



Research report

Piece of cake. Cognitive reappraisal of food craving

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ABSTRACT

A common emotion regulation strategy, cognitive reappraisal, involves altering the meaning of a situation so that the emotional response to the situation is changed. Most research on reappraisal has focused on down-regulation of negative emotion; few studies exist on reappraisal of positive affect, and even fewer have examined the cognitive reappraisal of craving for energy-dense (e.g., “junk”) foods. In the present study we examined this form of cognitive reappraisal using a new adaptation of a classic emotion regulation task. Subjects chose idiosyncratic categories of craved (and not craved) energy-dense foods as stimuli, and were instructed either to look at the stimulus or to reappraise it in a way that reduced desire to eat the depicted food using a strategy that could be used in the real world. A repeated-measures ANOVA and follow-up tests revealed that reappraisal significantly reduced self-reported desirability of both Craved and Not Craved foods, but for a greater degree in Craved foods. In addition, the degree to which subjects decreased their desire to consume Craved foods positively correlated with the cognitive restraint subscale of the Three-Factor Eating Questionnaire, a measure of self-control of eating in everyday life.

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Introduction

Overeating and obesity are rapidly growing problems in industrialized societies. Eating in the absence of hunger, or non-homeostatic eating, involves consuming too much food relative to what is biologically required (Corwin & Hajnal, 2005), and contributes to obesity and other weight-related problems (van Strien, Herman, & Verheijden, 2009). Identifying a way to reduce this form of overeating would not only contribute to public health, but it would also help individuals with their personal goals; this year, two of the three top goals among Americans surveyed by the APA were to lose weight and eat a healthier diet (American Psychological Association, 2012).

Recent research has investigated strategies for regulating overeating behavior, including message framing aimed at increasing fruit/vegetable intake (Gerend & Maner, 2011), imagining eating an unhealthy food instead of actual consumption (Morewedge, Huh, & Vosgerau, 2010), and enacting full-fledged societal interventions (Robinson, 2012). While these strategies focus on controlling eating behavior itself, others have found that targeting the *motivation* to engage in overeating may be sufficient to prevent this type of behavior. Desires or cravings for unhealthy foods are qualitatively similar to those for alcohol, drugs, and tobacco in that they are associated with increased attention to and intrusive thoughts about the desired target (Kavanagh, Andrade, & May,

2005; May, Andrade, Panabokke, & Kavanagh, 2004). Consciously reducing the strength of these unwelcome desires to eat unhealthy foods is a potentially powerful means of decreasing overeating behavior in service of weight control.

The cognitive regulation of craving has only recently begun to receive empirical attention. The emotion regulation literature has demonstrated that affective responses can be modulated using reappraisal, a strategy that involves deliberately controlling how one cognitively appraises the meaning of an affective stimulus (Giuliani, McRae, & Gross, 2008; Ochsner & Gross, 2008). Although most research on cognitive emotion regulation targets affective stimuli like negative pictures, recent work has begun to test the efficacy of reappraisal on new targets and new affective states. Specifically, a small number of studies have now examined reappraisal aimed at the reduction of reward encoding (Staudinger, Erk, & Walter, 2011), expected value (Staudinger, Erk, Abler, & Walter, 2009), and the craving of cigarettes (Kober, Kross, Mischel, Hart, & Ochsner, 2010; Kober, Mende-Siedlecki, et al., 2010) and food (Hollmann et al., 2011; Kober, Kross, et al., 2010; Kober, Mende-Siedlecki, et al., 2010; Siep et al., 2012; Svaldi, Tuschen-Caffier, Lackner, Zimmermann, & Naumann, 2012). Related threads of research have also recently emerged documenting dysfunctional reward responses in adolescents (Galvan, 2010; Geier, Terwilliger, Teslovich, Velanova, & Luna, 2010) and among individuals with bipolar disorder (Gruber, 2011; Phillips & Vieta, 2007).

The question of how people down-regulate appetitive motivations like craving is a relatively new area, with several important open questions. For example, it is unknown whether various

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reappraisal strategies are more or less efficacious because most studies in this area focus exclusively on one reappraisal strategy (e.g., imagining the long-term consequences of eating an unhealthy food or smoking a cigarette). Any given strategy may work well for some people but not others. Allowing participants to self-generate tailored reappraisal strategies may allow for greater ecological validity of results.

Another open question is whether reappraisal is effective for individually-tailored stimuli. Like the strategies for its cognitive regulation, craving is also idiosyncratic: what may be a highly desired food for one person may be a greatly disliked food for another. Previous work investigating regulation of food cues used the same set of food stimuli for all subjects. Indeed, as with regulation, asking participants to regulate their desire to consume energy-dense foods tailored to their tastes may allow for greater and more realistic cravings for those foods to emerge, which may be harder to reduce through cognitive regulation than the generic stimuli used in previous studies. As such, in the present study we applied a validated emotion and craving regulation paradigm (e.g., Kober, Kross, et al., 2010; Ochsner & Gross, 2004) to this question by allowing participants to choose among seven categories of matched energy-dense foods and employ one of four cognitive reappraisal strategies to reduce their desire to consume the food. We hypothesized that cognitive reappraisal would significantly decrease self-reported desire, and be meaningfully related to validated measures of daily self-regulation of eating.

