Health Psychology
2014, Vol. 33, No. 2, 103–109

0278-6133/14/$12.00 http://dx.doi.org/10.1037/a0031785

Health on Impulse: When Low Self-Control Promotes Healthy Food Choices

Stefanie J. Salmon
University of Groningen

Bob M. Fennis
University of Groningen and BI, Norwegian Business School

Denise T. D. de Ridder, Marieke A. Adriaanse, and Emely de Vet
Utrecht University

Objective: Food choices are often made mindlessly, when individuals are not able or willing to exert self-control. Under low self-control, individuals have difficulties to resist palatable but unhealthy food products. In contrast to previous research aiming to foster healthy choices by promoting high self-control, this study exploits situations of low self-control, by strategically using the tendency under these conditions to rely on heuristics (simple decision rules) as quick guides to action. More specifically, the authors associated healthy food products with the social proof heuristic (i.e., normative cues that convey majority endorsement for those products). ***Method:*** One hundred seventy-seven students (119 men), with an average age of 20.47 years (SD = 2.25) participated in the experiment. This study used a 2 (low vs. high self-control) × 2 (social proof vs. no heuristic) × 2 (trade-off vs. control choice) design, with the latter as within-subjects factor. The dependent variable was the number of healthy food choices in a food-choice task. ***Results:*** In line with previous studies, people made fewer healthy food choices under low self-control. However, this negative effect of low self-control on food choice was reversed when the healthy option was associated with the social proof heuristic. In that case, people made more healthy choices under conditions of low self-control. ***Conclusion:*** Low self-control may be even more beneficial for healthy food choices than high self-control in the presence of a heuristic. Exploiting situations of low self-control is a new and promising method to promote health on impulse.

Keywords: self-control, impulsive behavior, heuristics, food choice

Most models of health behavior assume that a high level of self-control is a prerequisite for making healthy food decisions (e.g., Hofmann, Friese, & Wiers, 2008; Schwarzer, 2008). Nevertheless, food decisions are often made mindlessly in an impulsive way, when individuals have low self-control and consequently are unable to exert the effort to warrant a well-considered, balanced decision (Bargh, 2002; Wansink & Sobal, 2007). Whereas previous research and interventions in healthy eating behavior frequently attempted to promote the exertion of self-control (e.g., Herman & Polivy, 2011), we contend that this may not be the best option to increase healthy food choices. Rather, our approach seeks to render the impulsive and automatic choice the healthier one, by exploiting situations of low self-control rather than fighting them. Our approach rests on typical characteristics of impulsive decision making under low self-control conditions that can be mobilized to foster healthier choice behavior.

Self-Control and Food Choice

Self-control refers to the ability to alter or override impulsive responses and regulate thoughts and behavior (Carver & Scheier, 1981; Metcalfe & Mischel, 1999; Vohs & Baumeister, 2004). High levels of self-control are related to several positive outcomes, such as more academic success and higher level of overall well-being (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Tangney, Baumeister, & Boone, 2004). In addition, high self-control has positive effects on health-related outcomes, such as increased levels of healthy eating, less binge eating, reduced alcohol consumption, and more physical exercise (de Ridder et al., 2012; Tangney et al., 2004; Wills, Isasi, Mendoza, & Ainette, 2007). In contrast, low self-control has been associated with adverse consequences such as decreased task-related performance and unhealthy behaviors, such as engaging in unprotected sex, indulging in alcohol, and consuming sugary and fatty foods (de Ridder et al., 2012; Friese & Hofmann, 2009; Hernandez, & Diclemente, 1992; Tangney et al., 2004).

It is important to note that recent research has shown that self-control relies on a limited resource, akin to a strength or energy (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Hagger, Wood, Stiff, & Chatzisarantis, 2010; Muraven & Baumeister, 2000). Repeatedly exerting self-control will use up the resource, impairing subsequent self-regulatory success, a state known as *self-regulatory resource depletion* (or ego-depletion). In such a

This article was published Online First March 11, 2013.

Stefanie J. Salmon, Department of Marketing, University of Groningen, Groningen, the Netherlands; Bob M. Fennis, Department of Marketing, University of Groningen, and Department of Marketing, BI, Norwegian Business School, Oslo, Norway; Denise T. D. de Ridder, Marieke A. Adriaanse, and Emely de Vet, Department of Health Psychology, Utrecht University, Utrecht, the Netherlands.

The work in this article was supported by ZonMW Grant 115100002 from the Netherlands Organization for Health Research and Development.

