

## Guilty pleasures II: Restrained eaters' implicit preferences for high, moderate and low-caloric food

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### ABSTRACT

In a previous study, restrained eaters showed stronger implicit preferences for high-caloric food compared to unrestrained eaters. Caloric density and palatability are however almost always intertwined, and it was never tested whether this high-calorie food preference of restrained eaters follows from the energy density or the palatability of high-calorie foods. Here, it was examined whether restrained eaters may hold stronger implicit preferences than unrestrained eaters for palatable food in general, irrespective of caloric density. Participants were randomly assigned to one of three conditions: Using two unipolar SCIATs positive and negative implicit associations were measured with palatable food of either high, moderate, or low caloric density. Results showed a strong effect of dietary restraint on implicit food preferences independently of caloric density, indicating stronger implicit preferences for all types of palatable food with increased dietary restraint. With respect to negative implicit associations, participants showed stronger negative implicit associations with high-calorie food than with moderate-calorie or low-calorie food, regardless of dietary restraint. Thus, restrained eaters show enhanced implicit preferences, not only for high caloric food, but for palatable food in general compared to unrestrained eaters.

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### 1. Introduction

Dietary restraint, which is the chronic limitation of food intake in order to lose weight, paradoxically seems to be characterized by frequent lapses of restraint and overconsumption (e.g., [Fedoroff, Polivy, & Herman, 1997](#); [Harris, Bargh, & Brownell, 2009](#); [Herman & Polivy, 1980](#); [Jansen & van den Hout, 1991](#)). According to dual-process models (e.g., [Strack & Deutsch, 2004](#)), the reason for these counterproductive effects is that restrained eaters experience a tug-of-war between motivational impulses to consume high-caloric palatable foods, and goals related to weight control. Specifically, palatable food may be automatically (implicitly) associated with positive affect in restrained eaters, thereby triggering the motivational impulse to indulge, even though they do not wish this to happen. Support for this intuitive assumption that dietary restraint is associated with stronger positive implicit associations with palatable high-caloric food, however, is mixed. While there is evidence showing stronger positive implicit associations with high-caloric food in restrained eaters compared to unrestrained eaters (e.g., [Hoefling & Strack, 2008](#)), other studies have found no relationship (e.g., [Roefs, Herman, MacLeod, Smulders, & Jansen, 2005](#)), or even a negative relationship between dietary restraint and implicit positive associations with high-caloric food

(e.g., [Maison, Greenwald, & Bruin, 2001](#); [Papies, Stroebe, & Aarts, 2009](#); [Vartanian, Polivy, & Herman, 2004](#)).

Most previous studies, however, examined differences between restrained and unrestrained eaters regarding their implicit associations with high-caloric food relative to low-caloric food. Consequently, it is unclear whether these findings reflect implicit attitudes toward high-caloric food or toward low-caloric food. Recently, we demonstrated that restrained eaters do not associate high-caloric food more strongly with positive affect compared to low-caloric food ([Houben, Roefs, & Jansen, 2010](#)). However, when we measured implicit positive associations with high-caloric food without the low-caloric food contrast, restrained eaters did show such positive associations, and also associated high-caloric food more strongly with positive affect compared to unrestrained eaters. One explanation for these findings could be that restrained eaters associate both high-caloric and low-caloric food more strongly with positive affect than unrestrained eaters. Is there any evidence to suggest that restrained eaters may hold a preference for food irrespective of caloric density?

While most previous research focused mainly on the effect of exposure to palatable, high-caloric food cues on subsequent consumption (e.g., [Fedoroff et al., 1997](#); [Jansen & van den Hout, 1991](#)), there is at least some evidence suggesting that exposure to palatable food increases consumption in restrained eaters regardless of caloric density ([Harris et al., 2009](#)). Thus, restrained eaters may experience stronger impulses to consume any type of palatable food, irrespective of caloric density. This study further examined this issue. Specifically, we

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measured positive and negative implicit associations with palatable food of either high, moderate, or low caloric density using unipolar SCIATs. We expected that dietary restraint would be associated with stronger implicit preferences toward all types of food, regardless of caloric density. Based on our previous findings (Houben et al., 2010), we further expected no differences between restrained and unrestrained eaters with respect to implicit negative associations with the different types of food.

