



Communicating eating-related rules. Suggestions are more effective than restrictions [☆]



F. Marijn Stok ^{a,b,*}, Emely de Vet ^c, John B.F. de Wit ^d, Britta Renner ^a,
Denise T.D. de Ridder ^b

^a Psychological Assessment and Health Psychology, University of Konstanz, Germany

^b Department of Clinical and Health Psychology, Utrecht University, The Netherlands

^c Communication, Philosophy and Technology: Centre for Integrative Development, Wageningen University and Research Centre, The Netherlands

^d National Centre in HIV Social Research, University of New South Wales, Australia

ARTICLE INFO

Article history:

Received 2 May 2014

Received in revised form 11 September 2014

Accepted 13 September 2014

Available online 22 September 2014

Keywords:

Social influence

Suggestion

Restriction

Eating-related rules

Health communication

ABSTRACT

Background: A common social influence technique for curbing unhealthy eating behavior is to communicate eating-related rules (e.g. 'you should not eat unhealthy food'). Previous research has shown that such restrictive rules sometimes backfire and actually increase unhealthy consumption. In the current studies, we aimed to investigate if a milder form of social influence, a suggested rule, is more successful in curbing intake of unhealthy food. We also investigated how both types of rules affected psychological reactance. **Method:** Students ($N = 88$ in Study 1, $N = 51$ in Study 2) completed a creativity task while a bowl of M&M's was within reach. Consumption was either explicitly forbidden (*restrictive rule*) or mildly discouraged (*suggested rule*). In the control condition, consumption was either explicitly allowed (Study 1) or M&M's were not provided (Study 2). Measures of reactance were assessed after the creativity task. Subsequently, a taste test was administered where all participants were allowed to consume M&M's. **Results:** Across both studies, consumption during the creativity task did not differ between the restrictive- and suggested-rule-conditions, indicating that both are equally successful in preventing initial consumption. Restrictive-rule-condition participants reported higher reactance and consumed more in the free-eating taste-test phase than suggested-rule-condition participants and control-group participants, indicating a negative after-effect of restriction. **Discussion:** Results show that there are more and less effective ways to communicate eating-related rules. A restrictive rule, as compared to a suggested rule, induced psychological reactance and led to greater unhealthy consumption when participants were allowed to eat freely. It is important to pay attention to the way in which eating-related rules are communicated.

© 2014 Elsevier Ltd. All rights reserved.

Introduction

Recent figures show that a majority of adults in the US and at least half of the adults in Europe currently weigh too much (Doak, Wijnhoven, Schokker, Visscher, & Seidell, 2012; Flegal, Carroll, Kit, & Ogden, 2012). Given the serious adverse health consequences of being overweight (e.g. Kopelman, 2007), it becomes ever more necessary to curb unhealthy eating behavior. One way to do this is through the use of social influence techniques. One social influence technique, which is commonly used for example in public health campaigns, is to communicate behavioral rules or

standards that advise people what they ought to do (i.e., 'you should not eat unhealthy food'; we refer to this type of social influence as *restrictive rules*). While such restrictive rules would probably lead to lower body mass indexes if they were ubiquitous, possibilities for imposing them are, in reality, limited. Eating-related rules are usually in place only during a certain period of time, in a certain location, or are contingent upon supervision, meaning that many situations in which unhealthy food is accessible still exist. Restrictive rules may thus initially succeed in suppressing unhealthy consumption, but previous research has shown that they may cause people to rebound and behave against the rule once it is no longer in place or can no longer be enforced (Albarraçin, Cohen, & Kumkale, 2003; Jansen, Mulken, Emond, & Jansen, 2008).

There are indications that a milder form of social influence, namely *suggesting not to eat unhealthily* (we refer to this type of social influence as *suggested rules*), may not suffer from negative after-effects on consumption (Mann & Ward, 2001). This may be the case because, while promoting the same behavior, a suggested rule merely provides a recommendation and leaves the choice up to the

[☆] **Acknowledgments:** This research was supported by the European Commission FP7 Research Program (Health-F2-2008-223488). The authors would like to thank Fee Benz, Rachel Gabauer, Inge de Kerf, Rixt Meinderts and Jair Shankar for their help with data collection.

* Corresponding author.

E-mail address: Marijn.Stok@uni-konstanz.de (F.M. Stok).

individual, whereas a restrictive rule proscribes behavior and interferes with an individual's sense of freedom of choice. This perceived restriction of freedom may induce a state of psychological arousal known as *reactance* and may cause people to restore their freedom by behaving against the behavioral rule. In the current study, we investigate if a milder form of social influence is indeed more successful in curbing unhealthy intake than outright restriction. We also investigate why this may be the case, using reactance theory as a theoretical framework.

Psychological reactance

Psychological reactance theory (Brehm, 1966; Silvia, 2006; Wicklund, 1974) posits that attempts to persuade an individual or to steer an individual's behavior may come across to that person as a threat to his or her freedom of choice. For example, when the rule not to consume unhealthy food is imposed, people may consider this a limitation of their array of possible choices. As people have a strong basic need for self-determination and a preference to perceive themselves as being in charge of their own decisions and behavior (Deci & Ryan, 2000), threats to their freedom of choice will motivate them to restore their sense of freedom and self-determination. One way to restore freedom is to act against the rule as soon as this is possible (i.e., doing exactly that what has been proscribed; Brehm, 1966; Clee & Wicklund, 1980). In other words, a well-intended restrictive rule – the rule is, after all, communicated with the intention of helping people eat more healthily – may thus ironically cause people to actually behave less in line with the desired behavior once it is no longer in place or can no longer be enforced.

Consider the implications for health-promotion campaigns: while possibly successful in suppressing unhealthy intake initially, restrictive rules may not constitute the best strategy for decreasing unhealthy eating behavior over time. An alternative strategy might be to use a milder type of social influence, namely to *suggest* not to eat certain foods. Although a suggested rule recommends the same behavior as a restrictive rule, the framing of the rule ('you ought to...' versus 'I suggest that you...') differs crucially. A restrictive rule, as described above, may threaten an individual's sense of self-determination. A suggested rule still discourages consumption of a certain food, but it leaves the ultimate decision about eating the food up to the individual. Accordingly, a suggested rule should leave an individual's sense of self-determination intact (Deci & Ryan, 2000; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). A suggested rule, therefore, should not arouse psychological reactance and should also not produce negative after-effects when the rule is no longer in place.