Correspondence concerning this article should be addressed to Stefanie J. Salmon, Department of Marketing, Groningen University, P.O. Box 800 9700 AV Groningen, the Netherlands. E-mail: s.j.salmon@rug.nl

state of low self-control, effortful and reflective planning becomes difficult and people typically have to resort to nonreflective, impulsive decision-making strategies. It is important that a state of resource depletion has been found to heighten sensitivity to immediate and concrete environmental influences, such as tempting foods and other situational cues (Bruyneel, Dewitte, Vohs, & Warlop, 2006; Hofmann, Strack, & Deutsch, 2008). Conversely, high self-control individuals are better able to transcend the lure of the here and now and use a more effortful, reflective strategy of behavior regulation, in line with longer term goals and values (e.g., Baumeister, Gailliot, DeWall, & Oaten, 2006; Hofmann, Friese, & Strack, 2009).

Because of these properties, more traditional approaches to health promotion have typically relied on fostering increased level of self-control, in such guiding frameworks as the theory of planned behavior (Conner, Norman, & Bell, 2002), the health belief model (Rosenstock, 1990), and protection motivation theory (Bandura, 2004). Strikingly, though, these efforts to raise self-control to face the challenges of overcoming unhealthy consumption has seen only limited success (Herman & Polivy, 2011; Michie, Abraham, Whittington, McAteer, & Gupta, 2009). Indeed, ample research has shown that the bulk of health-related (consumption) choices are made under mindless conditions, when self-control is low rather than high (Bargh, 2002; Wansink & Sobal, 2007). As a result, chances for health promotion might be substantially improved when this default state of reduced self-control is accepted and exploited rather than challenged and fought. This calls for examining strategies that rely on the properties of decision making under low self-control conditions for their effectiveness. This is a key objective of the present research. More specifically, we argue that a low level of self-control does not by definition have to result in unhealthy food intake. Rather, we propose that whether food decisions will be healthy or unhealthy under these conditions depends on external cues available in a situation. Specifically, we argue that low levels of self-control make individuals more impulsive and more prone to external, environmental cues. We also argue that when such cues prompt the individual to make more healthy decisions, low levels of self-control result in an impulsive adoption of healthy choices. We attempt to make the healthy option the impulsive one by associating it with an external salient cue, in the form of an influence heuristic.

Heuristic Food Decision Making

Under conditions of low self-control, individuals have the tendency to use impulsive decision-making strategies, such as relying on salient cues or heuristics (Fennis, Janssen, & Vohs, 2009; Janssen, Fennis, Pruyn, & Vohs, 2008). Heuristics are quick and simple decision rules that are assumed to save self-control resources, by excluding part of the information (Gigerenzer & Gaissmaier, 2011; Shah & Oppenheimer, 2008). Heuristics, thereby, provide an automatic and "easy way out" for individuals who are low in self-control.

External influence heuristics include the principles of *reciprocity* (the felt need to return a favor), *scarcity* (the need to acquire what is less available), and *social proof* (the tendency to adopt the option preferred by others; Cialdini, 2009; Lun, Sinclair, Whitchurch, & Glenn, 2007). Each of these principles can be translated into simple influence tactics. For example, the social proof heuristic can be translated into a tactic making group norms salient. In a well-known study on towel use in hotels, respondents were asked to reuse their towels, rather than having them refreshed daily during their stay. Towel reuse almost tripled by simply communicating on the door hanger that "a study showed that a majority of people in this room (e.g., room 313) chose to reuse their towels" (Goldstein, Cialdini, & Griskevicius, 2008). There are however also examples in the domain of health behavior. Whereas the food industry often promotes palatable, unhealthy food choices by means of heuristics, such as heuristics of social proof or scarcity (e.g., limited edition), we suggest that these heuristics may also work in a healthy direction. A first piece of evidence from Fennis et al. (2009) demonstrated that simple tactics such as paying consumers a compliment or offering them a modest incentive (inducing the reciprocity heuristic) promoted behaviors relevant for one's health (monitoring one's eating behavior for 2 weeks). It is important that this research showed that these behaviors in response to salient heuristics were especially prevalent under low self-control, when individuals would otherwise not be inclined to engage in these behaviors.

Taken together, we hypothesize that the negative effect of low self-control on food choice only occurs when no influence heuristic has been presented: when the healthy option is associated with an influence heuristic, we expect individuals under low self-control to make more healthy food decisions, in line with the heuristic. We, thus, expect that in the presence of a heuristic, low self-control individuals are equally capable of making healthy choices as individuals under high self-control conditions. Furthermore, to test more stringently the assumption that low self-control only predicts unhealthy food decisions when the food choice represents a self-control conflict between a palatable option that is immediately gratifying and a healthy option that is beneficial in the long term (Dhar, 1997; Wang, Novemsky, Dhar, & Baumeister, 2010), we manipulated whether or not the food choice represents a self-control dilemma. Half of the decisions are trade-off food choices representing a self-control conflict between healthy and tasty food products, whereas the other half represent food choices between healthy versus unhealthy food products that are equally tasty and, thus, do not consume self-control resources. We expect that the proposed effects would only occur in case of trade-off choices that represent a self-control dilemma.

