

MOTIVATED TO BE NUDGED? Motivation does not affect a container-shape nudge, container-shape only affects candy intake of females in the morning

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## Abstract

Previous research has indicated that nudges can positively affect healthy behaviour. This study extended earlier experimental research that merely focussed on the effect of nudges, by investigating the effect of motivation to eat healthy on a health promoting nudge. One lab experiment and one field experiment were carried out. The lab experiment ( $N = 99$ ) investigated the effect of the shape of a container (wide and low vs. tall and narrow) on likelihood and amount of candy consumption, and the effect of motivation on the effect of this nudge. The field experiment ( $N = 464$ ) was conducted to address limitations of the first experiment and merely investigated the nudge effect.

No effect of the nudge nor an effect of motivation was revealed in Experiment I. Interestingly when extrinsic motivation rather than general motivation was included in analyses, there was an effect of the nudge: participants ate more from the wide low container. Also there was a positive correlation between extrinsic motivation and amount of candy consumed. In Experiment II, women, but not men, were more likely to pick candy from a wide low vase rather than a tall narrow vase in the morning, but not in the afternoon.

Because of methodological limitations to this study, current findings cannot be taken to substantiate that manipulating accessibility of candy through container shape does not affect candy consumption. This research should be considered a first step in answering a relatively new scientific query and provide a starting point for future research exploring the relation between nudges and motivation.

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## Introduction

Imagine you are reading this thesis with a bowl of chocolates, chips, or the snack you like best beside you. You know you should not finish it because you know that is not healthy. Despite this, after a while, you find you have finished the entire bowl. Do you recognize this situation?

### *System I and System II*

People like to think of themselves as being in control of their own mind and body. Someone who makes conscious decisions based on deliberate judgment. Nobel Prize laureate Daniel Kahneman (2011) refers to this type of thinking as system II: the conscious, analytical, reasoning self. Next to system II, there is also System I which is automatic, quick, and intuitive type of thinking. There is no sense of control when using this system because this type of decision-making occurs unconsciously, e.g. you did not deliberately decide to finish that bowl of candy. Despite the fact that people like to think of themselves as executives, most decisions are taken using system I (Kahneman, 2011).

### *Small environmental changes*

System I thinking is heavily influenced by environmental cues. Small contextual changes can therefore have a major effect on people's behaviour. A famous and often mentioned example of a small contextual change, is the sticker of a blowfly in the Schiphol urinals. The fly triggers men to aim at it. The fly is glued to the spot where fluids find least resistance to the drain. Aiming at the fly thus results in the smallest amount of splatter outside the urinary (Thaler & Sunstein, 2008). Another example of a small change that directly affects eating behaviour, is the presentation of food in a cafeteria. When healthy

products are positioned in sight and easy to reach, and unhealthy alternatives are less visible or further at the back of the stand, more healthy products are chosen. The front row spot for a healthy product makes it less likely that people are seduced by the high caloric option. It also makes it harder to mindlessly grab the unhealthy alternative (Hanks, Just, & Wansink, 2013).

### *Nudges*

Both examples are illustrations of a small contextual change: a nudge. Nudging is to bring about a behavioural change via subtle hints in the environment without thwarting other possible behaviour. For example, men can still aim at another spot in the urinal and if you prefer pizza above a salad, it is still there. Thaler and Sunstein (2008), who made the term nudge famous, defined it as: ‘... any aspect of the choice architecture<sup>1</sup> that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye-level counts as a nudge. Banning junk food does not’ (p.6).

Our modern food environment overflows with nudges. Most not fostering our health but deteriorating it. Think of supermarkets where bright coloured candy is presented at children’s eye-height and at the counter, making it hard to resist buying it. Or think of the ever increasing meal sizes at (fast-food) restaurants that make people eat even more (Pratt, Croager, & Rosenberg, 2012).

### *Nudges affecting accessibility*

Unhealthy and tempting food is easily accessible in our society. To maintain a healthy weight, people need to regulate their calorie intake. They might be incentivized by nudges promoting health. Moreover, behavioural insights employed by companies to sell their

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<sup>1</sup>Choice architecture refers to the way options such as food choices in a cafeteria are presented.

products, can also be used to foster health. Different studies have for example shown that distance (Maas, de Ridder, De Vet, & de Wit, 2011), product placement in a cafeteria (Hanks, Just, and Wansink, 2013), amount relative to container size (Marchiori, Corneille, & Klein, 2012), portion size (Marchiori, Waroquier, & Klein, 2011; Marchiori, Waroquier, & Klein, 2012; Wansink and van Ittersum, 2007), and plate or bowl size (GreeNudge, 2012; Wansink and van Ittersum, 2013; Wansink, van Ittersum, and Painter, 2006; Wansink, van Ittersum, and Payne, 2014) all significantly affect how much people eat. Moreover, placing a product out of an arm's length reach, making it less visible, and presenting it in a smaller container, all make people eat less of that product.

A common factor in these studies is the accessibility of the food. The current study aims to build on this line of investigation by studying, in a lab and in the field, whether the shape of a container, affects how much people eat from candy that is presented in that container.

Besides environmental cues, also motivation is a factor influencing what and how much people eat. Experiments on motivation and depletion show that people who were motivated and depleted, perform better on a task than depleted individuals who are less motivated (Muraven & Slessavera, 2003). It could hence be argued that motivation to eat healthy, can make the effect of the nudge even stronger.

### *Hypotheses*

This study was carried out to investigate whether a nudge in the form of the shape of a vase containing candy, affects the likelihood and the amount that someone eats from the candy presented in that vase. Also, as a first orientation, it was investigated if motivation to eat healthy, fosters the effect of the nudge. In order to address these questions two hypotheses were formulated. Hypothesis 1: because of the greater accessibility of the candy in a low wide



vase than in a tall narrow vase, participants eat less candy from the tall narrow vase.

Hypothesis 2: the more motivated someone is to eat healthy, the stronger the effect of the nudge. Both hypotheses were addressed in the lab experiment. The field experiment merely addressed the first hypothesis.