Framing eating-related rules: restriction versus suggestion

Imposing restriction of consumption has indeed been shown to produce negative effects after the restrictive rule had been lifted. For example, children whose parents strongly restricted unhealthy food intake were found to consume more sweets when allowed to eat freely (Jansen, Mulken, & Jansen, 2007), and prohibiting consumption of sweets was found to increase children's intake of those sweets once consumption was allowed again (Jansen et al., 2008). Moreover, university students who were instructed not to eat a favorite food for 24 hours subsequently consumed more of this food in a free-eating taste test than did control participants who received no restrictive rule (Soetens, Braet, Van Vlierberghe, & Roets, 2008). Restricting undergraduates' carbohydrate or protein intake over a period of 3 days increased craving for the respective food and, for carbohydrates, also led to increased intake in a subsequent experimental session (Coelho, Polivy, & Herman, 2006). Restricting access to a favorite food increased children's positive

comments about and their requests for that food, and led to higher selection and consumption of it (Fisher & Birch, 1999). Taken together, these results indicate that, ironically enough, a restrictive rule may actually increase intake of food in situations where the rule is no longer in place or cannot be enforced.

Previous research also provides initial evidence that framing eating-related rules as suggestions rather than restrictions may indeed be a promising alternative strategy for promoting healthier eating behavior. In a set of two studies (Mann & Ward, 2001), college students were either prohibited from eating certain foods or encouraged not to eat them. This led participants in the prohibition group to desire the forbidden food more than a control group did, whereas participants in the encouragement group did not. These studies found no differences in actual consumption of the foods in a subsequent free-eating taste test. Another study in undergraduate students showed that label warnings of high-fat content in cream cheese led to higher intentions to taste the cream cheese than information labels simply informing of the high-fat content (Bushman, 1998). In other health-related domains, several studies have shown similar results. For example, university students reading a message that opposed the consumption of an alcohol-like product had higher intentions to consume that product than did participants reading a message that recommended moderation (Albarracín et al., 2003), and Grandpre, Alvaro, Burgoon, Miller, and Hall (2003) showed that high-school students reported a higher likelihood that they would try a cigarette after viewing an explicit (restrictive) anti-smoking message than after viewing an implicit (suggested) anti-smoking message (no difference was not found in younger children, probably because they are not yet so prone to reactance; cf. Rummel, Howard, Swinton, & Seymour, 2000).

Present research

There are thus clear indications that restrictive rules may lead to unfavorable health outcomes once the rule is no longer in place, whereas suggested rules may be free of these negative after-effects. In the eating behavior domain, earlier research has demonstrated such negative effects on cognitive measures of craving and desire (Mann & Ward, 2001), but this research did not find behavioral effects. So far, we are aware of only one (as of yet unpublished) study (De Vet, Stok, & De Ridder, in preparation) that shows actual behavioral effects. Another issue that has not yet received much attention is whether both types of rules are equally successful in inducing *initial* non-consumption, that is, while the rule is in place. In order for a suggested rule to be a realistic alternative to restrictive rules, for example as a tool to be used in health-promoting interventions, it should be shown to be at least equally successful in suppressing initial intake. Furthermore, although previous studies have often referred to psychological reactance as a possible explanation for these differential effects (e.g. Grandpre et al., 2003; Mann & Ward, 2001), this idea has not yet been put to the empirical test.

The current research has three main aims. First, we aim to show that both restrictive and suggested rules are highly and equally successful in suppressing initial consumption. Second, we aim to show that a restrictive rule, as compared to a suggested rule, has negative behavioral after-effects, leading to increased consumption once the rule is no longer in place. We also aim to show that a suggested rule is free from such negative effects. Third, we aim to empirically test the assumption that reactance may play a role in this difference, by investigating whether reactance is higher in people who receive a restrictive rule than in people who receive a suggested rule.

Both studies included in this article consist of two phases. In the first phase, participants are exposed to M&M's but consumption is either not allowed (restrictive rule) or discouraged (suggested rule).

Two different control conditions are employed (free consumption in Study 1 and no exposure in Study 2). In the second phase, participants are again exposed to M&M's and allowed to consume ad-lib. In between the two phases, reactance is assessed. At this time, participants also rate how effortful they perceived resisting the M&M's, as individual differences in perceived effort may affect the level of psychological reactance experienced regardless of experimental condition (in which case effort should be controlled for). A priori, we were not sure whether the experimental manipulation would have a main effect on effort. It could be the case that complying with a restrictive rule may require more effort than complying with a suggested rule, which is suggested in a previous study (De Vet et al., in preparation), but it is also plausible that complying with a clear prohibition requires less effort than following a more ambiguous suggestion.

Study 1

This study, which was described to the participants as a study investigating the association between creativity and hunger, followed the general two-phase protocol outlined above.¹ In the first phase, participants performed a creativity task while being exposed to M&M's, with the experimenter explaining that in this phase consumption was not allowed (restrictive-rule-condition), discouraged (suggested-rule-condition) or allowed (control condition). In the second phase, which was presented as a separate and unrelated marketing study, participants were asked to taste M&M's ad libitum. We hypothesized, first, that both experimental conditions would be equally successful in suppressing initial consumption (that is, consumption during the creativity task while the rule was in place). Secondly, we hypothesized that reactance would be higher in the restrictive-rule-condition than in the suggested-rule-condition. No formal hypothesis was formulated about the effect of the experimental manipulation on perceived effort exerted to adhere to the non-consumption rule. Thirdly, we hypothesized that participants in the restrictive-rule-condition would consume more M&M's in the taste test than participants in suggested-rule- and control conditions. We also expected to find a difference between the latter two conditions, with control condition participants consuming even less, because they would probably be somewhat satiated already after freely consuming M&M's in the first phase of the study.

Methods

Participants

A total of 88 female students from a liberal arts and sciences college in The Netherlands participated in the study. Participants had a mean age of 20.4 years ($SD = 1.0$) and mean BMI was 21.7 ($SD = 2.6$; range 16.5 to 29.8). Participants were randomly assigned to the three conditions ($N = 29$ in the restrictive-rule-condition, $N = 29$ in the suggested-rule-condition, and $N = 30$ in the control condition).

Procedure

Participants were recruited for a study on hunger and creativity and asked to refrain from eating anything in the 2 hours before the experiment. Upon arrival at the lab, each participant first gave written consent for participation. The participant completed a questionnaire assessing socio-demographic characteristics, hunger, and liking for and wanting of chocolate. After the first questionnaire was completed, a bowl of M&M's (filled up to about 2 cm from the rim)

was placed on the participant's table. Unbeknownst to the participant, this bowl had been previously weighed (a standardized weight of 600 g was used as the starting weight for all participants, which included about 350 g for the bowl itself and about 250 g of M&M's). The participant then received the instructions for the creativity task, which included the experimental manipulation. All participants were informed that they would complete a creativity task. Attention was drawn to the bowl of M&M's by saying "there is a bowl of M&M's already on the table. These will be used in a next phase of the study, (...)", with the sentence continuing in a different way for each of the three conditions. In the restrictive-rule-condition, the experimenter finished the sentence by saying "and during this phase of the experiment, you are not allowed to eat from the bowl yet". In the suggested-rule-condition, the experimenter stated "and during this phase of the experiment, it is better if you do not eat from the bowl yet". In the control condition, the experimenter said "but if you want to eat from the bowl already, that is allowed". A pilot study showed that the experimental manipulation was successful in inducing higher perceived freedom of choice in the suggested-rule-condition than in the restrictive-rule-condition.²