Method

Participants and Design

One hundred seventy-seven students (119 men), with an average age of 20.47 years ($SD = 2.25$) participated in the experiment in exchange for money (€ 3.50) or course credit. The study used a 2 (self-control: low vs. high) × 2 (social proof heuristic vs. no heuristic) × 2 (trade-off choice vs. control choice) mixed design, with the latter as within-subjects factor.

Procedure

In this study, we investigate whether we can promote healthy food choices under low self-control conditions in an innovative way by using an influence heuristic. We will manipulate the

influence heuristic of social proof by presenting salient statistical information about the food choice of a relevant reference group. In addition, level of self-control will be manipulated by a frequently used ego-depleting task (adopted from Baumeister et al., 1998). By doing so, we can establish the effect of an influence heuristic on food choice under conditions of low and high self-control. The dependent variable in our study is the number of healthy food choices participants make in a food-choice task.

The experiment was presented as a study about written media and marketing. Upon arrival at the laboratory, participants completed a demographic questionnaire and rated their current affect. Participants were randomly assigned to the low or the high self-control condition, and performed the "E-crossing task," an established regulatory ego-depletion task (adopted from Baumeister et al., 1998; see Manipulations). Next, participants performed a food-choice task. This task consisted of six food product pairs, in which participants had to choose between healthy versus unhealthy food products (three of these represented a self-control dilemma, based on a pilot study, see Food-Choice Task). Participants were randomly assigned to either the social proof heuristic condition or to the no heuristic condition. Next, participants' goal to eat healthy was measured, after which participants were thanked and debriefed.

Manipulations

Self-control. Following the self-control strength approach delineated earlier, we used an established and validated task to vary self-control, adopted from Baumeister et al. (1998; see also Hagger et al., 2010, for an overview of this and other paradigms to induce differential levels of self-control). To be more specific, in the high self-control condition, participants had to cross out all the letters "e" in a text, whereas in the low self-control condition participants had to cross out all the letters "e" in the first part of the text, and thereafter, in the second part of the text, only the letters "e" that applied to certain complex rules, such as, "the letters E that are two spaces removed from a consonant." Therefore, participants in the low self-control condition had to override their first impulse to cross out all the letters "e." The cover story for this self-control task implied that the task was about written media. Participants read an article that could have been published in a popular magazine, about a girl that decides to study at the art academy. After the e-erasing task they had to fill out some filler questions about the article, such as in which magazine this article could have been published and what the target group of the article should be.

It is important to note that previous studies have shown that applying complex rules for crossing out the "e's" reliably drains self-regulatory resources and, thus, lowers self-control ability compared with the condition where individuals simply crossed out every "e" and, thus, retained their self-regulatory resources (Baumeister et al., 1998; Hagger et al., 2010).

Social proof heuristic. In the heuristic condition, the social proof heuristic was associated with the healthy options in the food-choice task. A pie chart was presented next to each product pair, which allegedly represented the percentage of choices of students who previously participated in this experiment. These percentages indicated that the majority of these participants (varying from 65% to 85%) had chosen the healthy food product (for instance the banana), without explicitly stating that the specific product was the healthy option. Providing statistical information about the majority of a reference group is an established way to manipulate social proof (e.g., Goldstein et al., 2008). In the condition without heuristic, no statistical information about participants' choices in previous studies was provided.

Food-Choice Task

The food-choice task consisted of three trade-off and three control product pairs. These product pairs were determined in a pilot study. Participants indicated which of the two products they would prefer at that moment. The dependent variables are the number of healthy choices for trade-off and for control product pairs, both ranging from zero to three.

Pilot study trade-off versus control food product pairs. In order to pose a self-control dilemma, the food product pairs in the study should represent a trade-off between the goal to eat healthy and the goal to enjoy palatable foods. Therefore, these trade-off product pairs have to include one tempting, but unhealthy, palatable food product, and one healthy food product that is not very palatable. In order to select trade-off product pairs, we conducted a pilot study in a separate sample of 90 participants (60 men) with an average age of 19.69 years ($SD = 2.05$). Participants evaluated the healthiness (e.g., "How healthy do you think this product is") and attractiveness (e.g., "How attractive do you find this product?") of 12 food product pairs on 7-point scales ranging from 1 (*not at all*) to 7 (*very much*).

