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Cue exposure therapy reduces overeating of exposed and non-exposed foods in obese adolescents



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ABSTRACT

Background and objectives: This study tested whether two sessions of food cue exposure therapy reduced eating in the absence of hunger (EAH), specified for exposed and non-exposed food, in overweight and obese adolescents, and whether habituation of food cue reactivity and reduced CS-US expectancies predicted a decrease in EAH.

Methods: 41 overweight adolescents (aged 12–18 years) were randomly assigned to a cue exposure intervention or a lifestyle intervention (control condition). Habituation of food cue reactivity (self-reported desire to eat and salivation) and CS-US expectancy were measured during both sessions, and EAH was measured at the end of session two.

Results: Compared to the control condition, the cue exposure condition showed less EAH for the exposed food item as well as for the non-exposed food items. Larger within-session (WSH) and between-session habituation (BSH) of cue reactivity were not related to less EAH, change in CS-US expectancy was unrelated to EAH.

Limitations: The study was underpowered, and compliance to homework instructions between sessions was poor, intervention effects might have been larger when participants adhered to daily homework exercises.

Conclusions: Food cue exposure was effective to reduce EAH of exposed and non-exposed food items, indicating generalisability of the exposure effect. In line with exposure effects in anxiety disorders, habituation was not found to benefit outcome, though the present data do also not provide evidence that CS-US expectancy violation predicts EAH.

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1. Introduction

Exposure-based interventions have widely received empirical support for the treatment of anxiety disorders (Deacon & Abramowitz, 2004). In eating disorders and obesity, far less evidence is available on the effectiveness of exposure therapy, in spite of an alarming need for effective treatments. Worldwide, overweight and obesity prevalences increase disturbingly, with estimated increases of 27.5% for adults and as much as 47.1% for children falling in the overweight range between 1980 and 2013 (Ng et al., 2014). Calorie intake beyond physiological needs, also referred to as eating in the absence of hunger (EAH), is a major

determinant of overweight. Several studies have reported on the significant association between EAH and adiposity in children (e.g. Butte et al., 2007; Kral et al., 2013). Triggers for EAH seem to be a core problem of overeating: increased food cue reactivity, which refers to anticipatory psychological (e.g., eating desires) and physiological responses (e.g., salivary production) that prepare for food intake, supposedly forms a major obstacle to resist palatable food and successful weight loss (A. Jansen, 1998). Indeed, a meta-analysis showed that cue-induced food cravings were prospectively related to eating and weight gain, with similar (medium) effect sizes for children and adults (Boswell & Kober, 2016). Moreover, a pilot study showed that cue reactivity was significantly reduced in successful dieters (formerly obese) compared to unsuccessful (still obese) dieters (A. Jansen, Stegerman, Roefs, Nederkoorn, & Havermans, 2010). These findings suggest that successfully refraining oneself from consuming high-caloric foods

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is related to decreased food cue reactivity, which in turn might make it easier to resist tempting foods and hence improve successful weight loss and relapse prevention.

Models of overeating state that food cue reactivity can be acquired through classical conditioning (A. Jansen, 1998): by associating food intake (unconditioned stimulus; US) with predictive cues (conditioned stimulus; CS), such as the smell and sight of food, presentations of merely the CS are capable of inducing cue reactivity (conditioned response). Results of human laboratory studies confirm that associations between food intake (US) and neutral stimuli (CS) are easily learned (Bongers, van den Akker, Havermans, & Jansen, 2015; van den Akker, Havermans, Bouton, & Jansen, 2014). If CS-US associations are acquired in daily life through classical conditioning, extinction of food cue reactivity, by repeated exposure to CSs without the US (eating), could be helpful to reduce overeating. During food cue exposure, participants are exposed to intake-predicting cues (CSs), like the sight of favourite food, while food intake (US) is not permitted, allowing conditioned motivation to eat to decrease over time. Pilot studies in bulimia nervosa patients show that cue exposure therapy is indeed effective in decreasing food cravings and binge eating (A. Jansen, Broekmate, & Heymans, 1992; A. Jansen, Van den Hout, De Loof, Zandbergen, & Grietz, 1989; Martinez-mallen et al., 2007; McIntosh, Carter, Bulik, Frampton, & Joyce, 2011; Toro et al., 2003). With regard to overweight samples, cue exposure has shown to prevent weight regain after successful weight loss in adults (Mount, Neziroglu, & Taylor, 1990). Interestingly, cue exposure is also effective for obese children to reduce EAH in a behavioural task (Boutelle et al., 2011, 2014). Investigating exposure therapy in children is of great importance, as obesity at a young age is not only associated with serious medical issues, it also increases the chance of being obese as an adult – along with the health consequences later in life (Serdula et al., 1993). In addition, children are less burdened with an ingrained learning history, and suggested to be more malleable than adults (e.g. faster adaptation of behavioural patterns), which make them an important target group for interventions (Wilson, 1994). Although the studies by Boutelle et al. (2011, 2014) found interesting result on EAH in general, it is of interest to further investigate the specificity of cue exposure effects on EAH: it has been shown in overweight adult women that a single session of cue exposure, as compared to an active control intervention, led to less EAH for the exposed foods, but no generalisation to non-exposed food items occurred (Schyns, Roefs, Mulkens, & Jansen, 2016).

