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The (bitter) sweet taste of nudge effectiveness: The role of habits in a portion size nudge, a proof of concept study

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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, when these behaviours are performed frequently they may turn into habits that are difficult to change. The aim of the current study was to investigate whether a portion size nudge has the potential to work in accordance with (instead of against) existing habits. Specifically, it was tested whether a portion size nudge would be more effective in reducing the amount of sugar added to tea, when people have a strong habit of adding a fixed amount of teaspoons of sugar to a cup of tea. The study (N = 123) had a mixed factorial design with teaspoon size (reduced size vs. control) as a within-subject factor, and habit disruption context condition (hot tea vs. cold tea) as a between-subjects factor. A paired *t*-test indicated that this nudge reduced sugar intake on average by 27% within subjects. When the context allowed for automatic enactment of the habit, the effectiveness of this nudge was moderated by habit strength. Surprisingly, the nudge effect was actually less pronounced when people had a strong habit. Implications for effective nudge interventions are discussed.

The (Bitter) Sweet Taste of Nudge Effectiveness: The Role of Habits in a Portion Size Nudge.

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^2 emission, infectious diseases and obesity (e.g., Aiello, Coulborn, Perez, & Larson, 2008; Church et al., 2011; Westhoek et al., 2014). 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 et al., 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 & Rünger, 2016). Previous research has indicated that nudges struggle to compete with existing habits, for example, in reducing the time spend on social media and changing food choices (e.g., Chapman & Ogden, 2012; 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 (Arno & Thomas, 2016; Skov, Lourenco, Hansen, Mikkelsen, & Schofield, 2013; Szaszi, Palinkas, Palfi, Szollosi, & Aczel, 2018). Habits appear to be one of those boundary conditions. Although both nudges and habits rely on the automatic processes that

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people use to navigate their choice environments (e.g., Thaler & Sunstein, 2008; Wood, Labrecque, Lin, & Rünger, 2014), it seems that habits play a home game for the automatic processes and nudges need to be very strong to compete in order to influence behaviour. For example, in a recent study, De Wijk et al. (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 proof of concept study 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 tableware sizes, rather than portions sizes (e.g., Hollands et al., 2015), 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 the size of a serving 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).

Instead, 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 et al., 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 tablespoon 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 (Verplanken & Aarts, 1999; Wood, Tam, & Witt, 2005). 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 behavior (e.g., adding two teaspoons of sugar) without having to consciously think about it (Wood & Rünger, 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 behavior (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; i.e., a turned on television when coming home acted as a cue that triggered the habit they had developed in their old university context (Wood et al., 2005).

1. Current study

The aims of this study were twofold. First, we wanted to investigate whether a portion size nudge (a smaller spoon) was effective in reducing the amount of added sugar to tea. Second, we wanted to test whether the nudge would have a stronger reduction effect for individuals with a strong habit to add a certain number of teaspoons of sugar to their tea, following the unit bias hypothesis. To ascertain that it would be indeed the activation of a habit that is moderating the nudge effect (Wood et al., 2005), a between subjects condition of habit context disruption vs. context preservation was included. In the current study ‘context’ pertains to the elements of a tea drinker's routine of preparing their tea. 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 their 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 would add less sugar to their tea in the nudge condition, where the teaspoon for the sugar was smaller compared to that in 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.

2. Method

2.1. 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

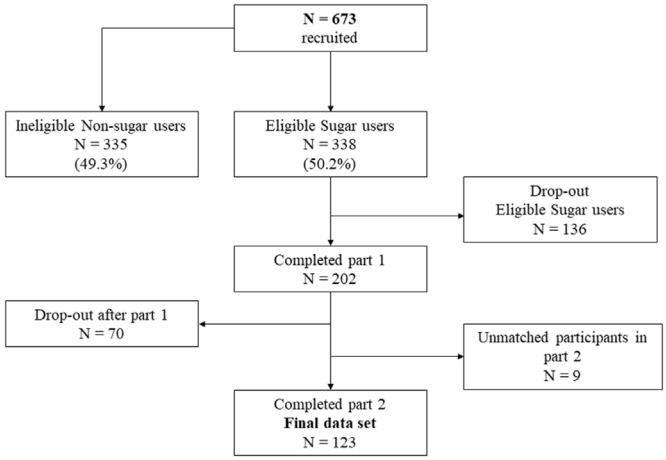

Fig. 1. Flow of participants.

screening, *p's* > 0.129. 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 Fig. 1 for the participant flow). They had a mean age of 21.42 (*SD* = 4.09).

2.2. 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 difference in percentages between the amount 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.

2.3. 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 conversational partners is influenced by the temperature of the beverage that they are holding". The current study allegedly investigated whether 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 (200 ml) 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.

3. Measures and materials

3.1. 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 °C as average drinking temperature and 21° 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.

