. Dit toont aan dat sterke bestaande voorkeuren de invloed van een nudge kunnen begrenzen.

In Hoofdstuk 4 hebben we de rol van bestaande voorkeuren als randvoorwaarde van de effectiviteit verder onderzocht door te onderzoeken in welke mate deze invloed hebben op de keuze wanneer mensen met een nudge worden geconfronteerd. In drie studies hebben we een zogeheten *center-stage* nudge ingezet om participanten te stimuleren om de kleinste van drie glazen frisdrank te kiezen. Deze nudge is gebaseerd op de neiging van mensen om voor de middelste ('center') optie te kiezen: in de nudge-conditie hadden we daarom het kleinste glas frisdrank in het midden geplaatst. In dit hoofdstuk hebben we bestaande voorkeuren ingedeeld in voorkeuren die overeenkomen met de bedoeling van de nudge (zoals het voornemen om minder frisdrank te drinken) en voorkeuren die daar juist van afwijken (zoals frisdrank heel lekker vinden). De resultaten van deze studies toonden consistent aan dat voorkeuren een belangrijke rol speelden in de keuze van de portie frisdrank, ongeacht of deze voorkeur nu wel of niet overeenkwam met de bedoeling van de nudge. Zo kozen mensen die veel van frisdrank houden vaker een grotere portie frisdrank en mensen die hun frisdrankconsumptie wilden verminderen vaker de kleine portie, ongeacht de aanwezigheid van de nudge. Als mensen weten wat ze willen heeft een nudge beduidend minder invloed op hun keuze.

Voortbordurend op deze bevindingen werd in Hoofdstuk 5 onderzocht of een nudge met name effectief zou kunnen zijn bij *afwezigheid* van duidelijke bestaande voorkeuren, omdat ze onverschillig zijn over de keuze die ze maken (Studie 1) of wanneer ze tegenstrijdige voorkeuren ervaren (Studie 2). In beide studies werd gebruik gemaakt van een *social-proof* nudge die aangeeft wat andere mensen in dezelfde situatie gekozen hebben. In Studie 1 werd onverschilligheid experimenteel opgewekt door een taak waarin participanten ambivalente kleuren zoals 'turquoise' en 'ocean' moesten categoriseren in blauw of groen. Daarbij gingen we ervan uit dat het deelnemers niet veel zou kunnen schelen wat ze uiteindelijk kozen. In tegenstelling tot de bewering dat nudges stiekem gedrag beïnvloeden (e.g., Hansen & Jespersen, 2013) toonden de resultaten aan dat de keuzes niet beïnvloed werden door de nudge wanneer de participanten de nudge niet opgemerkt hadden, oftewel geen aandacht schonken aan de keuzearchitectuur.

In Studie 2 werden tegenstrijdige voorkeuren geoperationaliseerd door de mate van ervaren ambivalentie met betrekking tot vleesconsumptie. Het eten van vlees is voor veel mensen een onderwerp dat ambivalente gevoelens oproept (e.g., Buttlar & Walther,

2018; Berndsen & van der Pligt, 2004): aan de ene kant genieten mensen van de smaak van vlees en aan de andere kant voelen ze zich ongemakkelijk als ze zich bedenken wat er met het dier is gebeurd of wat de impact op het milieu is. De resultaten van deze studie toonden aan dat de nudge die de afwijzing van vleesproducten stimuleerde invloedrijker was naarmate de ervaren ambivalentie groter was en mensen dus een minder sterke voorkeur hadden. Beide studies in dit hoofdstuk zijn afgenomen in een mouse-tracker programma dat op een objectieve manier aarzeling bij het maken van een keuze meet. Mede hierdoor brachten de resultaten van Studie 1 nog een derde situatie aan het licht (naast onverschilligheid en ambivalentie) waarin mensen geen sterke bestaande voorkeur ervaren: twijfel. De resultaten lieten zien dat de social-nudge in de kleurencategorisatie taak wel effectief was bij het sturen van keuze naar 'groen' maar niet naar 'blauw'. Terugblikkend denken we dat dit kwam doordat participanten al een lichte voorkeur hadden voor deze optie, maar twijfelden. Een evaluatie achteraf toonde aan dat de nudge als nuttiger werd beoordeeld door participanten als het hun lichte voorkeur bevestigde. De resultaten van hoofdstuk 5 suggereerden dus dat wanneer mensen enigszins betrokken zijn bij de beslissing, maar geen sterke bestaande voorkeur hebben, nudges een grotere kans hebben om gedrag te beïnvloeden.