### Experiment I: *chocolade kruidnoten*

#### Method

##### *Participants*

After recruiting in-class, 179 physiotherapy students from seven classes were scheduled for participation in the experiment between November 25<sup>th</sup> 2013 and December 12<sup>th</sup> 2013. Students could later indicate via e-mail if the scheduled time did not suit them or if they did not want to participate.

A total of 105 students participated in exchange for a monetary reward that could be spent on a class excursion. After splitting the sample based on gender, participants were randomly assigned to one of two experimental conditions.

Data from four participants was removed because they did not complete the experiment. One participant was excluded since he indicated to not have eaten from the candy because of his diet whilst he ate 41 grams. One more participant was excluded because she indicated not to like the candy at all. Three participants had not eaten for at least 10 hours, which was significantly longer than the time other participants had not eaten. Because these three participants were not significantly hungrier than other participants, they were not excluded from the analyses. None of the participants indicated to be allergic for the candy.

Because over half of the participants did not eat from the candy, using the study by Maas et al (2011) as example, it was chosen to conduct two separate analyses. The first analysis included the total sample and used a dichotomous dependent variable: eaten or not eaten from the candy. The second analysis was performed on the subsample that had eaten from the candy and employed the amount of candy consumed as continuous dependent variable. For the first analysis the final sample consisted of 99 participants (condition 1:  $n = 46$ , 24 males, condition 2:  $n = 53$ , 27 males) with a mean age of 19.68 ( $SD = 1.83$ ) and an average BMI of 22.11 ( $SD = 2.22$ ). The analyses in which merely the group that ate at least one piece of candy ( $>3$  g.) was included, consisted of 36 participants (condition 1:  $n = 16$ , 8 males condition 2:  $n = 20$ , 9 males) with a mean age of 19.51 ( $SD = 1.79$ ) and an average BMI of 21.92 ( $SD = 2.27$ ).

### *Procedure*

Upon arrival in the lab participants were escorted by the experiment leader to a cubicle with one computer. Using this computer, they answered a series of questions inferring about several aspects of their lifestyle. Participants were informed that they should open the door of their cubicle once they had finished answering the questions. Upon opening of the door, the experiment leader would come to bring them to another cubicle with a supposedly more advanced computer which was required for the remainder of the experiment. When the cubicle door opened, the experiment leader told the participant that unfortunately the second computer was still occupied and if they would mind to wait for approximately ten minutes in the waiting room. Participants were told that they should not distract or be distracted by other participants in the lab, and that therefore they had to wait in a separate room. In this room was a small two-seater couch and a coffee table with a magazine and a vase of candy on top of it (see materials). After ten minutes participants were brought to the second cubicle where they

performed a categorization task irrelevant to the current investigation. After the categorization task, participants filled out a series of questions to inquire about their hunger during the experiment and to probe for suspicion of the goal of the study. None of the participants was able to report the true objective of the study. Subsequently participants were debriefed.

### *Materials*

Because chocolate is a snack that is typically liked by most people (Weingarten & Elston, 1990), and *Sinterklaas* period (last half of November, first days of December) is the time when Dutch people eat *kruidnoten*

(a cookie-like kind of confectionary, see Figure 1), *kruidnoten* covered in dark-, milk- and white chocolate were used in this study. The chocolate was presented in one of two transparent cylindrical vases which could both contain approximately 400 g of the candy. As



Figure 1. *Chocolade kruidnoten* in the two cylindrical vases. Each vase contained approximately 400 gr.

can be seen in Figure 1, one of the vases was a wide, low vase (10 cm. high, 22

cm. Ø) whilst the other was tall and narrow (23 cm. high, 10 cm. Ø). A magazine on an unrelated topic (*Quest*), was placed on a coffee table next to the vase. It was verified that the magazine did not contain specifically food-related text or images. The coffee table was placed in front of the two-seater. Cushions were put on the couch in such a way that the participant could only take the spot right in front of the coffee table without removing the cushions. None of the participants removed the cushions.

## *Measurements*

### *Control variables*

*Hunger.* To provide an indication of their hunger state, just prior to the debriefing participants were asked to indicate how hungry they were whilst doing the experiment on an 11-point Likert scale ranging from 0 (not at all) tot 10 (very much).

*Liking of chocolate and acceptability of eating in waiting rooms.* After the experiment, participants indicated their liking of candy ('How tasty do you find *chocolade kruidnoten?*'). They further indicated whether they found it appropriate to eat from a vase in a waiting room (average from the two questions 'Do you think it is normal to eat from a vase in a waiting room?' and 'Do you think it is unhygienic to eat from a vase in a waiting room?'). They answered these questions using 11-point Likert scales ranging from 0 (not at all) to 10 (very much).

*Diet.* Also after the experiment participants were asked if they were on a diet and if this was the reason for not eating from the candy if they had not done so.

*Mood.* Whilst in the first cubicle, participants rated their current emotional state on four-point Likert scales ranging from 1 (not at all) tot 4 (very much). A single score for mood was created by calculating the mean score of the items 'lively', 'happy', 'caring', 'content', 'peppy', and 'calm' and the reversed scores for 'sad', 'tired', 'gloomy', 'jittery', 'drowsy', 'grouchy', and 'nervous' (Cronbach's  $\alpha = .71$ ).

*Motivation to eat healthy* was also measured in the first cubicle using a questionnaire with filler questions about life style. The eight questions used to infer about motivation to eat healthy were obtained from the Regulation of Eating Behaviour Scale (Pelletier, Dion, Slovenec-D'Angelo, & Reid, 2004). Eight different seven-point Likert scales ranging from 1 (not at all applicable to me) to 7 (very much applicable to me), were employed to measure intrinsic motivation: 'It is fun to create meals that are good for my health', 'For the

satisfaction of eating healthy', 'I like to think of new ways to create meals that are good for my health', 'I take pleasure in fixing healthy meals' and extrinsic motivation: 'Other people close to me will be upset if I don't', 'Other people close to me insist that I do', 'It is expected of me', 'People around me nag me to do it'. One single measure of motivation was calculated from the eight questions by adding up the answers and dividing those by eight.

