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Research report

Repeated cue exposure effects on subjective and physiological indices of chocolate craving

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Abstract

The aim of this study is to investigate the effects of repeated unreinforced exposure to chocolate cues in persons reporting chocolate craving. Participants in the experimental group ($n = 40$) received 10 consecutive brief exposures to chocolate cues in each of two sessions, separated by 1–3 days. Control participants ($n = 18$) received two exposures at the start and end of each session. Chocolate craving was measured (alternately) through subjective report and the amount of saliva secretion to chocolate cues. Results showed a between-sessions decrease in both craving measures in the experimental group, whereas no differences in craving between sessions were observed in the control group. These results provide evidence for the effects of cue exposure treatment in chocolate craving.

Keywords: Chocolate craving; Cue exposure; Salivation

Introduction

Food craving, which is defined as an intense desire or longing (Kozlowski & Wilkinson, 1987; Weingarten & Elston, 1990) to eat a particular food (Marlatt, 1987; Rozin, 1976), is a common phenomenon in the general population (Weingarten & Elston, 1991). In Western cultures, the food most frequently craved is chocolate, especially among women (Pelchat, 1997; Rogers & Smit, 2000; Rozin, Levine, & Stoess, 1991). Although for the majority of people chocolate craving is not harmful (Lafay et al., 2001), it may be subjectively experienced as unwanted, being an element of an unhealthy life style and possibly contributing to weight problems. In some cases, it may become a real problem when it rises to the level of binge eating (Kales, 1990). Therefore, it is important to gain insight into the craving process and to develop ways that can help to reduce chocolate craving (Kemps, Tiggemann, & Hart, 2005). Moreover, given that chocolate craving is highly prevalent and, unlike for example alcohol dependency and binge eating (Jansen, 1998), much less confounded by psychiatric co-morbidity, it allows craving and craving reduction techniques to be investigated in a relatively pure manner in easily accessible populations (Weingarten & Elston, 1991).

Only a few studies have hitherto been devoted to the reduction of chocolate craving, none of which has yielded clear results. One study looked at suppression of craving-related thoughts, but this did not seem to have a substantial effect (Johnston, Bulik, & Anstiss, 1999). Kemps et al. (2005) recently found that visuo-spatial working memory-based techniques reduced imagery vividness and self-reported chocolate craving in both female chocolate cravers and non-cravers. However, contrary to what was predicted, irrelevant speech also reduced both vividness and craving, be it to a lesser extent.

For any attempt to reduce chocolate craving, it is relevant to understand the critical cues and processes underlying the craving response to chocolate. Several accounts have been proposed (e.g., Rozin et al., 1991), which we will briefly discuss.

Chocolate is known for its "melt in the mouth" sensation that is attributed to one of its main fat

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ingredients, cocoa butter. Chocolate is also high in sugar. The combination of sugar and fat has a particular appeal (Drewnowski & Greenwood, 1983). Chocolate also has a uniquely attractive aroma. As a result, the taste and flavor of chocolate have a high incentive value (Rozin et al., 1991). Comparing the role of sensory and pharmacological properties of chocolate revealed that the former but not the latter satisfied the craving response (Michener & Rozin, 1994). In line with this, chocolate cravers reported that non-chocolate substitutes were inadequate to abate their craving (Polivy, Coleman, & Herman, 2005; Weingarten & Elston, 1991). In sum, results suggest that pharmacological factors play little—if any—role in the satisfaction of craving (Rogers & Smit, 2000).

Despite findings that depressed mood may increase chocolate craving (Willner et al., 1998) and that people report to self-medicate with chocolate (Schuman, Gitlin, & Fairbanks, 1987), a recent review revealed that the mood-enhancing effect of chocolate consumption is short-lived and that chocolate prolongs a dysphoric mood when consumed for comforting (Parker, Parker, & Brotchie, 2006).