The participant then completed the creativity task, which was a variation on a well-known creativity test (Guilford, 1967) and consisted of the participant having to list as many possible themes, locations, dress codes and performing artists as possible for the next college prom. The amount of time the participant spent working on the creativity task (rounded off to the nearest minute) was unobtrusively recorded by the experimenter to preclude the possibility that the participant in one condition would be exposed to the M&M's longer than participants in another condition. After the creativity task, a second questionnaire was brought in. For participants in the experimental conditions, this questionnaire included assessments of perceived effort and psychological reactance, as well as a number of filler items. In order to keep the questionnaires similar across all three conditions, participants in the control condition received similar items, but only as filler items which were not analyzed (because control condition participants' consumption was not restricted, they did not need to exert effort and freedom of choice was not threatened). Meanwhile, the bowl of M&M's was taken away again. The participant was told that the experimenter realized the bowl was not quite full enough, while the experiment required that all participants received a similarly full bowl, and that she would therefore add some more M&M's. While the participant completed the second

¹ In this study, we also measured self-reported feelings of (physical) arousal. No consistent effects were found on this variable and we do not further report on it in this article. Details may be obtained from the corresponding author.

² The pilot study ($N = 82$ female university students) employed exactly the same manipulation and was used to obtain a general idea of the manipulation and its potential. Various other outcome measures (wanting and liking of chocolate, perceived autonomy support, motivation, and interest in and importance of the creativity task) were assessed before the measure relevant for the current purposes, which was a 7-item instrument (Cronbach's $\alpha = .93$) based on the Perceived Choice subscale of the Intrinsic Motivation Inventory (Deci, Eghrari, Patrick, & Leone, 1994). Example items are "I had no choice regarding whether or not I would eat the M&M's" (reverse coded) and "I felt that I could decide for myself if I would eat the M&M's or not", measured on a scale ranging from 1 (completely disagree) to 7 (completely agree); higher scores thus indicated higher perceived freedom. An ANOVA with condition as independent variable and perceived choice as dependent variable showed a significant effect of condition, $F(2,79) = 54.60$, $p < .001$, $\eta_p^2 = .58$. Participants in the restrictive-rule-condition ($M = 3.1$, $SD = 1.4$) reported lower perceived choice than participants in the suggested-rule- ($M = 4.1$, $SD = 1.3$, $p = .005$) and control ($M = 6.4$, $SD = 0.8$, $p < .001$) conditions. The latter two conditions also differed significantly from each other, $p < .001$. To get a feeling for whether participants found the cover story for combining the creativity task and the taste test into one experiment believable, intake of M&M's was also assessed in the pilot study, but no significant results were found (likely due either to the fact that there was a rather large time interval between the manipulation and the taste test due to the many questionnaires administered or to the fact that we used two different rooms in the pilot study, one for the questionnaires and one for the two M&M's phases, with the participant switching for the different parts of the study. Both aspects were improved upon for Studies 1 and 2, in which the interval was shorter and in which the participant remained in the same room for the entire study duration).

questionnaire, the experimenter unobtrusively weighed the bowl of M&M's to determine consumption during the creativity task.

Lastly, a bowl of M&M's (which was again weighed beforehand and standardized to 600 g, but which the participant believed to simply be the same bowl that she had been presented with earlier, topped up with some extra M&M's) was brought in together with a taste test. In this final phase, the participant was asked if she would mind taking part in an unrelated extra study, which was described as a brief marketing study that the experimenter was asked to run for a friend. All participants consented to doing so. The participant was informed that she would have to rate the taste of the M&M's on a number of different dimensions (such as sweetness, smoothness and crunchiness) and that, while doing so, she was allowed to eat freely from the M&M's. In order to make sure that all participants were exposed to the M&M's for an equally long time and thus had equal opportunity to eat them, tasting time was standardized to 10 minutes. The participant was told that it was important that the taste test lasted equally long for all participants and that she could therefore not continue with the next part of the experiment sooner, and that the experimenter would come back when the 10 minutes were over. After the taste test, the participant answered some final questions including an item probing awareness of the true purpose of the study. The participant was then debriefed, paid and thanked for her participation. After the participant left, the experimenter weighed the bowl of M&M's again to determine consumption during the taste test.

Measures

Age, height and weight were self-reported by the participants. BMI was calculated from participants' height and weight.

Level of hunger was assessed using one item, "How hungry are you right now?", which was answered on a 7-point scale ranging from 1 (not at all) to 7 (very much).

Chocolate liking and wanting were assessed with one item each, "How much do you like chocolate?" and "How much would you like to eat chocolate at this moment?", respectively. Both items were measured on a 7-point scale ranging from 1 (not at all) to 7 (very much). The liking item was taken from [Ouweland and De Ridder \(2008\)](#), the wanting item from [Finlayson, King, and Blundell \(2008\)](#). Five people indicated not liking chocolate (with a score below the midpoint of the scale), although these people did not actually consume less chocolate. All results were rerun excluding these five participants, but as this did not change any outcome, results are reported for the full sample.

Consumption during the creativity task was computed by subtracting the weight of the bowl after completion of the creativity task from the weight of the bowl before the creativity task.

Compliance with the non-consumption rule was computed for the experimental conditions only and derived from the computed variable of consumption during the creativity task. A dichotomous variable was created (0 = complied with the non-consumption rule, 1 = did not comply with the non-consumption rule).

Psychological reactance was measured using an 8-item scale inspired by Hong's Psychological Reactance Scale ([Hong & Page, 1989](#)). Participants indicated how true each item was for them on a 5-point scale ranging from 1 (not at all true) to 5 (very true). An example item is "Being suggested not to eat the M&M's triggered a sense of resistance in me", Cronbach's alpha = .77. Five filler items (e.g. 'because I was hungry, I was less creative than I usually am') were interspersed with the reactance items to obscure the true purpose of the items.

Perceived effort needed to resist eating the M&M's during the creativity task was assessed with one item, "I needed a lot of self-control to refrain from eating M&M's", on a 5-point scale ranging from 1 (not at all true) to 5 (very true).

Consumption during the taste test was computed by subtracting the weight of the bowl after completion of the taste test from the weight of the bowl after the creativity task. Six participants consumed more than 2.5 SDs above the mean during the taste test. Taste test consumption of these six outliers was set to missing.³

Awareness of the study's true purpose was assessed by asking participants what they thought the true purpose of the study was (open-ended). Participants provided a written response.

Results

Answers on the items probing awareness were screened. No indications were found that any participant was aware of the true purpose of the study.