Descriptives for all above variables are presented in Table 1.

### *Dependent variable*

*Candy intake.* To assess the probability and the amount of candy intake, the vase with *chocolade kruidnoten* was weighed before and after the alleged pause period, when participants were not present. Because one piece of candy weighed approximately three gram, a difference of less than three gram in weight was considered as not eaten from the candy. For each participant the vase contained approximately 400 g of candy.

## Results

### *Randomization Check*

Separate T-tests showed that age, gender, BMI, time of the day the experiment was conducted, and experimenter<sup>2</sup> did not differ across conditions (all  $p > .245$ ), indicating successful randomization (see Table 1 for descriptives).

### *Possible confounding variables*

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<sup>2</sup> Two experimenters collaborated and conducted the experiment in turns. One of the experimenters was the teacher of some of the participants. There was no significant difference between conditions in students who were taught by this experimenter at the time of the experiment, or attended lectures earlier (both  $p > .340$ )

Separate *t*-tests for mood and hunger during the experiment, general-, intrinsic-, and extrinsic motivation to eat healthy, appropriateness to eat from a vase in a waiting room, and liking of the candy showed that these measures did not differ between conditions (all  $p > .083$ ). After the experiment, several participants indicated that they thought they were monitored via cameras in the cubicles and waiting rooms. These cameras were not functioning but because a substantial number of participants mentioned the cameras in the debriefing (18%), it was verified that this number did not differ significantly between conditions ( $p = .080$ ).

### *Normality*

All control variables except the time of testing, showed a significant deviance from normality as indicated by Shapiro-Wilk test results (all  $p < .035$ ). However, since z-scores for kurtosis and skewness were, with the exception of the variable mood, well below the limit of 3.29 (Field, 2009), and because log-transforming all these variables would make for very artificial analyses, these variables were not transformed. Exploratory analysis showed that there was one outlier for the variable mood; one participant scored zero for all dimensions. His data was therefore removed from relevant analyses. After removal of this outlier the variable mood showed a normal distribution.

Because the amount of candy consumed showed a non-normal distribution (Shapiro-Wilk(36) = .91,  $p = .006$ ), and because z-scores for kurtosis and skewness were exceeding the limit of 3.29 (8.21 and 6.87 respectively), a reciprocal (inverse) transformation was performed for this variable. To ease interpretation, beneath reported means and standard deviations are in grams instead of transformed results.

Bivariate correlation analyses showed that the likelihood and the amount of candy consumed both correlated with experimenter ( $r = .24, p = .017; r = -.25, p = .013$  respectively) and liking of the candy ( $r = .31, p = .002; r = -.30, p = .002$  respectively).

These correlations indicate that when participants were escorted by the male experiment leader, they were less likely to eat from the candy and also ate less of it. Participants who liked the candy better, were more likely to eat from it and also ate more from it. None of the other variables correlated with either the likelihood of eating from the candy or the amount eaten from the candy (all  $p > .087$ ).

Table 1. Means, *SDs*, or *n* per condition and *t*, and *p* for the variables in Experiment I

|                                 | <i>M(SD)</i> or<br><i>n(%)</i> for<br>condition 1 | <i>M(SD)</i> or<br><i>n(%)</i> for<br>Condition 2 | <i>t</i> (97)      | <i>p</i>          |
|---------------------------------|---|---|--------------------|-------------------|
| N = 99                          |   |   |                    |                   |
| Age                             | 19.72(1.71)                                       | 19.64(1.94)                                       | .21                | .838              |
| Gender male                     | 24(52)  | 27(51)  | -.12               | .904              |
| BMI                             | 22.00(2.06)                                       | 22.21(2.36)                                       | 1.48               | .634              |
| Time of testing                 |   |   | -1.17              | .245              |
| Experiment leader male          | 13(28)  | 18(34)  | -.61               | .547              |
| Mood (1-4)                      | 3.15(.32)   | 3.00(.53)   | 1.75               | .083              |
| Hunger during experiment (0-10) | 5.63(3.13)  | 6.32(2.97)  | -1.12              | .264              |
| On a diet                       | 4(9)  | 5(9)  | -.13               | .900              |
| Motivation to eat healthy (1-7) | 4.39(.84)   | 4.13(.87)   | 1.51               | .133              |
| Extrinsic                       | 3.73(1.39)  | 3.42(1.08)  | 1.24               | .218              |
| Intrinsic                       | 5.04(1.22)  | 4.83(1.27)  | .85                | .397              |
| Liking chocolate (0-10)         | 7.87(2.55)  | 8.32(1.80)  | -1.00 <sup>a</sup> | .319 <sup>a</sup> |
| Appropriate to eat (0-10)       | 5.64(1.36)  | 5.25(1.54)  | 1.31               | .192              |
| Camera mentioned                | 5(11)   | 13(25)  | -1.77              | .080              |
| N = 36                          |   |   |                    |                   |
| Age                             | 18.38(1.63)                                       | 19.62(1.94)                                       | -.41               | .687              |
| Gender male                     | 8(50)   | 9(45)   | -.14               | .890              |
| BMI                             | 21.82(2.01)                                       | 21.99(2.50)                                       | -.22               | .829              |
| Time of testing                 |   |   | -1.91              | .064              |
| Experiment leader male          | 1(6)  | 6(29)   | 1.88 <sup>b</sup>  | .069 <sup>b</sup> |
| Mood (1-4)                      | 3.13(.31)   | 3.14(.25)   | .10                | .919              |
| Hunger during experiment (0-10) | 6.56(3.31)  | 6.90(2.83)  | -.40               | .737              |
| On a diet                       | 0(0)  | 2(10)   | -1.45 <sup>c</sup> | .162 <sup>c</sup> |
| Motivation to eat healthy (1-7) | 4.22(.91)   | 4.09(.75)   | .47                | .640              |
| Extrinsic                       | 3.44(1.44)  | 3.36(.91)   | .21                | .837              |
| Intrinsic                       | 5.00(1.20)  | 4.83(1.05)  | .45                | .655              |
| Liking chocolate (0-10)         | 9.06(1.48)  | 9.05(1.40)  | .03                | .975              |
| Appropriate to eat (0-10)       | 5.81(1.20)  | 5.14(1.81)  | 1.35               | .209              |
| Camera mentioned                | 3(19)   | 4(19)   | -.02               | .982              |

<sup>a</sup> as Levene's test for equality of variances was violated ( $F(1, 97) = 5.46, p = .022$ ) *t*-test statistics reported here are those for which equal variances are not assumed.