3.1.1. 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.

3.2. 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.

3.3. 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 were collected.

3.4. 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*).

3.5. Data analysis plan

The effectiveness of the nudge in reducing the amount of added sugar was tested with a paired *t*-test that compared the number of grams of sugar in the control condition with that in the nudge condition within participants. Then an individual percentual difference score was calculated ((# grams control condition - # grams nudge condition)/#

grams control condition) such that a greater difference between the amounts of sugar used in the conditions is reflected in a larger score, indicating a stronger effect of the nudge.[1] To test whether nudge effectiveness was moderated by habit strength the PROCESS macro (Hayes, 2017) was used to run a linear regression model with the difference in percentages 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.[2] A bootstrap sample of 1.000 was used. All analyses were done using SPSS 26.

4. Results

4.1. Descriptives

The preferred drinking temperature for tea was on average 61.18 °C (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 = 0.61, 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).

4.2. Randomization check

A MANOVA was performed to check whether participants in the hot and cold tea conditions differed in age, habit strength and sugar reduction goal. Randomization was successful, p's > 0.304. A Chi-square test showed that men and women were equally distributed over the two conditions, p = .786.

4.3. 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.

4.4. Main analysis

4.4.1. 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 (123) = −6.17, p = < .001, Cohen's d = 0.56. Participants used significantly more sugar with the normal sized spoon (M_{grams} = 5.13, SD = 4.81) than with the smaller spoon, M_{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). Fig. 2 provides a visual overview of the grams of sugar used in each condition.

4.4.2. 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. 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 between habit strength and temperature condition was a significant predictor of the difference in percentages 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 Fig. 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 difference in percentages between 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.

5. 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.

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

[1] 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.

[2] 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.

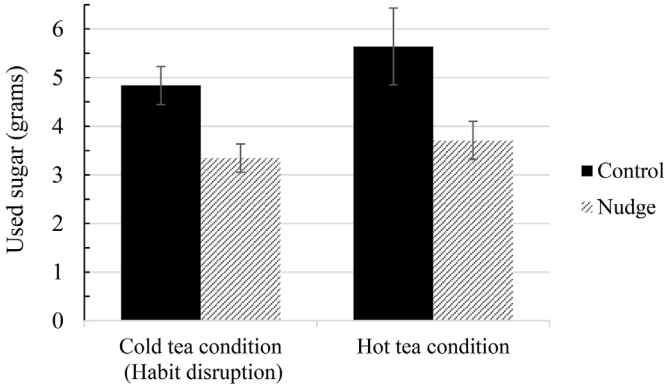

Fig. 2. Sugar use in grams per condition with standard errors.

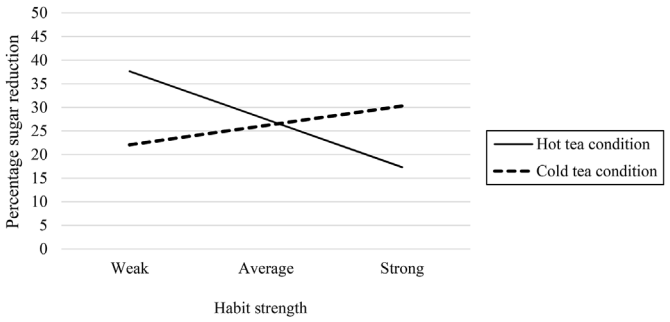

Fig. 3. Simple slopes analysis of interaction habit strength and temperature condition.

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., Herman & Polivy, 2005; Zlatevska & Spence, 2016). 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 difference in percentages 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., Neal, Wood, & Quinn, 2006; Wood et al., 2005) 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; 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, 2013; Ruh, Cooper, & Mareschal, 2010; Botvinick & Plaut, 2004).

A second limitation pertains to the behavioural consequences of the nudge. In the current study we did not systematically record whether participants liked the tea that they made (containing less sugar) and whether they emptied their cup. Observations by the first author who conducted the experiment reveal that most participants drank their tea, with a few exceptions (N = 3) in the habit disruption condition. These three participants wrote about their abhorrence of cold tea in the funnelled debriefing. As a result, we can draw no strong conclusions pertaining to the downstream consequences of this effective portion size nudge. Lastly, the experiment leader left the kitchen to avoid that participants would feel observed while they were preparing their tea. Consequently, we cannot know whether an individual routine of adding sugar involved tasting between adding scoops, even though the result of the order effect suggest that this was not the case. This proof of concept study, that directly connects nudges and habits, shows promising results, therefor future research that further explores this relation is warranted.

The routine 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 proof of concept 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 expected to be higher for those who have an abstract category of "beverage" in their minds than those who have a very concrete product in mind.

6. Conclusion

This proof of concept 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 bittersweet.

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Declaration of competing interest

None.

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