## 2. Method

### 2.1. Participants

Participants were 112 female volunteers (age:  $M = 24.88$ ,  $SD = 5.92$ ; BMI [Body Mass Index;  $\text{kg}/\text{m}^2$ ]:  $M = 23.50$ ,  $SD = 4.20$ , range 18.03–40.56) who completed this study in return for a gift certificate.

### 2.2. Measures and procedure

Participants were recruited and tested via the Internet. After giving consent, participants were randomly assigned to one of the three conditions: A high-caloric food (HC) condition, a moderate-caloric food (MC) condition, and a low-caloric food (LC) condition. In all three conditions, participants then performed a unipolar positive Single Category Implicit Association Test (SCIAT; Karpinski & Steinman, 2006; see also Houben et al., 2010) and a unipolar negative SCIAT, in balanced order.

Both SCIATs consisted of three blocks. In block 1 (24 trials), participants sorted stimuli into two attribute concepts using two response keys. In the unipolar positive SCIAT, participants sorted stimuli as pleasant (tasty, delicious, good, delightful, heavenly, outstanding) or neutral (average, undefined, general, normal, usual, everyday). In the unipolar negative SCIAT, participants sorted stimuli as unpleasant (tasteless, unsavoury, bad, nasty, awful, disgusting) or neutral. In block 2 (72 trials), participants sorted stimuli of one attribute category and the food target category with one response key, and items from the other attribute category with the other key (e.g., [un]pleasant + food vs. neutral). The target category consisted of six pictures of high-caloric food (i.e.,  $>3$  kcal/g; e.g., French fries, pizza) in the HC condition, six pictures of moderate-caloric food (i.e., 1.0–3.0 kcal/g; e.g., steak, cooked potatoes) in the MC condition, and six pictures of low-caloric food (i.e.,  $<1.0$  kcal/g; e.g., salad, fruits) in the LC condition. In block 3 (72 trials), the response assignment of the food target category was reversed and participants performed the reversed combination (e.g., [un]pleasant vs. neutral + food). To keep the number of left and right responses comparable in block 2 and in block 3, food-related pictures were presented 30 times, attributes assigned to the same response key as food were presented 12 times, and attributes assigned to the other response key were presented 30 times. The response assignment of the target and attribute categories was counterbalanced across participants. Stimuli were presented in the middle of the computer screen and the labels of the categories assigned to the left and right response key were presented in the corresponding upper corners of the screen.

Next, participants rated the food pictures that were presented during the SCIATs (i.e., high, moderate, or low-caloric food, depending on the condition) on caloric density (7-point Likert scale: 1 = low caloric density, 7 = high caloric density) and on palatability (7-point Likert scale: 1 = unpalatable, 7 = palatable). Next, participants filled out the Restraint Scale (RS; Herman & Polivy, 1980), consisting of 10 items assessing dietary restraint. Higher scores indicate an increased intention to restrict food intake. Finally, participants reported their weight and height (used to calculate BMI).

## 3. Results

### 3.1. Manipulation check

Mean caloric density ratings were analyzed using a Univariate Analysis of Variance (ANOVA) with condition (HC, MC or LC) as a between-subjects factor and dietary restraint as a (standardized) continuous covariate (instead of performing a median split to minimize loss of power, van Breukelen & van Dijk, 2007). Means for high and low dietary restraint are estimated at  $-1$   $SD$  and  $+1$   $SD$ , respectively. The mean restraint score was 14.63 ( $SD = 5.87$ ). Results showed a significant effect of condition,  $F(2, 106) = 133.48$ ,  $p < .001$ , while the effect of restraint,  $F(1, 106) = 1.46$ ,  $p = .23$ , nor its interaction with condition ( $F < 1$ ) was significant. Follow-up t-tests indicated that the high-caloric food in the HC condition was perceived as richer in calories ( $M = 6.20$ ,  $SD = .59$ ) compared to the moderate-caloric food in the MC condition ( $M = 4.09$ ,  $SD = .83$ ),  $t(70) = 12.50$ ,  $p < .001$ , and that the moderate-caloric food in the MC condition was judged as higher in calories than the low-caloric food in the LC condition ( $M = 2.45$ ,  $SD = 1.01$ ),  $t(72) = 7.58$ ,  $p < .001$ .