<sup>b</sup> ( $F(1, 35) = 17.88, p < .001$ )

<sup>c</sup> ( $F(1, 35) = 7.96, p = .008$ )

*Tests of hypotheses*

### *Likelihood of consumption.*

Analysis of covariance (ANCOVA) showed that there was no significant effect of the shape of the vase on the likelihood of candy consumption ( $p = .631$ ) when controlling for the effects of experimenter and liking of the candy. There was a main effect of liking the candy ( $F(5, 93) = 7.15, p = .009, \eta^2 = .07$ ) indicating that participants who liked the candy better were more likely to eat from it. Participants who were escorted by the male experiment leader were marginally less likely to eat from the candy ( $F(5, 93) = 3.90, p = .051, \eta^2 = .04$ ; experiment leader male: 19% ate from the candy, experiment leader female: 44% ate from the candy).

### *Likelihood of consumption and motivation.*

An ANCOVA revealed that a model including condition (low wide vase vs. tall narrow vase) and motivation to eat healthy (continuous) and the covariates experimenter and liking of the candy, showed no significant main effects nor a significant interaction effect (all  $p > .535$ , see upper part Table 2) indicating that neither the shape of the vase nor the degree of motivation to eat healthy affected the likelihood of candy consumption when controlling for the effect of experimenter and liking of the candy.

Separate ANCOVA's including intrinsic and extrinsic motivation to eat healthy, did not show significant main or interaction effects either (all  $p > .341$ ).

### *Amount of consumption.*

To assess the effect of the shape of a the vase on the amount of candy consumed, an ANCOVA was conducted on the subsample that had eaten from the candy ( $n = 36$ ). In this ANCOVA, the variables experimenter and liking of the candy were included as covariates.



Also the interactions between these variables and the condition were included. Results showed no main effects nor interaction effects (all  $p > .599$ ).

*Amount of consumption and motivation.*

In order to investigate the effect of motivation to eat healthy on the amount of candy consumed, an additional ANCOVA including condition (low, wide vase vs. high small vase), motivation to eat healthy (continuous), and the covariates experimenter and liking of the candy was conducted. This analysis showed no significant main effects nor significant interaction effects (all  $p > .718$ ; see lower part Table 2) indicating that neither the shape of the vase nor the level of motivation to eat healthy affected the amount of candy consumed.

Table 2.  $F$ ,  $p$  and  $\eta^2$  for condition, extrinsic motivation to eat healthy and interaction between condition and motivation to eat healthy

|  | $F$ | $P$  | $\eta^2$ |
|--|-----|------|----------|
| Likelihood of consumption ( $N = 98$ ) |     |      |          |
| Condition                              | .24 | .628 | .01      |
| Motivation                             | .96 | .535 | .36      |
| Condition* motivation                  | .83 | .658 | .24      |
| $R^2 = .54$ (Adjusted $R^2 = .04$ )    |     |      |          |
| Amount of consumption ( $N = 36$ )     |     |      |          |
| Condition                              | .15 | .718 | .03      |
| Motivation                             | .43 | .918 | .63      |
| Condition* motivation                  | .26 | .916 | .21      |
| $R^2 = .73$ (Adjusted $R^2 = -.87$ )   |     |      |          |

Separate ANCOVA's including extrinsic and intrinsic motivation to eat healthy, showed no main or interaction effects when intrinsic motivation was included in the model (all  $p > .482$ ). Interestingly, when extrinsic motivation to eat healthy was included in the analysis, the model showed a main effect of condition ( $F(1, 7) = 5.88, p = .046, \eta^2 = .46$ ) indicating that participants ate significantly more from the wide low vase ( $M = 21.69, SD = 11.00$ ) than from the tall narrow vase ( $M = 16.30, SD = 15.78$ ). This model also showed a

main effect of extrinsic motivation ( $F(17, 7) = 3.81, p = .039, \eta^2 = .90$ ) indicating that as participants were more extrinsically motivated to eat healthy, they ate more from the candy. There was no interaction effect between condition and extrinsic motivation to eat healthy.

## Discussion

This experiment investigated if the shape of a vase and the motivation to eat healthy, affect whether candy is eaten and how much is eaten. Counter to what was hypothesized, it was found that neither the shape of the vase nor motivation to eat healthy affected the likelihood or the amount eaten from the candy. Interestingly, when extrinsic instead of general motivation to eat healthy was included in the model, analyses showed significant main effects for both condition and extrinsic motivation to eat healthy. As predicted, participants ate more from the wide low vase. Unexpectedly, participants who were more extrinsically motivated to eat healthy, ate more from the candy. No significant effects were found when intrinsic motivation to eat healthy was included in the model.

First, the absence of the expected nudge and motivation effect in the main analyses will be discussed. Thereafter a discussion of the finding that extrinsic motivation did show to affect amount of consumption will follow.

### *Main findings*

Three reasons can be put forward to explain the absence of an effect of the shape of the vase and motivation. All three reasons are build on the notion that the effect of the nudge and the effect of motivation are so small, that these were overruled by the effect of three possible other factors.

First, it could be that both the nudge and motivation effect were overruled by the strong preference of all participants to eat healthy. All participants were physiotherapy

students. Because of their studies, they were well informed about healthy behaviour in general, and their own health in particular. This explanation for the absence of a nudge effect is supported by the fact that less than half of the participants ate from the candy and by the fact that participants who did eat from it, did not eat much. This hypothesis is further supported by the fact that participants who were escorted by the male experimenter, ate less of the candy. See secondary findings.