Descriptive statistics

On average, participants were neither hungry nor satiated ($M = 4.6$, $SD = 1.5$) and reported liking chocolate ($M = 5.9$, $SD = 1.4$) although they did not report a strong desire to consume chocolate at that moment ($M = 4.6$, $SD = 1.9$). They worked on the creativity task for 17.9 minutes on average ($M = 3.3$).

Randomization check

Separate univariate ANOVAs with condition as independent variable and age, BMI, hunger, liking of chocolate, wanting of chocolate and time spent on the creativity task as dependent variables indicated that there were no differences between the three conditions on any of these variables, all F 's (2,85) < 1.80, all p 's > .17.

Consumption during the creativity task: immediate effects

An ANOVA with experimental condition as independent variable and grams consumed during the creativity task as dependent variable showed a main effect of condition, $F(2,85) = 27.92$, $p < .001$, $\eta_p^2 = .40$. Post-hoc pairwise comparisons (least square difference) showed that participants in the control condition consumed more M&M's ($M = 31.1$, $SD = 26.3$) than participants in both the suggested-rule-condition ($M = 2.9$, $SD = 10.6$, $p < .001$) and the restrictive-rule-condition ($M = 1.7$, $SD = 7.9$, $p < .001$). There was no significant difference between the restrictive-rule- and suggested-rule-conditions ($p = .80$).

A chi-square analysis comparing compliance with the non-consumption rule between the two experimental conditions showed that five participants (two in the restrictive-rule-condition and three in the suggested-rule-condition) did not comply with the rule. Frequency of non-compliance did not differ between the two conditions, $\chi^2(1, N = 58) = 0.22$, $p = .64$. All subsequent analyses were conducted twice, once including the five non-compliers and once without them. Removing these participants did not significantly change any of the reported outcomes. Results are therefore reported for the full sample. In the control condition, 90% ($N = 27$) of participants ate M&M's during the creativity task. Average consumption in the control condition was 31.1 g ($SD = 26.3$).

³ Including the outliers slightly affected the results of the analysis investigating the effect of condition on taste test consumption. Although the main effect and the pairwise comparisons between restrictive-rule and control, and suggested-rule and control, were still significant, the difference between restrictive- and suggested-rule became marginally significant ($p = .09$). While the difference between means was in fact higher in the sample with outliers ($M_{restrictive} = 18.8$, $M_{suggested} = 12.8$) than in the sample without outliers reported in the main analysis, standard deviations were much higher in the sample with outliers ($SD_{restrictive} = 16.1$, $SD_{suggested} = 16.6$) than in the sample without outliers, indicating greater measurement error and suppressing the significance level.

Effort and reactance

Only the two experimental conditions were included in these analyses. An ANOVA with condition as independent variable and perceived effort as dependent variable showed that complying with the suggested rule was perceived as more effortful ($M = 2.4$, $SD = 1.1$) than complying with the restrictive rule ($M = 1.8$, $SD = 0.9$), $F(1,56) = 6.41$, $p = .014$, $\eta_p^2 = .10$. An ANOVA was then conducted with condition as independent variable and reactance as dependent variable. No significant effect of condition was found, $F(1,56) = 1.15$, $p = .29$. As a positive correlation was found between reactance and perceived effort ($r = .38$, $p = .003$), it seemed that, irrespective of the framing of the rule, those who reported having exerted more effort in adhering to the instructions also reported more reactance. We therefore re-ran the analysis on reactance, this time including perceived effort as a covariate. Results of this ANCOVA showed a significant effect on the level of psychological reactance participants experienced, $F(1,55) = 5.56$, $p = .02$, $\eta_p^2 = .09$. In accordance with our hypotheses, when controlling for perceived effort, reactance was shown to be significantly higher in the restrictive-rule-condition ($M = 2.7$, $SD = 0.8$) than in the suggested-rule-condition ($M = 2.3$, $SD = 0.8$), while effort was a significant covariate, $F(1,55) = 14.55$, $p < .001$, $\eta_p^2 = .21$. Such a change from non-significant to significant predictor could be indicative of suppression, with effort suppressing the effect of experimental condition on reactance.

The presence of suppression was tested using Hayes' INDIRECT macro for SPSS described in Preacher and Hayes (2008). Experimental condition was dummy coded (0 = suggested-rule, 1 = restrictive-rule) and effort was mean-centered. Regression analyses showed that the predictive strength of the direct path from experimental condition to reactance (i.e., the *c* path) increased from non-significant ($B = 0.22$, $SE = 0.20$, $p = .29$) to significant when the indirect path via effort was taken into account (i.e., the *c'* path; $B = 0.47$, $SE = 0.19$, $p = .02$). A bootstrap procedure showed that this indirect path was significant: using the bootstrap procedure for indirect effects outlined in Preacher and Hayes (2008) with 5000 bootstrap resamples, a 95% bias-corrected bootstrap confidence interval was derived for the indirect effect; $B = -0.23$, $CI [-0.48, -0.08]$. As zero was not included in the confidence interval, the indirect effect via effort was significant, suggesting a suppression effect. This suppression effect indicates that perceived effort (which was higher in the suggested-rule-condition) suppressed the pure effect of the experimental manipulation on reactance (which was higher in the restrictive-rule-condition).

Consumption during the taste test: after-effects

An ANOVA with condition as independent variable and taste test consumption as dependent variable showed that condition was a significant predictor of taste test consumption, $F(2,79) = 9.85$, $p < .001$, $\eta_p^2 = .20$. Post-hoc pairwise comparisons (least square difference) indicated that participants in the restrictive-rule-condition consumed more M&M's when allowed to consume freely ($M = 13.2$, $SD = 7.5$) than did participants in both the suggested-rule-condition ($M = 9.1$, $SD = 9.3$, $p = .04$) and the control condition ($M = 4.7$, $SD = 3.5$, $p < .001$), see Fig. 1. The difference between the latter two conditions was also significant, $p = .02$.

Discussion

Study 1 showed that the suggested rule and the restrictive rule were equally successful in suppressing initial consumption compared to a no-rule control condition. This indicates that a suggested rule does not detract from the positive initial effects of more restrictive rules, and may thus be a practical, viable alternative to a restrictive rule. Results also indicated that the restrictive rule induced more psychological reactance in participants than the suggested rule. This effect was found only when individual differences in

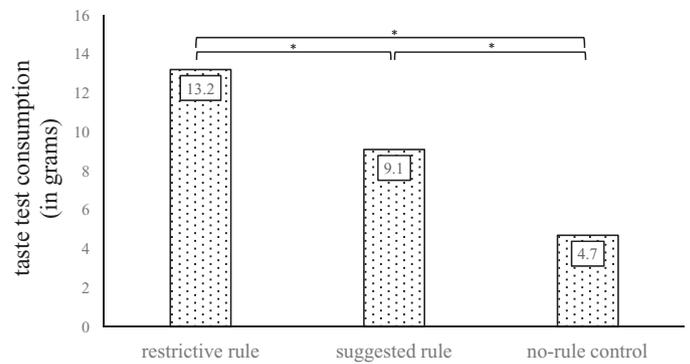


Fig. 1. Consumption of M&M's (in grams) in each condition during the taste test in Study 1 (* indicates a significant difference at $p < .05$).