On the basis of the evaluations, three trade-off product pairs were selected that differed significantly on the healthiness dimension and on the attractiveness dimension; chocolate bar versus cereal cookie, crisps versus rice crackers with peanuts, and crisps versus mixed nuts and raisins. In these trade-off product pairs, the healthy option is evaluated to be healthier and less attractive than the unhealthy option. In addition, three product pairs that did not represent a trade-off (i.e., that differed significantly on healthiness but not on attractiveness) were selected out of the remaining product pairs as control pairs; chocolate cookie versus fruit biscuit, Dutch caramel waffle versus banana, and chocolate versus grapes (see Table 1 and 2 for all means and standard deviations).

Control variables. Hunger, affect, and goal to eat healthily were measured to determine whether there were any differences between conditions in these variables that might affect food choices.

Hunger. Hunger was measured with one item, "How hungry do you feel at this moment?" on 7-point scales ranging from 1 (*not at all*) to 7 (*very much).*

Affect. The extent to which participants experienced positive versus negative affect was measured with one item, "How do you feel at this moment?" on 7-point scales ranging from 1 (*very negative*) to 7 (*very positive*).

Healthy eating goal. Healthy eating goal was measured with one item, "To what extent do you have the goal to eat healthily?" on 7-point scales ranging from 1 (*not at all*) to 7 (*very much).*

Results

Descriptives and Randomization Check

Participants reported a positive level of affect ($M = 5.14$, $SD = 0.96$), and a moderate level of hunger ($M = 4.17$, $SD = 1.71$). On

Table 1
Perceived Healthiness of Food Products for Trade-Off Pairs and Control Pairs

Pair	Healthiness *M*	Healthiness *SD*	*t* test, η^2
	Trade-off		
Cereal cookie	4.79	1.04	$t(89) = 17.35, 0.77$
Chocolate bar	2.18**	1.07	
Mixed nuts and raisins	4.40	1.38	$t(89) = 10.35, 0.55$
Crisps	2.48*	1.37	
Rice crackers with peanuts	3.68	1.23	$t(89) = 7.83, 0.41$
Crisps	2.33**	1.25	
	Control		
Fruit biscuit	4.61	0.94	$t(89) = 19.00, 0.80$
Chocolate cookie	2.39**	1.04	
Grapes	6.43	0.74	$t(89) = 28.83, 0.90$
Chocolate	2.20**	1.13	
Banana	6.13	0.85	$t(89) = 19.91, 0.82$
Dutch caramel waffle	2.87**	1.24	

* $p < .05$. ** $p < .01$.

average, participants valued the goal of healthy eating ($M = 4.97$, $SD = 1.44$). Three separate analyses of variance (ANOVAs) with hunger ($F = 1.85$, $p = .14$), affect ($F < 1$, $p = .45$) and healthy eating goal ($F < 1$, $p = .56$) as dependent variables revealed no significant differences between the four conditions, which indicates that randomization of participants was successful. Moreover, a chi-square test with gender as dependent variable also revealed no significant differences between conditions, $\chi^2(3, N = 177) = 0.25$, $p = .86$. The average amount of healthy food choices for trade-off product pairs was 0.81 ($SD = 0.85$), and for control product pairs 1.67 ($SD = 0.96$) on a scale ranging from one to three healthy choices. The amount of healthy choices made was significantly related to hunger ($r = -.159$, $p = .034$) and goal to eat healthy ($r = .192$, $p = .011$).

Table 2
Perceived Attractiveness of Food Products for Trade-Off Pairs and Control Pairs

Pair	Attractiveness *M*	Attractiveness *SD*	*t* test, η^2
	Trade-off		
Cereal cookie	3.91	1.16	$t(89) = -6.62, 0.33$
Chocolate bar	4.99**	1.20	
Mixed nuts and raisins	2.89	1.40	$t(89) = -9.94, 0.53$
Crisps	4.76**	1.16	
Rice crackers with peanuts	3.27	1.58	$t(89) = -6.81, 0.34$
Crisps	4.83**	1.34	
	Control		
Fruit biscuit	4.63	1.03	—
Chocolate cookie	4.58	1.31	
Grapes	5.60	1.29	—
Chocolate	5.43	1.38	
Banana	5.12	1.39	—
Dutch caramel waffle	5.18	1.07	

* $p < .05$. ** $p < .01$.