Another reason was put forward by the participants themselves during the debriefing: participants thought they were being monitored via a camera. Post hoc analysis showed that mentioning the camera during the debriefing did not predict whether participants ate from the candy or how much they ate from it. However, as no direct question concerning the presence of the camera was included in the debriefing (the question were participants mentioned the camera was: did you feel you were influenced by the environment and if so, by what?), it could be that participants did feel influenced by the camera but did not mention it.

A third reason for the fact that participants ate only small amounts of the candy or even nothing, could be that during the recruitment phase participants were told –accidentally– that the experiment they would participate in concerned a study investigating eating habits. Of course waiting for the second part of the experiment in the alleged waiting room where a bowl of candy was present could then appear suspicious. Especially when a camera is present. Indeed a number of participants indicated that they felt the bowl of candy could be part of the experiment.

Although evidence arguing against the first explanation was found in participants not scoring extremely high on motivation to eat healthy, all three arguments require further research. In order to address these arguments, a second experiment was carried out (see beneath).

Including extrinsic motivation in the model rather than general motivation, showed

that a higher degree of this type of motivation, resulted in an increase of candy consumption but not in an increased likelihood to eat from the candy. Also there was a small nudge effect when extrinsic motivation was included in the model: as predicted, participants ate a little more candy from the wide low vase. Based on that participants thought they were being monitored, two opposing lines of reasoning could be put forward to account for the effect of extrinsic motivation. It could be that the thought of being monitored fosters external motivation and thus results in less consumption. Alternatively the presence of the camera could have fostered some kind of rebellion resulting in participants eating more exactly because they thought they were being monitored. Moreover, in fact the camera would be a nudge to them as it would be a reminder of their extrinsic motivation to eat healthy but since they knew the experiment was about eating behaviour, the presence of the camera caused them to eat more rather than less. Additionally it could be that participants ate more because they were merely extrinsically motivated to eat healthy. Previous research on self-regulation has shown that multiple capacities are required in order to translate goals into behaviour. For example, establishing specific action plans and monitoring goal-relevant behaviour when encountering difficult situations (Kuhl 1994, Palfai, 2002). If someone is merely extrinsically motivated and the extrinsic motivator is not present, it would be harder to uphold action plans and monitor behaviour, especially in the presence of a temptation such as a bowl of candy.

Results corroborate the latter two hypotheses. Further research is required to investigate these accounts.

### *Secondary findings*

Not related to the main questions of this research but of interest, were the findings that the more participants liked the candy, the more likely they were to eat from it. Liking of the candy did not affect how much participants ate from it. Also it was found that merely 19% of

the participants who were escorted by the male experimenter ate from the candy whilst 44% of the participants escorted by the female experimenter ate from the candy. The experiment leader did not affect how much participants ate from the candy. When motivation to eat healthy was included in the model, the effect of experiment leader and the effect of liking of the candy disappeared.

The fact that liking of the candy makes one more likely to eat from it is intuitively logical. Interestingly participants did not eat more from the candy when they liked it better. This could potentially be explained by the fact that participants were all physiotherapy students that were well-informed about healthy behaviour. Moreover, eating a small amount of candy, which all participants did, is not bad for one's health. It is eating a large amount or eating candy very often that makes it bad. Hence for these participants liking of the candy would affect whether or not they ate from it whilst these participants awareness of what is healthy kept them from eating more from the candy when they liked it more.

What is more interesting is that participants were over twice as likely to eat from the candy when escorted by the female experiment leader. The most likely reason would be to attribute this effect to the gender of the experiment leader: maybe the female students felt restricted by the presence of the male experimenter and were therefore less likely to eat from the candy when escorted by the male experimenter (Allen-O'Donnell, Cottingham, Nowak, & Snyder, 1999; Chaiken & Pliner, 1987). A post hoc test did not corroborate this hypothesis by showing that it was actually the male participants eating no candy when escorted by the male experimenter. Another reason for participants eating less candy when accompanied by the male experimenter, is that the male experiment leader was also the teacher of all participants. The presence of their teacher could remind the participants of their study and their health goals and hence boost their extrinsic motivation to eat healthy resulting in participants eating less candy when being escorted by the male experimenter. This hypothesis

is corroborated by the findings of the present study. Aside from the question inferring about if participants felt they were influenced by something during the experiment, no question was posed inquiring whether participants thought their behaviour was influenced by the experimenter. Future research should look into this.

### *Rationale for Experiment II*

The three explanations put forward as possible reasons for the lack of effect of shape of the vase, could be addressed by carrying out a field experiment including another population than physiotherapy students. Therefore a second experiment was conducted outside the lab. The same vases were used in the second experiment but since it was April now, instead of *chocolade kruidnoten* chocolate Easter eggs were put into the vases. The vases, first one, then the other, were placed at the reception of the National Institute for Health and Environment (RIVM) on two consecutive mornings and two consecutive afternoons.

## Experiment II: Easter eggs

### Method

#### *Participants*

Approximately 1500 people work at the RIVM. Employees have a key card that allows them to enter the grounds without going by the reception but visitors and employees who forget to bring their card, have to by the reception. Therefore it could be expected that unique people would pass by the reception the mornings and afternoons the experiment was conducted..

The sample for Experiment II consisted of 464 participants who were visiting or

working at the Dutch National Institute for Health and Environment (condition 1:  $n = 232$ , 145 males, condition 2:  $n = 234$ , 160 males).

### *Procedure*

On two consecutive mornings (April 16<sup>th</sup> and 17<sup>th</sup>, 2014, 8:00-10:30hour) and two consecutive afternoons (April 22<sup>nd</sup> and 23<sup>rd</sup>, 2014, 15:00-17:15hour) around Easter, a vase with chocolate Easter eggs was placed at the reception desk (see Figure 2). The eggs were presented in the two cylindrical vases that had been used for Experiment I. The first morning and the first afternoon the vase containing the Easter eggs was the tall narrow vase, the other morning and afternoon the wide, low vase was used to present the eggs. There was one experimenter carrying out this experiment. The experimenter set at a the table in front of the reception and pretended to be reading and waiting for an appointment whilst counting the visitors and employees passing by the reception desk. The two receptionists were instructed not to point visitors to the Easter eggs. When visitors asked for it, the receptionists would say that visitors should feel free to take from the vase.