perceived effort were taken into account. The effect of the experimental manipulation on perceived effort itself was also significant; participants reported greater perceived effort in the suggested-rule-condition than in the restrictive-rule-condition. In this study, then, complying with a suggested rule required more effort than complying with a restrictive rule, which was shown to suppress the pure effect of the experimental manipulation on reactance. It should be noted that in this study, effort was measured with one item only, which constitutes a limitation. Furthermore, once consumption was allowed again, previously having followed a restrictive rule had a negative after-effect as compared to having followed a suggested rule: consumption during the taste test was higher in the former condition. Direct comparison of taste test consumption of the two experimental conditions to the control condition was difficult because participants in the control condition generally had already consumed M&M's during the creativity task and so it is likely that they were already rather satiated when starting the taste test. In summary, this study showed that the restrictive rule led to greater reactance (when perceived effort was taken into account) and to greater consumption in the taste test than the suggested rule.

The consumption of M&M's during the creativity task phase in the control condition constitutes an important limitation of the current study, because it means that, due to satiety effects, we cannot directly assess whether complying with a suggested rule has a negative behavioral after-effect as compared to not receiving a rule at all. In order for suggested rules to be considered a promising tool for interventions, they should not only lead to lower negative after-effects than restrictive rules; ideally, they should have no negative after-effects at all as compared to a no-rule control condition – but this could not be tested in Study 1. The procedure for Study 2 was adjusted in such a way that this second aspect could be investigated as well.

Study 2

This study, which was described to the participants as a study investigating the association between creativity and taste, again followed the general two-phase protocol outlined in the introduction section.¹ In this study we aimed to replicate and extend the findings from Study 1 using a slightly adjusted study procedure. The most important procedural difference concerned the control condition. In Study 2, participants in the control condition were not exposed to M&M's in the first phase (during the creativity task). This means that their satiety level when starting the taste test will be comparable to that of participants in the experimental conditions, facilitating comparison of taste test consumption between the control and experimental conditions. Another improvement was a more comprehensive assessment of perceived effort, in order to further

investigate the role that effort plays in the development of feelings of reactance. Moreover, a different population was studied in Study 2 (male and female German university students) as compared to Study 1 (female Dutch college students), in order to extend the generalizability of the results.

As in Study 1, we hypothesized that both experimental conditions would be similarly successful in suppressing initial consumption. Our second hypothesis was that reactance would be higher in the restrictive-rule-condition than in the suggested-rule-condition. As in Study 1, no formal hypothesis about effort was formulated. Thirdly, we hypothesized that participants in the restrictive-rule-condition would consume more M&M's in the taste test than the participants in the suggested-rule- and control conditions. Unlike Study 1, we did not expect to find a difference in taste test consumption between the latter two conditions in this study.

Methods

Participants

The sample consisted of 51 participants (21 men and 30 women).⁴ Participants had a mean age of 23.7 years ($SD = 3.8$) and a mean BMI of 22.5 ($SD = 4.0$; range 15.4 to 34.7). They were randomly assigned to the three conditions ($N = 14$ in the restrictive-rule-condition, $N = 18$ in the suggested-rule-condition, and $N = 19$ in the control condition).

Procedure

Large parts of the study procedure were identical to Study 1 and are repeated here only briefly; changes and amendments to the procedure are highlighted. Participants were recruited for a study ostensibly investigating the relation between creativity and taste. (In Study 1, the cover story was that the study investigated the relation between hunger and creativity; the change in protocol made it unnecessary to present the taste test as an ostensibly separate study.) Participants were asked to refrain from eating anything in the 2 hours before the experiment. Upon arrival at the lab, the participants first gave written consent for participation and then completed a questionnaire assessing socio-demographic characteristics, hunger, and liking for and wanting of chocolate. In the two experimental conditions, a bowl of M&M's (again filled up to about 2 cm from the rim, with a standardized starting weight of 500 g, including about 250 g for the bowl itself and about 250 g of M&M's) was then placed on the participant's table, and instructions (including the experimental manipulation) were provided for the creativity task. As in Study 1, the experimenter stated either that consumption was not yet allowed in this phase of the experiment (restrictive-rule-condition) or that it would be better if the participant did not eat from the bowl yet (suggested-rule-condition). The procedure for the control condition deviated from Study 1. In the control condition, no bowl of M&M's was placed in front of the participant yet. The participant then completed the creativity task, which was again a variation on Guilford's creativity test (Guilford, 1967) and which this time consisted of participants having to list as many

possible different ways to use four everyday objects. The amount of time the participants spent working on the creativity task was recorded again.

After the creativity task, the bowl of M&M's was taken away and unobtrusively weighed. Psychological reactance and effort were assessed in the experimental conditions. Unlike in Study 1 (where control condition participants received similar items which were not analyzed), no filler items were provided to control condition participants in Study 2. Finally, in all conditions a bowl of M&M's (again weighed beforehand and now standardized to 550 g, meaning it contained 50 g more M&M's than in the first phase, which was done to make the cover story about 'topping up' more believable) was brought in together with a taste test that was similar to the test used in Study 1, and as in Study 1, the participant was informed that this part of the study would last 10 minutes. After the taste test, the experimenter probed awareness of the true purpose of the study. The participants were then paid and thanked for their participation. Unlike in Study 1, where debriefing followed immediately, in Study 2 debriefing occurred via e-mail after the study was finished. This was done to make sure that earlier participants could not tell future participants about the true purpose of the study.

Measures

Age, height and weight were self-reported by the participants. BMI was calculated from participants' height and weight.

Level of hunger was assessed as in Study 1.

Chocolate liking and wanting were assessed as in Study 1. There were no people who did not like chocolate; everybody scored at or above the midpoint of the scale.

Consumption during the creativity task was computed for the experimental conditions only, by subtracting the weight of the bowl after completion of the creativity task from the weight of the bowl before the creativity task.

Compliance with the non-consumption rule was computed for the experimental conditions only and derived from the computed variable of consumption during the creativity task. A dichotomous variable was created (0 = complied with the non-consumption rule, 1 = did not comply with the non-consumption rule).

Psychological reactance was measured as in Study 1; Cronbach's alpha was .86.

Perceived effort was assessed with two items, "I needed a lot of self-control to refrain from eating M&M's" (which was also used in Study 1) and "Resisting the temptation of the M&M's was hard for me" (which was a new item), on a 5-point scale ranging from 1 (not at all true) to 5 (very true). The items correlated strongly ($r = .82$, $p < .001$) and one average measure was computed.