Effects of Low Self-Control and Heuristic on Food Choice

To test the effect of self-control, heuristic, and their interaction on healthy choices for trade-off versus control product pairs, a mixed ANOVA was performed, with self-control and heuristic as between-subject factors and choice type (trade-off vs. control) as within-subjects factor. There were no main effects of self-control and heuristic on the number of healthy choices made, all Fs <1. However, the ANOVA revealed a main effect of choice type on the number of healthy choices, $F(1, 173) = 118.82$, $p = < .001$, $\eta^2 = .41$. Participants made more healthy control choices ($M = 1.67$, $SD = 0.96$) than healthy trade-off choices ($M = 0.81$, $SD = 0.85$). There were no two-way interactions of type of choice and self-control and of type of choice and heuristic on the total amount of healthy choices made, all Fs <1.

The expected three-way interaction was significant, $F(1, 173) = 6.27$, $p = .013$, $\eta^2 = .04$.[1] To decompose the interaction, we will separately describe the findings for control choices and for trade-off choices. As expected, no main effects of self-control and heuristic on healthy choice were revealed for the control product pairs, Fs <1. Also, no significant interaction effect of self-control and heuristic on food choice was found for the control product pairs, $F<1$ (see Figure 1).

For the product choices involving a trade-off, there were no main effects of self-control ($F < 1$, $p = .87$) and heuristic ($F = 1.55$, $p = .22$) on food choice, which is in line with our expectations. A separate ANOVA with self-control and heuristic as independent variables showed an interaction effect of self-control and heuristic on healthy trade-off choices, $F(1, 173) = 9.20$, $p = .003$, $\eta^2 = .05$. Simple main effects showed that for participants high in self-control, there was no difference in number of healthy choices between the heuristic ($M = 0.71$, $SD = 0.72$) and the no heuristic condition ($M = 0.93$, $SD = 0.80$), $F(1, 173) = 1.65$, $p = .201$. For participants low in self-control, the number of healthy choices was higher in the heuristic ($M = 1.07$, $SD = 1.06$), compared with the no heuristic condition, ($M = 0.53$, $SD = 0.70$), $F(1, 173) = 8.90$, $p = .003$, $\eta^2 = .05$. Stated differently, in the no heuristic conditions, participants who were low in self-control made less healthy choices than participants high in self-control, $F(1, 173) = 5.14$, $p = .025$, $\eta^2 = .03$, whereas in the heuristic conditions, participants who were low in self-control made more healthy choices, compared with participants high in self-control, $F(1, 173) = 4.09$, $p = .045$, $\eta^2 = .02$ (see Figure 2).

Discussion

Although previous studies have assumed that high self-control is required to engage in healthy decision making about foods, our findings show that the negative effect of a low level of self-control

[1] Because the amount of healthy choices made was significantly related to hunger and goal to eat healthy, we added these variables as covariates to the main analyses. Goal to eat healthy ($F = 5.34$, $p = .022$, $\eta^2 = .03$) was significant as covariate and hunger was marginally significant ($F = 3.40$, $p = .067$, $\eta^2 = .02$). The found effects remained similar; there was a main effect of choice type, $F(1, 171) = 12.41$, $p = .001$, $\eta^2 = .07$, and the three-way interaction remained significant, $F(1, 171) = 6.75$, $p = .010$, $\eta^2 = .04$. For sake of clarity, we present only the mixed analyses of variance in the Results section of this article.

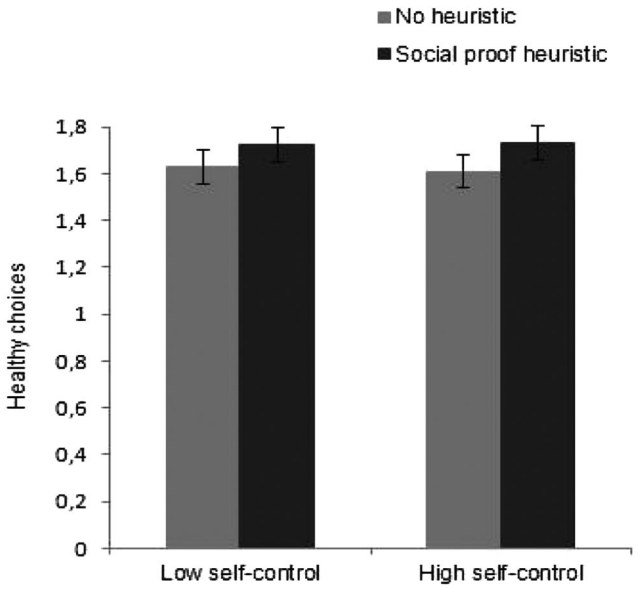

Figure 1. The effects of self-control and heuristic on the number of healthy control choices.

on food choice can be eliminated when a choice between foods is accompanied by an influence heuristic. These results even suggest that the effect of self-control on food choice can be reversed in the presence of an influence heuristic. In line with previous research on food choice and eating behavior, participants made fewer healthy food choices under conditions of low than under conditions of high self-control, when no heuristic pointing toward the healthy option was available. However, when the healthy food option was associated with a social proof heuristic, participants made more healthy food choices under these low self-control conditions. Our findings, thus, demonstrate that conditions of low self-control may be even more beneficial for healthy eating behavior than high self-control in the presence of a heuristic.