### *Materials*

As has been pointed out in the material section of Experiment I, chocolate is a snack that is typically liked by most people (Weingarten & Elston, 1990). Around Easter Dutch people eat



Figure 2a. Easter eggs in the two cylindrical vases. Each vase contained approximately 560 gr. Figure 2b. Vase as placed on the reception desk

small Easter eggs made of chocolate. To make Experiment II more similar to Experiment I, it was chosen to present Easter eggs made of dark-, milk-, or white chocolate. Both vases could contain approximately 560 g of the candy. When there were no visitors, the experimenter would top up the vases with the chocolate eggs if necessary.

### *Measurements*

*Visitors.* The number of male and female visitors was tallied by the experimenter. Also the number of visitors who took an Easter egg was counted per gender. Participants did not show suspicion towards the experimenter. This was verified by the receptionists.

*Candy intake.* To assess the amount of intake, the total amount of visitors and the amount of visitors who took an Easter egg were counted. To confirm the tally, additionally the total amount of Easter eggs (the eggs in the vase and the eggs that were kept apart to fill up the vases if necessary) was weighed before and after the experiment sessions, when participants were not present.

## Results

### *Possible confounding variables*

The percentage female and male visitors did not differ between conditions, neither for the morning, nor for the afternoon sessions (both  $p = .263$ ).

### *Test of hypothesis*

A total of 234 visitors and employees came by the reception when the Easter eggs were presented in the wide low vase during which 27 eggs were taken. When the tall narrow



vase was used to contain the chocolate eggs, out of 232 people who passed by the reception, 14 people took an Easter egg. This results in a relative risk of 2.03 when the wide low vase was used compared to the tall narrow vase. In other words, people who came by the reception were 2.03 times more likely to take an Eastern egg (95% C.I. 1.04, 3.98) when these were presented in a wide low vase.

Since people tend to have less control over their (health) behaviour during the end of the day because their self-control is depleted after a day of work, it was expected that the afternoon sessions might show a different pattern than the morning sessions. It could be that the lack of self-control intensifies the effect of the nudge. However, it could also be that the effect of lack of self-control is that strong, that it overrules the nudge effect. Splitting the sample based on the moment the experiment was conducted, corroborated the latter notion. In the morning (8:00-10:30h), visitors and employees were more likely to take an Easter egg from the wide low vase compared to the high narrow vase whilst in the afternoon there was no significant increase from one vase to the other (15:00-17:15h; see Table 3).

Table 3. Odds ratios and 95% confidence intervals to contrast amount taken from the vases

|                  | Condition        | N visitors   |           | N visitors taking an egg (percentage) |           |
|------------------|------------------|--|-----------|---------------------------------------|-----------|
|                  |                  | Morning  | Afternoon | Morning                               | Afternoon |
| All participants | High narrow vase | 126  | 106       | 3(2)                                  | 11(11)    |
|                  | Low wide vase    | 148  | 86        | 16(11)                                | 11(13)    |
| OR (95% C.I.)    |                  | Morning: 4.97 (1.41 – 17.47)<br>Afternoon: 1.27 (.52 – 3.08) |           |                                       |           |
| Male visitors    | High narrow vase | 79   | 66        | 1(1)                                  | 4(6)      |
|                  | Low wide vase    | 98   | 62        | 5(5)                                  | 7(11)     |
| OR (95% C.I.)    |                  | Morning: 4.91 (.48 – 36.66)<br>Afternoon: 1.97 (.55 – 7.10)  |           |                                       |           |
| Female visitors  | High narrow vase | 47   | 40        | 2(4)                                  | 7(18)     |
|                  | Low wide vase    | 50   | 24        | 11(22)                                | 4(17)     |
| OR (95% C.I.)    |                  | Morning: 6.35 (1.32 – 30.40)<br>Afternoon: .94 (.24 – 3.63)  |           |                                       |           |

Because it appeared from the raw data that females were relatively more likely to take an Easter egg, additional exploratory analyses were conducted looking at males and females separately for both the morning and the afternoon sessions. Results corroborated the observation by showing that there was no significant difference for males whilst in the mornings but not in the afternoons, females took more Easter eggs from the wide low vase than from the tall narrow vase (see Table 3).

## Discussion

This experiment was conducted to investigate whether the shape of a vase in which candy is presented in a natural setting, affects the amount of candy that is taken from that vase. It was found that the odds of taking an Easter egg are increased when the eggs are presented in a low wide vase compared to a tall narrow vase. Moreover, looking separately at mornings and afternoons revealed that merely in the morning, the odds of taking an egg from the wide low vase compared to the tall narrow vase was significantly higher. Splitting the sample per gender, showed that female visitors were more likely to take an Easter egg from the wide low vase whilst there was no significant increase from one vase to the other for males.

### *No nudge effect in the afternoon*

Two reasons could be put forward to account for the absence of a nudge effect in the afternoon. One explanation is that the afternoon sessions were conducted the first two days after Easter. Perhaps people had so many Easter eggs during Easter, that they no longer wanted a chocolate egg. Present results showing that people on average ate more Easter eggs in the afternoon (7 % vs. 11 %), do not support this explanation.

The alternative explanation is that the nudge effect is that small, that in the afternoon it is overruled by the stronger effect of depleted self-control (Muraven & Slessavera, 2003). One additional reason for more depleted self-control in the afternoon, is that increased self-control in the mornings was required. Most participants in this study came to the RIVM because of meetings. At a meeting, you do not want to appear with a mouth full of chocolate. These explanations are supported by results showing that there was no significant difference between morning and afternoon in the amount of eggs taken from the wide low vase whilst there was a difference for the tall narrow vase. The receptionists, both experienced receptionists who had worked for different companies, suggested to conduct the same experiment with peppermints instead of chocolate. Their experience was that a bowl with peppermints would be emptied much quicker than a bowl with hard candy. Future research should look into this. Also it would be interesting to investigate if current findings generalize to other categories of candy.