Consumption during the taste test was computed by subtracting the weight of the bowl after completion of the taste test from the weight of the bowl after the creativity task. Two participants consumed more than 2.5 SDs above the mean during the taste test. Taste test consumption of these two outliers was set to missing.⁵ One further participant asked to take the M&M's home and put them in her bag before the experimenter could weigh them; taste test consumption for this participant was thus missing.

Awareness of the study's true purpose was assessed by asking participants what they thought the true purpose of the study was (open-ended). Participants reported their response orally to the ex-

⁴ Twenty-three psychology students were also tested. However, results for this group of participants differed substantially from those of the remaining participants: no significant effects of the experimental manipulation on effort or reactance were found, and most importantly, the effect on consumption during the taste test was reversed, with participants consuming less in the restrictive-rule-condition ($M = 15.7$, $SD = 11.7$) than in the suggested-rule- ($M = 35.9$, $SD = 18.1$) and control ($M = 35.7$, $SD = 19.2$) conditions (detailed results can be obtained from the corresponding author). This probably reflects more understanding among psychology students of food-related experiments (indeed, they reported significantly higher awareness of the fact that the bowl of M&M's would be weighed after the taste test, $\chi^2(1, N = 74) = 8.18$, $p = .004$, and marginally significantly higher awareness of the instructions pertaining to the experimental manipulation, $\chi^2(1, N = 74) = 2.95$, $p = .09$). Results were therefore reported only for the sample of non-psychology students.

⁵ Including the outliers changed the results of the analysis investigating the effect of condition on taste test consumption. Both outliers were in the control condition, and including them substantially increased mean consumption in the control condition (to $M = 37.4$, $SD = 35.9$). While the means of the other two conditions remained the same, results of the ANOVA were affected: the main effect was no longer significant, $F(2,47) = 1.94$, $p = .16$. The only pairwise comparison that remained marginally significant was that between the restrictive- and suggested-rule-conditions, $p = .06$.

perimeter. In order to facilitate quantitative analysis of awareness, four yes-or-no items were created, each of which reflected partial awareness of one aspect of the study's true purpose. The experimenter indicated for each item whether the participants' reply reflected awareness of that aspect of the study's true purpose. The items were 'presence of the M&M's during the creativity task'; 'instructions about not eating during the creativity task'; 'true relation between the creativity task and the taste test'; and 'weighing bowl to determine intake of M&M's'.

Results

Analysis of the awareness items indicated that no participant was fully aware of the true purpose of the study. Most participants were aware of none ($N = 34$; 66.7%) or only one ($N = 13$; 25.5%) of the four relevant aspects. Only 7.8% of the sample ($N = 4$) reported awareness of two aspects, and nobody reported being aware of three or four aspects.

Descriptive statistics

On average, participants were neither hungry nor satiated ($M = 4.7$, $SD = 1.4$) and reported liking chocolate ($M = 6.0$, $SD = 1.0$). They also reported a moderate desire to consume chocolate at that moment ($M = 5.0$, $SD = 1.3$). They worked on the creativity task for 12.8 minutes on average ($M = 4.8$).

Randomization check

Separate univariate ANOVAs with condition as independent variable and age, BMI, hunger, liking of chocolate, wanting of chocolate and time spent on the creativity task as dependent variables indicated that there were no differences between the three conditions on any of these variables, all F 's ($2, 48$) < 1.21 , all p 's $> .30$. A chi-square test indicated that the conditions also did not differ with regard to gender, $\chi^2(2, N = 51) = 0.06$, $p = .97$.

Consumption during the creativity task: immediate effects

An ANOVA with condition as independent variable (experimental conditions only) and grams consumed during the creativity task as dependent variable showed no effect of condition, $F(1, 30) = 1.63$, $p = .21$. Two participants (both in the suggested-rule-condition) did not comply with the non-consumption rule.

A chi-square analysis comparing compliance with the non-consumption rule between the two experimental conditions showed that frequency of non-compliance did not differ between the two conditions, $\chi^2(1, N = 32) = 1.66$, $p = .20$. All subsequent analyses were conducted twice, once including the two non-compliers and once without them. Removing these participants did not significantly change any of the reported outcomes. Results are therefore reported for the full sample.

Effort and reactance

Only the two experimental conditions were included in these analyses. An ANOVA with condition as independent variable and perceived effort as dependent variable showed that following the restrictive rule was perceived as requiring more effort ($M = 3.1$, $SD = 1.2$) than following the suggested rule ($M = 2.1$, $SD = 1.2$), $F(1, 30) = 5.50$, $p = .03$, $\eta_p^2 = .16$. An ANOVA with condition as independent variable and reactance as dependent variable showed that reactance was also higher in the restrictive-rule-condition ($M = 2.8$, $SD = 0.9$) than in the suggested-rule-condition ($M = 2.0$, $SD = 0.9$), $F(1, 30) = 5.68$, $p = .02$, $\eta_p^2 = .16$. A strong correlation was found between reactance and perceived effort ($r = .67$, $p < .001$). Unlike in Study 1, however, controlling for perceived effort as a covariate in an ANCOVA with experimental condition as independent variable and reactance as dependent variable nullified the predictive strength of experimental condition, $F(1, 29) = 1.18$, $p = .29$, while effort was a

significant covariate, $F(1, 29) = 17.30$, $p < .001$, $\eta_p^2 = .37$. Such a change from significant to non-significant predictor could be indicative of mediation, with effort mediating the effect of experimental condition on reactance.

The presence of mediation was tested using Hayes' INDIRECT macro for SPSS described in Preacher and Hayes (2008). Experimental condition was dummy coded (0 = suggested-rule, 1 = restrictive-rule) and effort was mean-centered. Regression analyses showed that the predictive strength of the direct path from experimental condition to reactance (i.e., the c path) decreased from significant ($B = 0.77$, $SE = 0.32$, $p = .02$) to non-significant when the indirect path via effort was taken into account (i.e., the c' path; $B = 0.31$, $SE = 0.28$, $p = .29$). A bootstrap procedure showed that this indirect path was significant: using the bootstrap procedure for indirect effects outlined in Preacher and Hayes (2008) with 5000 bootstrap resamples, a 95% bias-corrected bootstrap confidence interval was derived for the indirect effect; $B = 0.44$, CI [0.15, 1.01]. As zero was not included in the confidence interval, the indirect effect via effort was significant, indicating that effort mediated the effect of type of rule on reactance.

Consumption during the taste test: after-effects

An ANOVA with condition as independent variable and taste test consumption as dependent variable showed that condition was a significant predictor of taste test consumption, $F(2, 45) = 4.91$, $p = .01$, $\eta_p^2 = .18$. Post-hoc pairwise comparisons (least square difference) indicated that participants in the restrictive-rule-condition consumed a greater amount of M&M's when allowed to consume freely ($M = 49.6$, $SD = 29.7$) than participants in both the suggested-rule-condition ($M = 28.1$, $SD = 22.8$, $p = .01$), and the control condition ($M = 26.3$, $SD = 14.0$, $p = .01$), see Fig. 2. There was no difference between the latter two conditions, $p = .82$.