Women often report a stronger craving for chocolate in their perimenstruum (e.g., Hill & Heaton-Brown, 1994), suggesting a role for sex hormones (Bruinsma & Taren, 1999). However, Spanish women reported much less premenstrual chocolate craving than American women, suggesting a cultural origin (Osman & Sobal, 2006; Zellner, Garriga-Trillo, Centeno, & Wadsworth, 2004). One way to frame this is by assuming that chocolate craving is triggered by classically conditioned food cues. Zellner and Edwards (2001) state that conditioning is strongly involved in the production of food cravings; neutral stimuli or cues that have been associated with food intake can, over time, elicit reactivity that can be experienced as craving for the food. So, with repeated consumption of chocolate during the perimenstruum, moods and typical feelings during this period may become conditioned cues for the high incentive value of the sensory properties of chocolate. Chocolate craving is then seen as a mediator of cue-induced eating.

Craving or urge to use a given drug is considered an important source of maintenance and relapse in addiction literature (Drummond, Tiffany, Glautier, & Remington, 1995; Jansen, 1998). Exposure-based therapies, inspired by Pavlovian conditioning models of addiction, aim to extinguish this craving. These therapies consist of repeated exposures to drug cues while preventing drug use (response prevention) and have proven successful to extinguish craving. Given its success in the domain of alcohol abuse (Drummond et al., 1995), bulimia nervosa (Carter, McIntosh, Joyce, Frampton, & Bulik, 2006) and binge eating (Jansen, 1998; Jansen, Broekmate, & Heymans, 1992), the conditioning model of food craving (Jansen, 1998; Zellner & Edwards, 2001) seems to provide the best heuristic tool when trying to devise techniques to reduce chocolate craving. Specifically, Jansen et al. (1992) have demonstrated cue exposure to be efficacious in binge eaters, reducing the binge frequency. Nevertheless, techniques for chocolate craving reduction based on the conditioning model have not been put to empirical test yet.

In the present study, we repeatedly presented chocolate cues to chocolate cravers in a clinical analogue study in two consecutive sessions. Chocolate craving was measured in two ways and this alternately: By subjective report and by the amount of saliva secretion to chocolate cues, using the cotton roll method. This method appears to yield a sensitive, valid and reliable index of craving (Nederkoorn, de Wit, Smulders, & Jansen, 2001; Tuomisto et al., 1999; White, 1977).

Research on addiction has shown that effects of exposure are often limited to the context in which exposure is conducted (e.g. Thewissen, Snijders, Havermans, van den Hout, & Jansen, 2006). Therefore, the experiment also contained a mood induction manipulation aimed at exploring to what extent reduction of craving would generalize to different mood contexts. However, our mood manipulation failed to induce the intended mood changes (see infra); therefore, the contextual control of chocolate craving could not be addressed.

Method

Participants

Participants ($n = 58$) were recruited on the basis of a questionnaire, administered to 335 students, that labeled them as chocolate cravers. They met the criterion for chocolate craver when they reported to (a) be "very bad"/"bad"/"rather bad" at postponing a chocolate craving, (b) "rather like"/"very much like" to gain more control over their chocolate craving and (c) find it "neutral"/"rather difficult"/"very difficult" to gain more control over their chocolate craving. All were female psychology students at the University of Leuven, aged between 20 and 24 years ($M = 20.71$, $SD = 0.80$). All participated on a voluntary basis.

Measures

Chocolate craving was measured, alternately, through subjective report and the amount of saliva secretion to chocolate cues.

Subjective report

Self-reported craving was measured using an online scale. The scale, presented on a computer screen in front of the participant, ran from bottom to top and ranged from 0 (*no craving for chocolate at all*) to 100 (*extreme craving for chocolate*). It was divided in 10 boxes representing 10 units each. Above the scale the question "*How strong is your craving for chocolate at this moment?*" appeared.

During the time of an exposure trial (2 min), participants were instructed to rate their craving at any time, but at