#### *Merely a nudge effect for females in the morning*

An explanation for only female participants showing a nudge effect, could be the stereotypes surrounding women and food. In the morning, when going to a meeting, you need to impress the party you are meeting. For women that concerns, amongst others, appearing feminine, as dictated by a thin ideal body image (Allen-O'Donnell, Cottingham, Nowak, & Snyder, 2011; Jensen & Holm, 1999). For future research it would interesting to see if similar or different results would be obtained when peppermints are used instead of chocolate.

## General discussion

The current study investigated the relation between accessibility of candy, motivation to eat healthy, and the probability and the amount of candy intake. Two experiments were carried out to extend previous research on nudging of accessibility. This was done by investigating a type of nudge that had not previously been researched, specifically: the effect of the shape of a container.

The first experiment was carried out in a lab setting at Utrecht University. It investigated how a nudge in the form of the shape of a vase containing candy, affects consumption of that candy. In this experiment it was also investigated how motivation to eat healthy influenced the effect of the nudge. The second experiment was conducted to address the limitations of the first experiment. This experiment was a field study carried out at the RIVM.

The present study centred around two hypotheses: Hypothesis 1: because of the greater accessibility of candy in a low wide vase than in a tall narrow vase, participants eat less candy from the tall narrow vase than from the wide low vase. Hypothesis 2: the more motivated someone is to eat healthy, the stronger the effect of a nudge promoting healthy behaviour. The following section will discuss the main findings of the study. Subsequently limitations of the current study, implications of the findings, and suggestions for future research will be provided.

### *Discussion of main findings*

Counter to what was hypothesized, it was found in Experiment I, that the shape of the vase did not affect the probability nor the amount that was eaten from the candy. For Experiment II the odds of taking candy from the wide low vase rather than the tall narrow

vase, were merely increased for females and only in the morning. Prior studies investigating different nudges pertaining to the accessibility of food, have shown that ease of access significantly affects if and how much is eaten from a product not just for females, but also for males (GreeNudge, 2012; Hanks, Just, and Wansink, 2013; Marchiori, Corneille, & Klein, 2012; Marchiori, Waroquier, & Klein, 2011; 2012; Wansink & van Ittersum, 2007; 2013; Wansink, van Ittersum, & Painter, 2006; Wansink, van Ittersum, & Payne, 2014).

Experiment I further showed that motivation to eat healthy did not influence the likelihood or the amount eaten from the candy. Nor did it influence the –absence of the- effect of the nudge. This was also an unexpected finding as previous research indicated that motivation is a factor significantly affecting behaviour (Brehm & Self, 1989; Muraven & Slessavera, 2003).

Since previous research has pointed out an effect of accessibility and motivation on eating behaviour, the lack of significant effects in the first experiment and the small effect found in the second experiment, may be accounted for by the limitations of the current study.

Interestingly, when extrinsic instead of general motivation to eat healthy was included in the model, analyses showed a significant main effect for both condition and extrinsic motivation to eat healthy. As predicted, participants ate more from the wide low vase. But unexpectedly, participants who were more extrinsically motivated to eat healthy, ate more from the candy. To account for this findings it was argued that the presence of the camera, and the knowledge that the experiment investigated eating behaviour, triggered a certain rebellion amongst participants which made them eat more candy rather than less. Furthermore it was argued that extrinsic motivation is easily fostered but also easily disappears, especially when a temptation is present and the extrinsic motivator is not present. Although this was supported by participants eating less candy when escorted by the male experimenter who was their teacher and thus might have reminded them of their health goals related to their study,

these notions warrant further research.

### *Limitations and implications for future research*

Five shortcomings regarding the present study should be addressed. First, the samples for both experiments were not selected randomly. Nevertheless, after dividing the sample of the first experiment based on gender, participants were randomly assigned to the experimental conditions. For Experiment II no such randomization procedure was possible. Furthermore, although it can be considered a strength that both experiments did not rely on psychology students, both samples cannot be considered representative of the Dutch population at large. This is because the physiotherapy students from Experiment I are on average more aware than other students of what a healthy diet and healthy eating habits entail. What is more, despite the fact that Experiment II was conducted outside the lab, also this sample cannot be considered representative of the general population. The RIVM is an institute investigating and advising on vaccinations, epidemics, viruses, and health. It could thus be assumed that people visiting the RIVM for meetings, know more about health than the general Dutch population. Future research should address this limitation by investigating if current findings generalize to environments that are more typical of the general population.

A second restraint of this study pertains un-healthiness of the candy that was presented to the participants. Although both *chocolade kruidnoten* and Easter eggs are high caloric candy and thus detrimental to health when consumed often, eating just a small amount of it cannot be considered truly unhealthy. Especially not if one is active during the remainder of the day which is probably true for the participants of both experiments. Future research should investigate the relation between motivation to eat healthy and candy consumption in a sample less attentive to health.

Two more restraints that pertain specifically to Experiment I, were the presence of the camera and the fact that the experiment was accidentally introduced to participants as a study on eating behaviour. Indeed a substantial number of participants (18%) mentioned the camera. As no question directly inferring about the camera was posed during the debriefing questionnaire, it could be that the number of participants noticing the camera was even larger than the number mentioning the camera. Both the presence of the camera and accidental explanation about the experiment likely influenced the eating behaviour of the participants. Future research should control for these factors.

Finally one limitation to the second experiment should be mentioned. In the lab it was possible to debrief participants and inquire about possible confounds and motivation to eat healthy. This was not done for the Experiment II. Although the receptionists indicated that they thought participants were not suspicious of the vase containing Easter eggs, it would be better to infer about suspicion directly though posing questions to the participants (and simultaneously ask about motivation to eat healthy).