Discussion

Study 2 replicated the finding that the suggested and restrictive rules were equally successful in reducing consumption compared to a no-rule control condition. We also replicated the finding that the restrictive rule induced greater psychological reactance in participants than the suggested rule. In Study 2, this effect seemed to be mediated by the level of perceived effort. Furthermore, the finding that, once consumption was allowed again, a restrictive rule had a negative after-effect as compared to a suggested rule was also replicated: consumption during the taste test was greater in the former condition. The suggested rule had no negative after-effect at all; no differences were found between the suggested-rule-condition and the no-rule control condition.

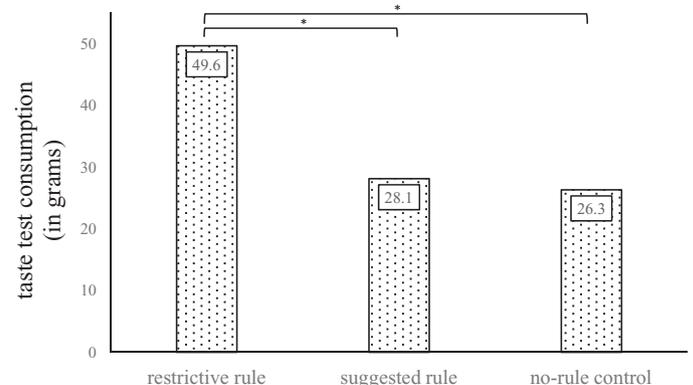


Fig. 2. Consumption of M&M's (in grams) in each condition during the taste test in Study 2 (* indicates a significant difference at $p < .05$).

General discussion

The present studies aimed to investigate whether suggested rules could be an effective alternative for restrictive rules as a social influence technique for inducing non-consumption. We aimed to show that suggested rules are as useful as restrictive rules in suppressing consumption while the rule is in place and that suggested rules do not lead to increased consumption after the rule is no longer in place, whereas restrictive rules do. We also aimed to show that the differential effect of restrictive and suggested rules is due in part to the fact that restrictive rules induce stronger feelings of psychological reactance. Both studies showed that adherence to the non-consumption rule was equal and high for both types of rules, indicating that both can be used to discourage initial consumption of unhealthy food. Results from Study 1 additionally indicated that, as compared to a situation where unhealthy consumption was allowed, both types of rules were equally successful in suppressing consumption. Moreover, people who received a restrictive rule reported higher levels of psychological reactance than people who received a suggested rule. This effect was suppressed (Study 1) or mediated (Study 2) by perceived effort. Furthermore, the existence of a negative after-effect of restrictive rules was demonstrated in both studies: after the rule was no longer in place, consumption was greater in those who had received a restrictive rule than in those who had received a suggested rule. Finally, Study 2 indicated that in fact there was no negative after-effect of the suggested rule at all: people who had received a suggested rule did not eat more after the rule was lifted than people who had received no rule at all. As has been mentioned, the role of perceived effort varied between the two studies and will be discussed more extensively below.

Restrictive versus suggested rules

Although negative effects of consumption-related social influence techniques have been observed in multiple studies (Mann & Ward, 2001; Stok, De Ridder, De Vet, & De Wit, 2014), the underlying mechanism for such negative effects had not yet been examined empirically. This research indicated that one of the reasons why the communication of eating-related rules may produce unwanted effects is that they may induce reactance. The current research also uncovered a potential alternative for traditional restrictive rules that is largely free from these negative effects: *suggested* rules were found to be less susceptible to reactance. Interestingly, the current studies demonstrated behavioral after-effects, with people who received a restrictive rule consuming more after the rule was no longer in place than people who received the suggested rule. Previous research using a similar experimental manipulation (Mann & Ward, 2001) had found cognitive effects in the same direction, but no effects on actual behavior.

Communicating behavioral rules is necessary from time to time: people need to be informed about what they should and should not do (in order to be healthy, but also in order to, for example, uphold laws). Current results demonstrate that there are more and less effective ways of communicating such rules, however, and that it is thus important to pay attention to the way in which social influence is exerted. A suggested rule was found to be more effective than a restrictive rule: it had the same initial positive effects of suppressing consumption as did a restrictive rule, but it was free from the negative after-effects found for restrictive rules. The crucial difference between the two types of behavioral rules seems to lie in the fact that the suggested rule preserves the perception that one has a choice; it does not prescribe or proscribe, but only encourages or suggests. A subtle change can thus produce substantial differences in reactance and prevent an increase in intake of unhealthy food once the rule is no longer in place. When

communicating behavioral rules or *ought (not) to* messages, for example in interventions to promote healthier eating behavior, it is important to be aware of the different ways in which rules can be communicated and their subsequent effects.

The role of effort

Much research has shown that, if one has already exerted substantial effort on an initial task, it becomes more difficult to again exert effort on a subsequent task, a phenomenon known as ego-depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Hagger, Wood, Stiff, & Chatzisarantis, 2010). In this research, we showed that the exertion of effort on a task (in this case, complying with a non-consumption rule in the presence of tasty food) may not only make it more difficult to exert effort again on a second task, but also induces feelings of psychological reactance. One potential explanation for this finding is that following *any* type of rule (suggested or restrictive) will require effort only when the rule goes against one's personal goals. As long as this is not the case, the presence of a rule may actually serve to support one's goals.

From the current studies no definite conclusions can be drawn about the effect of the normative manipulation itself on perceived effort. In the first study, perceived effort was greater in the suggested-rule-condition than in the restrictive-rule-condition; apparently, this difference suppressed the pure effect of the experimental manipulation on reactance (although effort was not measured optimally in Study 1, where only one item was used). The effect was reversed in the second study, in which perceived effort was greater in restrictive-rule-condition (corroborating earlier findings showing that adhering to a restriction is more depleting than adhering to a suggestion; De Vet et al., in preparation), and in which a mediation analysis indicated that effort mediated the effect of experimental condition on reactance. Importantly, in this study, measurement of effort was improved as compared to Study 1.

As discussed in the introduction, it is theoretically plausible both that following restrictive rules requires more effort and that following suggested rules requires more effort. The current studies do not provide a conclusive answer. The fact that, in the current studies, reactance and perceived effort were measured directly after each other means that it is difficult to fully disentangle their roles. Although the effects of suggested and restrictive rules on perceived effort should be further elucidated in future research, the current research consistently shows that the effect of restrictive rules on psychological reactance is more negative than that of suggested rules.