This is in line with previous research on persuasion and heuristics, showing that individuals are especially prone to the influence of heuristics when they are low in self-control (e.g., Fennis et al., 2009). Under high self-control conditions, people will react less impulsive, because their reflective system is more active. Therefore, people high in self-control may be able to override their impulsive tendencies toward situational influences like the social proof heuristic. Because of these reflective capacities under high self-control, people are expected to make more deliberate, often healthy, choices, regardless of whether a heuristic is available. Therefore, decision making of low self-control individuals may be more amenable to situational influences than that of their high self-control counterparts and consequently, a heuristic pointing toward the healthy option in case of low self-control is expected to contribute more to healthy food choices, compared with situations of high self-control.

Nevertheless, our findings also demonstrate that a relatively large proportion of the choices in all conditions involved unhealthy ones. It is surprising that participants still made a substantial number of unhealthy food choices in high self-control conditions. This is a remarkable finding, because it has often been assumed that a sufficient level of self-control is not so much a necessary but rather a sufficient condition to make healthy food decisions. Our findings suggest that high levels of self-control are not indisputably beneficial for healthy eating behavior. This is in line with previous research, showing that high levels of trait self-control had relatively weak effects on healthy eating compared with other behaviors that are beneficial in the long run, such as academic performance (de Ridder et al., 2012).

Together, our findings suggest that we are not doomed to make unhealthy food decisions under low self-control conditions. This is important, because the majority of food choices are made automatically, when individuals do not have the capacity or willingness to exert self-control. Whether food decisions are healthy or unhealthy under these circumstances is dependent on the environment in which individuals make food decisions. When an unhealthy option is suggested, people will probably decide for an unhealthy product—as has been shown in previous research (e.g., Hofmann, Friese, et al., 2008). However, findings from this study suggest that an external influence heuristic associated with the healthy option will steer people, in a relatively mindless way that does not require self-control resources, toward choosing the healthy alternative. These findings are in line with the premises of dual-systems theories posing that low self-control promotes impulsive behavior, regardless of whether these impulses relate to healthy or unhealthy behavior.

Our findings extend the literature on influence heuristics by showing that influence heuristics are effective in supporting people to make the healthy choice when trade-off decisions that pose a self-control conflict are involved. Up to now, the effectiveness of several influence heuristics has been proven for a diversity of behaviors, such as donating money to charities, participating in research, or becoming a member of a specific organization (e.g., Fennis et al., 2009; Janssen et al., 2008). However, none of these prior studies examined behaviors in which the conflicting goals are as salient and tempting as trade-off decisions between either or not choosing a palatable food. This research suggests that also in

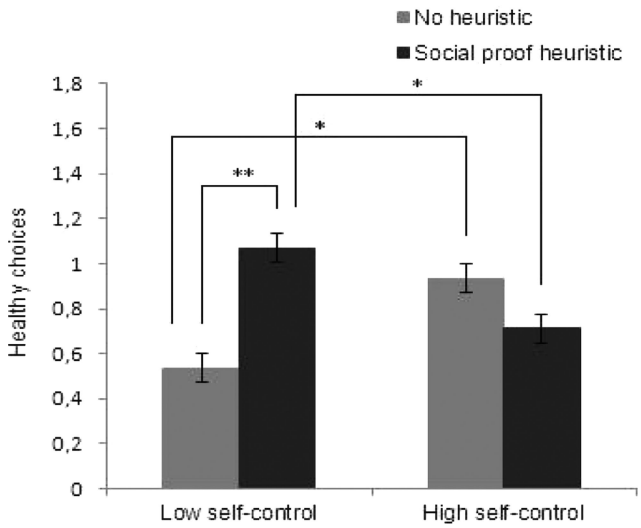

Figure 2. The effects of self-control and heuristic on the number of healthy trade-off choices. $^{*}p < .05$. $^{**}p < .01$.

situations with a salient and tempting food option that is in conflict with a long-term goal, the influence heuristic of social proof is an effective method to increase healthy food decisions under conditions of low self-control.