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## THEORETISCHE IMPLICATIES

De bevindingen in dit proefschrift bieden empirische ondersteuning voor het idee dat mensen hun keuzevrijheid gebruiken om af te zien van de genudgede optie en de alternatieve optie te kiezen als ze dat willen. In Hoofdstuk 2 zagen we bijvoorbeeld dat tijdens de interventieperiode de meeste gemeentemedewerkers de zit-sta-bureaus gebruikten om te zitten als ze niet wilden staan. In Hoofdstuk 3 zagen we dat deelnemers die een sterke gewoonte hadden om hun thee met een bepaalde mate van zoetigheid te drinken gewoon grotere of meer scheppen suiker in hun thee deden wanneer ze blootgesteld werden aan de kleinere theelepels. In Hoofdstuk 4 kozen dorstige participanten die graag frisdrank dronken een van de grotere glazen ondanks de aanwezigheid van een nudge, en in Hoofdstuk 5 selecteerden de participanten vleesproducten wanneer ze dat wilden, ondanks de normatieve suggestie om ze te weigeren. Deze resultaten tonen aan dat nudge-incongruente voorkeuren, i.e., bestaande voorkeuren voor de alternatieve opties, grenzen stellen aan de invloed van een nudge.

Een belangrijke bevinding die tot nu toe onderbelicht is geweest in de nudge literatuur is dat ook nudge-congruente bestaande voorkeuren een begrenzing vormen voor de effectiviteit van nudges. De nudge is namelijk overbodig voor deze personen omdat ze uit zichzelf al de wenselijke keuze maken. Zo bleven de werknemers in Hoofdstuk 2 die vóór de nudge interventie al regelmatig staand werkten dit ook doen tijdens de interventieperiode. Net als de participanten met sterke doelen om gezond te eten in Hoofdstuk 4, die ook zonder nudge kozen voor het kleinste glas frisdrank.

Deze bevindingen komen overeen met eerdere publicaties die aantoonde dat nudge-interventies niet effectief waren wanneer de beoogde populatie sterke nudge-congruente voorkeuren had (e.g., Trudel, Murray, Kim, & Chen, 2015; Theotokis & Manganari, 2015). Het theoretische en praktische belang van deze bevindingen is dat ze helpen om exacter de doelgroep te kunnen bepalen waarvan redelijkerwijs kan worden aangenomen dat ze ontvankelijk zullen zijn voor nudge-interventies. Het huidige proefschrift onderschrijft hiermee het idee dat nudge-onderzoekers en beleidsmakers zich ervan bewust moeten zijn dat de invloed van nudge-interventies vooral 'de inconsistente beslissers' treft (Goldin, 2015), dat wil zeggen individuen die geen sterke bestaande voorkeuren hebben en die daarom meer worden beïnvloed door de keuzearchitectuur.

Dit alles heeft drie belangrijke implicaties voor het interpreteren van de effectiviteit van nudge-interventies. De eerste implicatie is dat de potentiële sterkte van het effect van een nudge direct gerelateerd is aan het aantal inconsistente beslissers in de steekproef. Relatief meer inconsistente beslissers in een steekproef zullen een accuratere schatting van de effectiviteit geven. De tweede belangrijke implicatie is dat hoewel het aantal individuen met sterke nudge-*incongruente* voorkeuren een duidelijke begrenzing vormt voor het verwachte eindresultaat van een nudge-interventie, dit aantal geen invloed heeft op het accuraat schatten van de sterkte van het effect. De derde belangrijke implicatie is dat individuen met sterke nudge-congruente voorkeuren *wel* de nauwkeurigheid van de effectgrootte beïnvloeden; hoe groter de groep individuen die al een verstandige keuze maakt vanwege hun bestaande voorkeuren, hoe meer de invloed van de nudge-interventie zal worden *onderschat*. Het inventariseren van bestaande voorkeuren vóór het begin van een nudge-interventie kan dus een meer realistische beoordeling opleveren van de potentiële effectiviteit van een nudge.

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## PRAKTISCHE IMPLICATIES

Wat kunnen beleidsmakers doen met de informatie dat bestaande voorkeuren belangrijk zijn voor de effectiviteit van nudges? Ten eerste kan het peilen van de bestaande voorkeuren van burgers helpen om te beslissen of een nudge een geschikt beleidsinstrument zou kunnen zijn: als burgers zwakke bestaande voorkeuren hebben, kunnen nudge-interventies succesvol zijn. Zoals in dit proefschrift is aangetoond, kan het vooraf beoordelen van voorkeuren op verschillende manieren worden gedaan. Echter, alleen het meten van de intenties zal waarschijnlijk een overschatting geven van de bestaande voorkeuren van mensen voor de verstandige keuze, vanwege de vaak gevonden kloof tussen intentie en gedrag, ook wel *intention-behaviour gap* genoemd (Sheeran, 2002). Het combineren van informatie over de intenties van mensen met feitelijke gedragsobservaties kan een accuratere schatting geven van de grootte van deze kloof. Deze kloof geeft het aantal inconsistente beslissers weer, en daarmee inzicht in de kans op een succesvolle uitkomst van een nudge-interventie. Ten tweede impliceren