Limitations and suggestions for future research

Two important methodological limitations of the current studies are the laboratory setting and the specific (student) samples. Both raise questions as to the generalizability of the current findings. In these specific laboratory settings, all participants knew that eventually there would come a phase in the experiment during which consumption would be allowed. This knowledge may induce lower reactance than would be the case with the communication of behavioral rules in real life, for example in public health campaigns. Our current setting may therefore have provided a conservative estimation of the effect, but the fact that results were obtained even within this specific setting with very temporary rules shows that the social influence technique of communicating restrictive rules may produce negative after-effects after only a short period of exposure. With regard to the sample, we have to wonder whether these results would be replicated in, for example, community samples. It should be noted that, with the inclusion of males and participants with a BMI outside the 'normal' range, and by conducting studies in two different countries, the current studies do constitute a slight improvement on many previous food-related

psychological experiments and at least allow for the generalization of the conclusions to a wider student population including male students as well as underweight and overweight students. Future research should replicate the current results across different settings and in different populations.

Due to practical constraints we had fairly small samples (especially in the second study), which constitutes another limitation, as was evident from the fact that a few outlying consumption values had a substantial effect on the results of the analyses. Outliers were therefore removed in the current studies, but this is not an optimal solution (high intake, after all, does not mean that the case is invalid). It is therefore important to replicate the current results in larger, more robust samples, in which the observed effects should hold even with some extreme consumption values in the data.

The current study showed that framing of a non-consumption rule in a restrictive, as compared to a suggested manner, leads to greater reactance and also to greater consumption. In mediation terms, we have now shown that the independent variable (restrictive or suggested rule) affects the dependent variable (consumption) and the proposed mediator (reactance). In order to complete the mediation framework, future research should investigate whether reactance to rule presentation, when manipulated independently (that is, when reactance is manipulated directly), also affects consumption.⁶

Conclusion

The current results show that, when behavioral rules are used to promote healthier eating, suggesting that one should not eat unhealthily may be more effective than restricting unhealthy eating. A suggested rule generated less psychological reactance than a restrictive rule and did not lead to a negative after-effect on consumption once the rule was lifted, while it was equally successful in suppressing initial consumption. When communicating behavioral rules to promote healthy eating behavior, it may be prudent to do so in a manner that preserves the receiver's sense of self-determination, by suggesting healthier eating behavior rather than prescribing it. Prescribing behavior is more likely to arouse feelings of psychological reactance in people, which they might resolve by defying the proposed rule and which would lead to an undesirable unhealthy rebound effect of a rule intended to promote healthier eating. Suggesting a healthy rule, on the other hand, does not seem to have such negative after-effects.

References

Albarracín, D., Cohen, J. B., & Kumkale, G. T. (2003). When communications collide with recipients' actions. Effects of post-message behavior on intentions to follow the message recommendation. *Personality and Social Psychology Bulletin*, 29, 1–12.

- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion. Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74, 1252–1265.
- Brehm, J. W. (1966). *A theory of psychological reactance*. New York: Academic Press.
- Bushman, B. J. (1998). Effects of warning and information labels on consumption of full-fat, reduced-fat, and no-fat products. *The Journal of Applied Psychology*, 83, 97–101.
- Clee, M. A., & Wicklund, R. A. (1980). Consumer behavior and psychological reactance. *The Journal of Consumer Research*, 6, 389–405.
- Coelho, J. S., Polivy, J., & Herman, C. P. (2006). Selective carbohydrate or protein restriction. Effects on subsequent food intake and cravings. *Appetite*, 47, 352–360.
- De Vet, E., Stok, F. M., & De Ridder, D. T. D. (in preparation). Is it better to steer health behavior with explicit rules or with milder suggestions?
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. (1994). Facilitating internalization. The self-determination theory perspective. *Journal of Personality*, 62, 119–142.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits. Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268.
- Doak, C. M., Wijnhoven, T. M. A., Schokker, D. F., Visscher, T. L. S., & Seidell, J. C. (2012). Age standardization in mapping adult overweight and obesity trends in the WHO European Region. *Obesity Reviews*, 13, 174–191.
- Finlayson, G., King, N., & Blundell, J. E. (2008). The role of implicit wanting in relation to explicit liking and wanting for food. Implications for appetite control. *Appetite*, 50, 120–127.
- Fisher, J. O., & Birch, L. L. (1999). Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *The American Journal of Clinical Nutrition*, 69, 1264–1272.
- Flegal, K. M., Carroll, M. D., Kit, B. K., & Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of Body Mass Index among US adults, 1999–2010. *Journal of the American Medical Association*, 307, 491–497.
- Grandpre, J., Alvaro, E. M., Burgoon, M., Miller, C. H., & Hall, J. R. (2003). Adolescent reactance and anti-smoking campaigns. A theoretical approach. *Health Communication*, 15, 349–366.
- Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.
- Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control. A meta-analysis. *Psychological Bulletin*, 136, 495–525.
- Hong, S. M., & Page, S. (1989). A psychological reactance scale. Development, factor structure and reliability. *Psychological Reports*, 64, 1323–1326.
- Jansen, E., Mulkens, S., Emond, Y., & Jansen, A. (2008). From the Garden of Eden to the land of plenty. Restriction of fruit and sweets intake leads to increased fruit and sweets consumption in children. *Appetite*, 51, 570–575.
- Jansen, E., Mulkens, S., & Jansen, A. (2007). Do not eat the red food! Prohibition of snacks leads to their relatively higher consumption in children. *Appetite*, 49, 572–577.
- Kopelman, P. (2007). Health risks associated with overweight and obesity. *Obesity Reviews*, 8, 13–17.
- Mann, T., & Ward, A. (2001). Forbidden fruit. Does thinking about a prohibited food lead to its consumption? *The International Journal of Eating Disorders*, 29, 319–327.
- Ouwehand, C., & De Ridder, D. T. D. (2008). Effects of temptation and weight on hedonics and motivation to eat in women. *Obesity*, 16, 1788–1793.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891.
- Rummel, A., Howard, J., Swinton, J. M., & Seymour, D. B. (2000). You can't have that! A study of reactance effects & children's consumer behavior. *Journal of Marketing Theory and Practice*, 8, 38–45.
- Silvia, P. J. (2006). Reactance and the dynamics of disagreement. Multiple paths from threatened freedom to resistance to persuasion. *European Journal of Social Psychology*, 36, 673–685.
- Soetens, B., Braet, C., Van Vlierberghe, L., & Roets, A. (2008). Resisting temptation. Effects of exposure to a forbidden food on eating behaviour. *Appetite*, 51, 202–205.
- Stok, F. M., De Ridder, D. T. D., De Vet, E., & De Wit, J. B. F. (2014). Don't tell me what I should do, but what others do. The influence of descriptive and injunctive peer norms on fruit consumption in adolescents. *British Journal of Health Psychology*, 19, 52–64.
- Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence. The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology*, 87, 246–260.
- Wicklund, R. A. (1974). *Freedom and reactance*. Oxford, UK: Lawrence Erlbaum.

⁶ The authors thank the guest editor for this suggestion.