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Decreased Salivation to Food Cues in Formerly Obese Successful Dieters

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Obesity is a major health problem that has been increasing dramatically worldwide. To reduce its health threats and costs, weight loss is necessary. However, weight loss and in particular its maintenance is difficult. It is estimated that merely 20% of the obese are able to reduce to a normal weight and to maintain it for at least a year [1]. One of the key strategies related to successful weight loss is great diet commitment and strict, regular and consistent dieting, that is, maintaining the same diet regimen across the day, week and year [1]. It is, however, not clear why some people are better able to stick to their diet than others in the current context of a 'toxic' environment in which highly palatable energy-dense foods are widely available and the need for physical activity is decreased. A difference between successful and unsuccessful dieters might be related to the automatic responding of one's body to appetitive cues. Overeating is associated with increased cue reactivity, that is, increased appetitive responding to food cues [2]. When overeaters are confronted with a diverse range of tasty food cues that are predictive of food intake – like the smell, taste and sight of high-calorie foods – they show increased cephalic phase responding, like salivation and the release of insulin, followed by increased food intake [2, 3]. As a consequence, dieting is much easier without these appetitive responses. Appetitive responding extinguishes when exposure to foods systematically remains unreinforced [2], thereby assuming that strict dieting will lead to an extinction of appetitive responses. Knowing that successful dieters are strict, whereas unsuccessful dieters are less so [1], it was hypothesized that formerly obese successful dieters (FOSD) show decreased salivary responding during exposure to tasty high-fat food cues, whereas currently obese unsuccessful dieters (COUD) show increased salivary responding during exposure to tasty high-fat food cues.

The participants were 11 FOSD and 12 COUD. The FOSD participants were currently at normal weight ($BMI \leq 25$) after an intentional weight loss of $\geq 10\%$ and a successful maintenance of this weight loss for at least half a year without any substantial weight fluctuations. The COUD participants' current BMI was ≥ 30 and they reported no significant weight loss during the past 6 months, in spite of serious attempts to lose weight. Most par-

ticipants were female [10/11 (83%) of FOSD and 11/12 (92%) of COUD, $\chi^2(1) < 1$]. The groups did not differ in age ($M = 43.6$, $SD = 10.5$), highest lifetime BMI ($M = 35.4$, $SD = 5.9$) and BMI at the start of the last diet attempt ($M = 35.2$, $SD = 5.9$). None of the participants was in treatment since their last diet attempts, meaning that the weight loss and maintenance of the FOSD group was reached without professional help. At the time of the study, the FOSD had a normal BMI ($M = 24.5$, $SD = 2.3$) that was significantly lower than the BMI of the COUD ($M = 34.3$, $SD = 3.8$, $t(21) = 7.3$, $p < 0.001$). The mean weight loss since the last diet attempt in the FOSD was 27.3% ($SD = 12.7$) and in the COUD group 3.0% ($SD = 4.3$), $t(21) = 6.3$, $p < 0.001$. FOSD reported stricter dieting on the Restraint Scale [4] ($M = 3.8$, $SD = 0.7$) than COUD ($M = 3.2$, $SD = 0.6$, $t(21) = 2.1$, $p = 0.05$). On a scale ranging from 1 (never easy) to 4 (always easy), FOSD ($M = 3.6$, $SD = 0.5$) reported greater ease to refuse high-calorie tasty foods than COUD ($M = 2.0$, $SD = 0.5$, $t(20) = 7.5$, $p < 0.001$).

Baseline saliva was collected for 1 min using 3 cotton dental rolls (2 rolls between the cheek and lower left and right gum, and 1 roll below the tongue) and about 45 min later saliva was collected during a 1-min exposure to food pictures. Between both saliva measurements the participant was interviewed on weight course and diet history. Then, the participant was exposed to the 9 A-4 format colour pictures of tasty high-calorie foods and salivary response was measured. (S)he was instructed to watch all the pictures while trying to remember them all for a memory test, to prevent any cognitive avoidance, and to give in to the feelings the pictures elicited. The weight of the dental rolls in a small plastic re-sealable bag was registered before and after saliva collection.

The 2 (group: FOSD vs. COUD) \times 2 (time: baseline vs. exposure) ANOVA on salivary response found no main effects, F 's < 1.1 , but a highly significant interaction, $F(1, 21) = 13.96$, $p = 0.001$. The COUD showed a significant increase in salivation during food exposure ($M = 0.92$, $SD = 0.61$) as compared to baseline ($M = 0.71$, $SD = 0.46$, $t(11) = 2.4$, $p < 0.05$), whereas the FOSD showed a significant decrease in salivary responding during food confrontation ($M = 0.54$, $SD = 0.17$) as compared to baseline ($M = 0.73$, $SD = 0.3$, $t(10) = 3.2$, $p < 0.01$). Both groups remembered an equal number of food pictures ($M = 6.5$, $SD = 1.0$ for FOSD and $M = 6.3$, $SD = 0.8$ for COUD), $F < 1$, making cognitive avoidance during the exposure an unlikely explanation for the difference in salivation response.

FOSD showed decreased cue reactivity (salivation) during confrontation with tempting food cues, whereas COUD showed increased cue reactivity. These data suggest that a dieter who is able to resist high-fat food temptations and keeps dieting if exposed to a 'toxic' environment will experience a decrease in and eventually extinction of automatic urges to eat, which in turn makes it easier to refrain from eating high-fat foods for a longer period of time. It is likely that successful dietary restraint, i.e. a sternly maintained restriction of food intake, reduces salivary responding, whereas an unsuccessful diet, i.e. alternating periods

of dieting and overeating, increases salivary responding. Resisting foods in case of increased cue reactivity is difficult, whereas decreased cue reactivity makes it easier to resist foods. Weight loss maintenance becoming easier over time might be a consequence of extinguished cue reactivity. Thus, the first blow might be half the battle; a successful start of the diet frees the body of its cue reactivity and makes dieting easier and more successful. Cue exposure with response prevention is an effective intervention to extinguish cue reactivity [2] and might therefore be used as a method to maintain weight loss. These data are preliminary; we merely tested cue reactivity to high-fat food cues but not to low-fat food cues in a small cross-sectional sample. We nonetheless found interesting associations between strict and successful dieting with decreased cue reactivity. Future studies should prospectively test whether there is a causal relationship between a decrease in cue reactivity to specifically high-calorie but not low-calorie foods and long-term diet success.

References

- 1 Wing RR, Phelan S: Long-term weight loss maintenance. *Am J Clin Nutr* 2005;82:222S–225S.
- 2 Jansen A: A Learning model of binge eating: cue reactivity and cue exposure. *Behav Res Ther* 1998;36:257–272.
- 3 Power M, Schulkin J: Anticipatory physiological regulation in feeding biology: cephalic phase responses. *Appetite* 2008;50:194–206.
- 4 Van Strien T: Dutch Eating Behaviour Questionnaire (manual). Amsterdam, Boom Test Publishers, 2005.

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