This study aimed to validate the hypotheses that the shape of a container affects candy intake and that motivation to eat healthy, positively affects the effect of a nudge influencing accessibility of candy. Findings of this study can be used as a first exploration in dissecting the relation between motivation and the effect of nudges. Future research could, in addition to addressing the above mentioned methodological limitations, focus on furthering this first investigation by extending the current experimental set-up to include the effect of depletion, the effect of awareness of the nudge, and the interaction of these factors with nudges and motivation.

## Conclusion

The two experiments that were conducted, showed merely a limited effect of a nudge in the form of the shape of a vase in Experiment II and no effect of the nudge or motivation in Experiment I. In Experiment II, women, but not men, were more likely to pick candy from a wide low vase rather than a tall narrow vase in the morning, but not in the afternoon. However, the current evidence is not enough to substantiate the notion that accessibility of candy does not affect candy consumption in this situation. This is because there are a number of methodological limitations to these experiments. Moreover, different studies proved that motivation has a major influence on behaviour and abundant research has shown a direct relationship exists between accessibility and consumption. Therefore this research should be considered a first step in answering a relatively new scientific query.

This thesis opened with the question whether you recognized the situation of finishing a complete bowl of candy without noticing it. Not only do we nudge ourselves by leaving that bowl within an arm lengths reach, we are nudged always and everywhere we go. Most of the time, not in a direction promoting our health. To maintain a healthy weight in our current society, we need to regulate our caloric intake. More insight in methods such as nudges fostering healthy behaviour, is crucial. This thesis aims to provide a springboard from which future research can further explore the associations between nudges and motivation.



## References

- Allen-O'Donnell, M., Cottingham, M. D., Nowak, T. C., & Snyder, K. A. (2011). Impact of group settings and gender on meals purchased by college students. *Journal of Applied Social Psychology, 41*, 2268–2283. doi: 10.1111/j.1559-1816.2011.00804.x
- Brehm, J. W., & Self, E. (1989). The intensity of motivation. *Annual Review of Psychology, 40*, 109-131.
- Chaiken, S., & Pliner, P. (1987). Women, but not men, are what they eat: The effect of meal size and gender on perceived femininity and masculinity. *Personality and Social Psychology Bulletin, 13*(2), 166-176.
- Field, A. (2009). *Discovering statistics using SPSS*. Sage Publications Ltd: London
- GreenNudge (November 20th, 2012). 2nd Green nudge: A good meal. Retrieved June 13<sup>th</sup>, 2014 from <http://www.greenudge.no/en/studier>
- Hanks, A. S., Just, D. R., & Wansink, B. (2013). Smarter lunchrooms can address new school lunchroom guidelines and childhood obesity. *Journal of Pediatrics, 162*, 867-869.
- Jensen, K., & Holm, L. (1999). Preferences, quantities, and concerns: Sociocultural perspectives on the gendered consumption of foods. *European Journal of Clinical Nutrition, 52*, 351–359.
- Kahneman, D. (2011). *Thinking, fast and slow*. London: Penguin Group.
- Kuhl, J. (1994). Action versus state orientation: psychometric properties of the Action-Control Scale (ACS-90). In J. Kuhl, & J. Beckmann (Eds.), *Volition and personality: action versus state orientation* (pp. 47-56). Seattle: Hogrefe Huber.
- Maas, J., de Ridder, D.T.D., de Vet, E., & de Wit, J.B.F. (2011). Do distant foods decrease intake? The effect of food accessibility on consumption. *Psychology & Health, 1-15*. DOI:10.1080/08870446.2011.565341

- Marchiori, D., Corneille, O., & Klein, O. (2012). Container size influences snack food intake independently of portion size. *Appetite*, *58*, 814-817
- Marchiori, D., Waroquier, L., & Klein, O. (2011). Smaller food item sizes of snack foods influence reduced portions and caloric intake in young adults. *American Dietetic Association*, *111*, 727-731.
- Marchiori, D., Waroquier, L., & Klein, O. (2012). “Split them!” Smaller item sizes of cookies lead to a decrease in energy intake in children. *Journal of Nutrition and Education Behavior*, *44*, 251-255.
- Muraven, M., & Slessavera, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin*, *29*(7), 894-906. doi: 10.1177/0146167203253209
- Palfai, T. B. (2002). Action–state orientation and the self-regulation of eating behavior. *Eating Behaviors*, *3*(3), 249–259. doi: 10.1016/S1471-0153(02)00068-5
- Pelletier, L.G., Dion, S.C., Slovinec-D’Angelo, M., & Reid, R. (2004). Why do you regulate what you eat? Relationships between forms of regulation, eating behaviours, sustained dietary behaviour change, and psychological adjustment. *Motivation and Emotion*, *28*(3), 245-278.
- Pratt, I. S., Croager, E. J., & Rosenberg, M. (2012). The mathematical relationship between dishware size and portion size. *Appetite*, *58*, 299-302.
- Thaler, R.H., & Sunstein, C.R., (2008). *Nudge, improving decisions about health, wealth, and happiness*. London: Penguin Books Ltd.
- Wansink, B., & van Ittersum, K. (2007). Portion size me. Downsizing our consumption norms. *Journal of the American Dietetic Association*, *107*(7), 1103–1106.
- Wansink, B., & van Ittersum, K. (2013). Portion size me: Plate-size induced consumption norms and win-win solutions for reducing food intake and waste. *Journal of Experimental*

*Psychology: Applied*, 19(4), 320-332.

Wansink, B., van Ittersum, K., & Painter, J.E. (2006). Ice cream illusions: Bowl, spoons and self-served portions sizes. *American Journal of Preventive Medicine*, 31(4), 240-243.

Wansink, B., van Ittersum, K., & Payne, C.R. (2014). Larger bowl size increases the amount of cereal children request, consume, and waste. *Journal of Pediatrics*, 164(2), 323-326.

Weingarten, H.P., & Elston, D. (1990). The phenomenology of food cravings. *Appetite*, 15, 231-246.