Furthermore, with our findings we present a novel social influence perspective on health promotion and persuasion. Prior research and interventions in healthy eating behavior mainly attempted to convince people by cognitive means, such as increasing self-monitoring, perceived self-efficacy, or perceived control (Bandura, 2004; Conner et al., 2002; Rosenstock, 1990). Moreover, the elaboration likelihood model for instance suggests that to effectively influence behavior, messages should be elaborated on (Chaiken, 1980). Because people often do not have the willingness or capacity to make well-deliberated decisions, health behavior is often determined by impulsive influences. With these results, we show that these impulsive tendencies provide a promising opportunity to mindlessly steer people toward healthy food choices.

Our research has some limitations. First, the study involved participants from a student sample who are relatively young and well educated, including a large proportion of men. Although we do not have any indications that our results will be different in other populations, future research should study a broader sample, in order to increase the generalizability and external validity of these findings. Second, the food choices participants made involved virtual rather than actual food choices. Future research should study influence heuristics in actual food choices with real-life implications for eating behavior. On the one hand one might argue that the impact of influence heuristics might be reduced, because the palatable qualities of the actual food items will become more salient, and previous work has shown that real food items indeed present a substantial challenge to resource depleted consumers (Bruyneel et al., 2006). On the other hand, there is ample research showing that subtle heuristics are still very well capable of directly affecting actual overt, behavior, both within and beyond the health domain (e.g., Fennis et al., 2009), an issue that future research might be able to flesh out. A third limitation is that we studied only one heuristic influencing choices under conditions of low self-control. Future research should consider whether other types of heuristics can turn unhealthy choices into healthy ones to the same extent as the social proof heuristic. Finally, the effect sizes of our findings are in the small-to-modest range. Nevertheless, this range of values is plausible given the subtlety of our manipulations and the dichotomous nature of the dependent variables used. Moreover, as much research in social influence testifies (Cialdini, 2009), subtle social influences can ultimately amount to substantial changes in actual behavior.

Notwithstanding these limitations, our findings demonstrate that a state of low self-control can be used to the advantage of people's health when they are presented with information that suggests healthy choices at the moment that they are most willing to respond to these suggestions. Future research should further investigate how we can take advantage of people's tendency to act impulsively under conditions of low self-control and which types of heuristics are effective in steering people toward the healthy option when they are open to suggestions due to their low levels of self-control.

Furthermore, for a fuller understanding of the role of self-control in heuristic (food) decision making, trait self-control should be taken into account. Prior research found some evidence for the relationship between trait self-control and eating behavior (e.g., de Ridder et al., 2012; Gerrits et al., 2010; Tangney et al., 2004; Wills et al., 2007). For instance, high trait self-control seems to be related to more fruit and vegetable intake, and low trait self-control to more saturated fat intake in adolescents (Wills et al., 2007). Future studies should systematically explore the role of trait self-control in actual food choices.

Finally, the current findings have implications for promotion of and interventions on healthy eating behavior. Healthy eating starts with making healthy choices at point-of-purchase settings, such as cafeterias, kiosks, and supermarkets. In such settings, the social proof heuristic can be relatively easily implemented without requiring a radical change in the decision context. An example of how the social proof heuristic can be implemented is, for instance, by advertising a certain product with a simple message presenting a healthy sandwich in a kiosk as "sandwich of the month," thereby suggesting that the majority of the people who buy their lunch at this kiosk chose the healthy sandwich. Furthermore, because most food choices are made without cognitive elaboration, subtle changes in the food environment based on other influence heuristics, such as limited editions of healthy food products (scarcity principle) or suggesting that an authority approves a certain healthy food choice (authority heuristic), may mindlessly steer individuals toward healthy food choices.

All in all, with this study, we showed that the healthy option can be the automatic one, by associating healthy food products with an influence heuristic. Applying these heuristics to food products in everyday purchase settings may be a new and promising method to provoke more health on impulse.

References

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31,* 143–164. doi:10.1177/1090198104263660

Bargh, J. A. (2002). Losing consciousness: Automatic influences on consumer judgment, behavior, and motivation. *Journal of Consumer Research, 29,* 280–285. doi:10.1086/341577

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. doi:10.1037/0022-3514.74.5.1252

Baumeister, R. F., Gailliot, M., DeWall, C. N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. *Journal of Personality, 74,* 1773–1802. doi:10.1111/j.1467-6494.2006.00428.x

Bruyneel, S., Dewitte, S., Vohs, K. D., & Warlop, L. (2006). Repeated choosing increases susceptibility to affective product features. *International Journal of Research in Marketing, 23,* 215–225. doi:10.1016/j.ijresmar.2005.12.002

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior*. New York, NY: Springer-Verlag.

Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology, 39,* 752–766. doi:10.1037/0022-3514.39.5.752

Cialdini, R. B. (2009). *Influence: Science and practice* (5th ed.). Boston, MA: Allyn & Bacon.

Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating. *Health Psychology, 21,* 194–201. doi:10.1037/0278-6133.21.2.194

de Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review, 16,* 76–99. doi:10.1177/1088868311418749

Dhar, R. (1997). Consumer preference for a no-choice option. *Journal of Consumer Research, 24,* 215–231. doi:10.1086/209506

Fennis, B. M., Janssen, L., & Vohs, K. D. (2009). Acts of benevolence: A limited-resource account of compliance with charitable requests. *Journal of Consumer Research, 35,* 906–924. doi:10.1086/593291

Friese, M., & Hofmann, W. (2009). Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality, 43,* 795–805. doi:10.1016/j.jrp.2009.07.004

Gerrits, J. H., O'Hara, R. E., Piko, B. F., Gibbons, F. X., de Ridder, D. T. D., Keresztes, N., . . . De Wit, J. B. F. (2010). Self-control, diet concerns and eater prototypes influence fatty foods consumption of adolescents in three countries. *Health Education Research, 25,* 1031–1041. doi:10.1093/her/cyq055

Gigerenzer, G., & Gaissmaier, W. (2011). Heuristic decision making. *Annual Review of Psychology, 62,* 451–482. doi:10.1146/annurev-psych-120709-145346

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research, 35,* 472–482. doi:10.1086/586910

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. doi:10.1037/a0019486

Herman, C. P., & Polivy, J. (2011). The self-regulation of eating: Theoretical and practical problems. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory and applications* (pp. 522–536). New York, NY: Guilford Press.

Hernandez, J. T., & Diclemente, R. J. (1992). Self-control and ego identity development as predictors of unprotected sex in late adolescent males. *Journal of Adolescence, 15,* 437–447. doi:10.1016/0140-1971(92)90073-E

Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and self-control from a dual-systems perspective. *Perspectives on Psychological Science, 4,* 162–176. doi:10.1111/j.1745-6924.2009.01116.x

Hofmann, W., Friese, M., & Wiers, R. W. (2008). Impulsive versus reflective influences on health behavior: A theoretical framework and empirical review. *Health Psychology Review, 2,* 111–137. doi:10.1080/17437190802617668

Hofmann, W., Strack, F., & Deutsch, R. (2008). Free to buy? Explaining self-control and impulse in consumer behavior. *Journal of Consumer Psychology, 18,* 22–26. doi:10.1016/j.jcps.2007.10.005

Janssen, L., Fennis, B. M., Pruyn, A., & Vohs, K. D. (2008). The path of least resistance: Regulatory resource depletion and the effectiveness of social influence techniques. *Journal of Business Research, 61,* 1041–1045. doi:10.1016/j.jbusres.2007.09.013

Lun, J., Sinclair, S., Whitchurch, E. R., & Glenn, C. (2007). (Why) do I think what you think? Epistemic social tuning and implicit prejudice. *Journal of Personality and Social Psychology, 93,* 957–972. doi:10.1037/0022-3514.93.6.957

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of the delay of gratification: Dynamics of willpower. *Psychological Review, 106,* 3–19. doi:10.1037/0033-295X.106.1.3

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychology, 28,* 690–701. doi:10.1037/a0016136

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126,* 247–259. doi:10.1037/0033-2909.126.2.247

Rosenstock, I. M. (1990). The health belief model: Explaining health behavior through expectancies. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), *Health behavior and health education: Theory, research, and practice* (pp. 39–62). San Francisco, CA: Jossey-Bass.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology, 57,* 1–29. doi:10.1111/j.1464-0597.2007.00325.x

Shah, A. K., & Oppenheimer, D. M. (2008). Heuristics made easy: An effort-reduction framework. *Psychological Bulletin, 134,* 207–222. doi:10.1037/0033-2909.134.2.207

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72,* 271–324. doi:10.1111/j.0022-3506.2004.00263.x

Vohs, K. D., & Baumeister, R. F. (2004). Ego-depletion, self-control, and choice. In J. Greenberg, S. L. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 398–410). New York, NY: Guilford Press.

Wang, J., Novemsky, N., Dhar, R., & Baumeister, R. F. (2010). Trade-offs and depletion in choice. *Journal of Marketing Research, 47,* 910–919. doi:10.1509/jmkr.47.5.910

Wansink, B., & Sobal, J. (2007). Mindless eating: The 200 daily food decisions we overlook. *Environment and Behavior, 39,* 106–123. doi:10.1177/0013916506295573

Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-control constructs related to measures of dietary intake and physical activity in adolescents. *Journal of Adolescent Health, 41,* 551–558. doi:10.1016/j.jadohealth.2007.06.013

Received January 12, 2012
Revision received July 12, 2012
Accepted October 18, 2012 ■