onze bevindingen dat wanneer nieuw geïmplementeerd beleid niet tot de gewenste resultaten leidt, dit niet noodzakelijkerwijs aangeeft dat het publiek het doel van het beleid niet ondersteunt, i.e., dat mensen sterke *incongruente* bestaande voorkeuren hebben. Een nadere beschouwing van de keuzearchitectuur die bij het “mislukte” beleid hoort, kan erop wijzen dat deze onvoldoende op de inconsistente beslissers was gericht. De derde praktische implicatie is dat nudge-interventies niet in de plaats zouden moeten komen van educatieve campagnes, die op zichzelf wellicht niet tot massale gedragsverandering leiden, maar mogelijk wel een belangrijke rol hebben bij de vorming van deze bestaande voorkeuren. Gedragsveranderingsinterventies die informatieverstrekking combineren met aanpassingen in de keuzearchitectuur om de gewenste keuze te vergemakkelijken, zijn tot nu toe veelbelovend gebleken. Een goed voorbeeld zijn interventies om de griepvaccinatiegraad te verhogen die gebruik maken van een combinatie van informatievoorziening en nudgestrategieën zoals vooraf geboekte afspraken (Borgey et al, 2019; Lehmann, Chapman, Franssen, Kok, & Ruiters, 2016; Chapman, Li, Leventhal, & Leventhal, 2016). De bevindingen in Hoofdstuk 5 suggereren een mogelijke verklaring voor het succes van deze combinatie: wellicht worden personen met sterke nudge-*incongruente* voorkeuren door de informatie die onverenigbaar is met hun opvattingen in een staat van ambivalentie gebracht (i.e., tegenstrijdige voorkeuren). Een nudge-interventie kan dan helpen deze ambivalentie op te lossen ten gunste van de gewenste keuze. Meer onderzoek is nodig om dit veronderstelde mechanisme verder uit te zoeken.

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## CONCLUSIE

De bevindingen in dit proefschrift laten zien dat mensen niet zo gemakkelijk worden beïnvloed door nudges als ze al sterke bestaande voorkeuren hebben voor een specifieke keuzeoptie. Door rekening te houden met deze bestaande voorkeuren bij het onderzoeken van de effectiviteit van nudges kunnen nauwkeurigere uitspraken worden gedaan over de daadwerkelijke invloed van nudge-interventies. Dit proefschrift hoopt bij te dragen aan een genuanceerder beeld rondom nudges als beleidsinstrument. Empirisch onderzoek toonde aan dat nudges geen panacee zijn waardoor iedereen verstandige keuzes maakt. Maar nudges zijn ook geen instrument voor massamanipulatie, zoals sommige critici vrezen. De waarheid ligt in het midden: nudges zijn een hulpmiddel voor gedragsverandering met een groot potentieel zolang voldaan is aan bepaalde randvoorwaarden waarbij met name bestaande voorkeuren een cruciale rol spelen.



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## CURRICULUM VITAE

Tina Venema was born on the 21<sup>st</sup> of April 1991 in Bellingwolde, a village in the north of the Netherlands. After obtaining her HAVO and VWO high school diploma's she proceeded with the bachelor Psychology at the Rijksuniversiteit Groningen. Next to the regular program, she completed the Honours College program. This allowed her to pursue her research interests in both clinical and social psychology through research internships at the eating disorder clinic 'Accare Ruyterstee' and in the Social Psychology department at the RUG. After obtaining her bachelor degree she worked as a research assistant at Ghent University in collaboration with 'Het Zeepreventorium' - a boarding school for obese children. Determined to find out why people continue to make decisions that are bad for them she successfully applied for the Research Master Social and Health Psychology at Utrecht University.

During the research master, Tina worked as a research assistant for the Self-regulation lab and completed her master thesis about the topic of Nudges under supervision of prof. dr. Denise de Ridder. Upon graduating Tina continued on the topic of Nudges during her PhD project, under supervision of prof. dr. Denise de Ridder and dr. Floor Kroese. This project was part of the multidisciplinary consortium WINK (Welfare Improvement through Nudging Knowledge) financed by a top-grant from NWO.

During her PhD Tina was active as a board member in PhD Network Utrecht (PrOUt), a general member of PhD Network Netherlands (PNN), a PhD representative in the PhD Council of Social Sciences faculty, a co-organizer of the ASPO KLI social animal event 2019 at Tivoli Vredenburg and for two years she was a member of the ASPO dissertation committee. Along the way she applied for the Louis Bonduelle young researchers grant, which she was very lucky to receive. In the third year of her PhD she spend 4 months at Bath University to collaborate with prof. dr. Bas Verplanken on the topic of Habits.

Tina now works as a post-doctoral researcher with dr. Stefan Pfattheicher at Aarhus University, Denmark, on the topic of destructive behaviour.



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