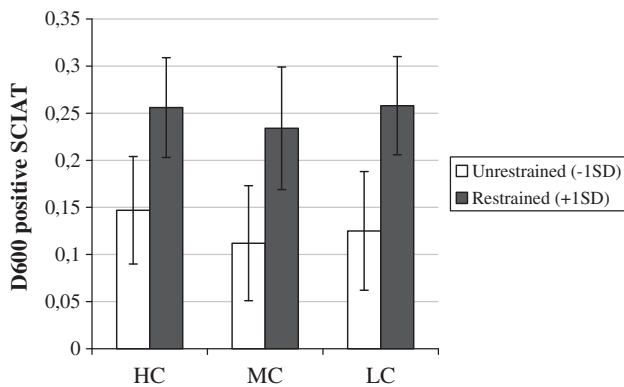
Similarly, mean palatability ratings were analyzed using ANOVA with condition (HC, MC or LC) as a between-subjects factor and dietary restraint as a (standardized) continuous covariate. Results showed a significant effect of condition,  $F(2, 106) = 5.69$ ,  $p = .005$ , while neither the effect of restraint or its interaction with condition (both  $F < 1$ ) was significant. Follow-up t-tests indicated that the high caloric food in the HC condition was perceived as equally palatable ( $M = 4.74$ ,  $SD = .93$ ) as the moderate-caloric food in the MC condition ( $M = 4.59$ ,  $SD = .88$ ),  $t(70) = .72$ ,  $p = .48$ . However, the low-caloric food in the LC condition was rated higher in palatability ( $M = 5.33$ ,  $SD = .97$ ) than the moderate-caloric food in the MC condition,  $t(72) = 3.42$ ,  $p = .001$ .

### 3.2. Implicit attitudes

For both the positive and negative SCIAT, scores were calculated with the D600 scoring algorithm (Greenwald, Nosek, & Banaji, 2003) so that higher scores respectively indicate stronger positive or stronger negative associations with food. Positive and negative SCIAT scores were analyzed separately using ANOVA with condition (i.e., HC, MC, or LC) as a between-subjects factor and dietary restraint as a (standardized) continuous covariate. Because one participant did not complete the positive SCIAT, the analysis on positive SCIAT effects was conducted with 111 participants.

Results for the positive SCIAT showed no significant effect of condition ( $F < 1$ ). Overall, participants had positive implicit associations with high-caloric food,  $t(37) = 5.10$ ,  $p < .001$ , moderate-caloric food,  $t(32) = 4.00$ ,  $p < .001$ , and low-caloric food,  $t(39) = 5.13$ ,  $p < .001$ . While the interaction between dietary restraint and condition was not significant ( $F < 1$ ), results did show a significant effect of dietary restraint,  $F(1, 105) = 6.21$ ,  $p = .01$ , indicating that restrained eaters had stronger positive implicit associations with food than unrestrained eaters, regardless of caloric density (see Fig. 1).

Results for the negative SCIAT showed no significant effect of dietary restraint or its interaction with condition (both  $F < 1$ ), while the effect of condition was marginally significant,  $F(2, 106) = 2.65$ ,  $p = .08$ . Follow-up t-tests confirmed that participants associated high-caloric food more strongly with negative affect than low-caloric food,  $t(76) = 2.41$ ,  $p = .02$  (see Fig. 2). There was no significant difference in negative implicit associations between high-caloric and moderate-caloric food,  $t(70) = .45$ ,  $p = .66$ , or between moderate and low-caloric food,  $t(72) = 1.69$ ,  $p = .10$ . One-sample t-tests further showed that participants associated high-caloric food with negative affect,  $t(37) = 2.74$ ,  $p = .01$ , while they did not associate moderate,  $t(33) = 1.52$ ,  $p = .14$ , or low-caloric food,  $t(39) = .81$ ,  $p = .43$ , with negative affect.