Methods

Participants

Eighty-two participants (28 male, age $M = 19.76$, $SD = 3.51$) completed a single-session study. All gave informed consent in accordance with the University of Oregon Institutional Review Board. Seven additional participants were excluded from analyses due to excessive missing data (>10%), failure to adhere to task instructions, or for food addiction as determined by the Yale Food Addiction Scale (Gearhardt, Corbin, & Brownell, 2009).

Procedure

After providing informed consent, participants were trained on the task, then asked to choose (a) their most and least craved categories of energy-dense stimuli and (b) the regulation strategy they believed would be most effective for them during Regulate trials per the instructions below. Participants then practiced the task with the experimenter (N.G. or R.C.), as detailed in the strategy training section below. Following the completion of the task, the experimenter interviewed each participant to ensure that he or she had indeed used the selected regulation strategy on all Regulate trials. Participants who could not report which strategy they used, or reported using different strategies on different trials, were removed from analyses. Lastly, participants completed the individual difference measures detailed below, reported their level of hunger on a 1 (“very hungry”) to 5 (“very full”) Likert scale, and were thanked for their time.

Stimuli

To elicit craving responses, pictures of foods were collected from two sources: prior research that has used similar photographic cues (Burger, Cornier, Ingebrigtsen, & Johnson, 2011; Kober, Kross, et al., 2010), and images downloaded from public online sources. In a separate pilot study, 61 participants (38 female)

rated images of 642 energy-dense foods in 12 categories, as well as 25 low energy-density foods on 1 (“not at all”) to 5 (“very much”) Likert scale. None of the pictures included people, and the foods in all pictures were prepared and ready for consumption. The final stimulus set consisted of 20 pictures of low energy-density food ($M = 2.48$, $SD = .27$), and 40 pictures in each of the following categories of energy-dense food (M s: 3.46–3.52, SD s: .17–.35): chocolate, cookies, donuts, fries, ice cream, pasta, and pizza. Importantly, images were chosen such that the means of the energy-dense food categories were not significantly different from each other (all paired-samples p -values > .05), and that the mean of each energy-dense food category was significantly greater than the mean of the low energy-density food stimuli (p -values < .001).

Task

Images of two types of palatable foods were included as stimuli: low energy density foods (“Neutral”), and energy-dense foods. All participants saw the same set of Neutral stimuli. For the energy-dense stimuli, participants chose the one category of food that they craved the most (“Craved”) and the one category of food they craved the least (“Not Craved”) from the categories listed above. Craving was defined as the desire and tendency to consume more of the target food, even when the individual is no longer hungry (i.e., overeating). Importantly, the stimuli in each category did not vary from participant to participant. For example, a participant who chose pizza as his Craved food and donuts as his Not Craved food would see the same stimuli as another participant who chose donuts as his Craved food and pizza as his Not Craved food. The energy-dense food trials were organized in a 2 (Stimulus: Craved vs. Not Craved) \times 2 (Instruction: Look vs. Regulate) design. The stimuli assigned to each condition were counterbalanced across participants, so the pictures of pizza seen under the Look instruction for one participant would be the stimuli seen under the Regulate instruction for the next participant who chose pizza as a stimulus category (independent of whether it was designated Craved or Not Craved). Thus, the final event-related design included five trial types (the 2 \times 2 of energy-dense foods plus Look Neutral), with 20 trials seen under each condition.

The Look instruction directed participants to focus on the pictured food, imagine that it is actually in front of them, and think about consuming it. The Regulate instruction again directed participants to focus on the pictured food and imagine that it is in front of them, and additionally to think about it in a way that reduces their desire to eat the depicted food (Regulate). To help participants generate a reappraisal strategy, we suggested the following four strategies that were developed on a separate sample in pre-testing: (1) imagine that you are currently very full, (2) focus on the negative consequences of eating that food (e.g., stomachache, weight gain), (3) remind yourself that you can save that food for later, and (4) imagine that something bad had happened to the pictured food (e.g., sneezed on). Participants were not required to use one of the suggested strategies, but were told that their reappraisal strategy should be applicable to the real world, and that they should choose one strategy before the task and use that same strategy on every trial. Importantly, the script used to train participants on the task instructed them to report their craving honestly at the end of each trial. To minimize the demand characteristics of the task regarding regulation success, we explicitly stated that “we don’t expect you to be able to do this on every picture, so please just let us know where you ‘end up’ when all is said and done.” To minimize contamination of instruction across trials, we instructed participants to view each trial as a fresh event, and to do their best to only Look or only Regulate, as instructed by the cue.

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