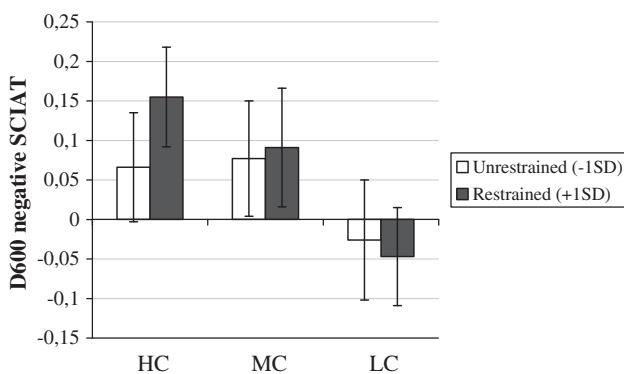


**Fig. 1.** Mean effects (with standard errors) for the positive unipolar SCIAT (D600 effect measure) in restrained versus unrestrained eaters (respectively 1 SD above or below mean RS score). Higher D600 scores indicate stronger implicit positive associations with high-caloric (HC), moderate-caloric (MC) or low-caloric (LC) food.

#### 4. Discussion

The aim of this research was to examine whether dietary restraint is related to stronger positive implicit attitudes toward palatable food of low, moderate and high caloric density. To test this hypothesis, two unipolar SCIATs were used to measure implicit positive and negative associations with palatable food of high, moderate, or low caloric density. As expected, restrained eaters demonstrated stronger implicit positive associations with palatable food, irrespective of caloric density. Thus, restrained eaters not only hold stronger implicit preferences for palatable high-caloric food as demonstrated in our previous study (Houben et al., 2010), but that they also hold stronger positive implicit attitudes toward palatable food with moderate and low caloric density. In addition, we did not find an effect of dietary restraint on implicit negative associations with food, which is similar to our previous findings (Houben et al., 2010).

Together, these findings suggest that restrained eaters, compared to unrestrained eaters, have stronger implicit positive associations with palatable food in general. Restrained eaters, thus, seem to experience a conflict between their goal of weight control and food restriction (reflective system), and strong positive implicit attitudes toward palatable



**Fig. 2.** Mean effects (with standard errors) for the negative unipolar SCIAT (D600 effect measure) in restrained versus unrestrained eaters (respectively 1 SD above or below mean RS score). Higher D600 scores indicate stronger implicit negative associations with high-caloric (HC), moderate-caloric (MC) or low-caloric (LC) food.

food causing a strong behavioral disposition to overconsume palatable food (impulsive system). Whenever such conflicts arise between the motivational drive to overeat and personal goals such as dieting standards, the motivational drive needs to be overruled by higher-order inhibitory control processes, so that behavior is more in line with deliberate long-term goals (Strack & Deutsch, 2004). Consequently, when inhibitory control is somehow impaired, the motivational drive will be more dominant in guiding eating behavior, leaving one unable to resist the temptations of palatable food (Frieze, Hofmann, & Wänke, 2008; Hofmann, Rauch, & Gawronski, 2007; Houben & Jansen, 2011).

The present findings suggest that the impulsive system generates a stronger signal to overeat in restrained eaters compared to unrestrained eaters due to their stronger positive implicit attitudes toward food. Restrained eaters therefore need to expend more cognitive resources to inhibit this automatic impulse. However, restrained eaters also appear to be less able to exert inhibitory control compared to unrestrained eaters (Nederkoorn, Van Eijs, & Jansen, 2004). Consequently, automatic impulses more easily gain the upper hand in restrained eaters, causing lapses of restraint and overconsumption.

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#### Contributors

Katrijn Houben designed the study. Katrijn Houben performed the statistical analysis, and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

#### Conflict of interest

All other authors declare that they have no conflicts of interest.

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