Given the limited research available, the food cue exposure domain could greatly benefit from the advances in the anxiety research field. A fascinating line of research on working mechanisms of exposure in anxiety disorders has shown that, in contrast to the original assumption that anxiety levels should habituate during therapy sessions, habituation of anxiety during (within session habituation; WSH) and between treatment sessions (between session habituation; BSH) is not a good predictor of treatment outcome (Craske et al., 2008). It is now well established that extinction learning is not erasing old CS-US memories, but instead creating new CS-noUS associations; inhibitory learning (Bouton & King, 1983; Bouton, 1993). Exposure should aim to make new CS-noUS associations as strong as possible, which can for example be achieved by violating US expectancies during exposure (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014). Exposure for panic disorder patients aimed at violating US expectancies has shown to be more effective than aiming at habituation of fear (Salkovskis, Hackmann, Wells, Gelder, & Clark, 2006). Strengthening inhibitory learning seems especially important for overweight and obese individuals (A. Jansen, Schyns, Bongers, & van den Akker, 2016), as several studies found associations between overeating and obesity and weak inhibitory skills (e.g., Guerrieri, Nederkoorn, & Jansen,

2012; Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010; Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006), also in children and adolescents (e.g., Batterink, Yokum, & Stice, 2010; Nederkoorn, Braet, Van Eijs, Tanghe, & Jansen, 2006). To improve inhibitory learning, the expectancy violation approach could be translated to food cue exposure by exposure to specific overeating cues that are linked to strong eating expectancies (e.g., “If I feel exhausted and palatable food is available [CS], then I will have a binge [US]”) while testing whether the US indeed takes place as expected. Although evidence on the role of habituation and expectancy violation in cue exposure research is scarce, one study established that, in line with the findings of anxiety studies, WSH of cue reactivity (salivation and self-reported eating desires) did not predict EAH. Instead, self-reported change in CS-US expectancy was significantly related to EAH: lower US expectancies predicted less EAH of an exposed food item (Schyns et al., 2016). However, no generalisation to non-exposed foods was found. Generalisation of the exposure effect remains very important for the usability of exposure in clinical practice; it is plausible that more sessions are required for generalisation to occur, and/or better consolidation of the new CS-noUS memory, for example by sleeping after the session (Pace-Schott, Verga, Bennett, & Spencer, 2012). Further, even when the new CS-noUS association has been well-consolidated, the original CS-US association remains intact and forms a risk of return of responses in another context or later in time. One possible way to enhance accessibility of the CS-noUS association are retrieval cues: mental or physical cues that help to remember the extinction memory (Craske et al., 2014). Adding a retrieval cue has been shown to attenuate renewed responding after a context switch in conditioning studies (Dibbets, Havermans, & Arntz, 2008; Vansteenwegen et al., 2006), though results in more clinically applied exposure studies are mixed (Culver, Stoyanova, & Craske, 2011; Dibbets, Moor, & Voncken, 2013).

The primary aim of the present experiment is to investigate whether two sessions of food cue exposure reduce EAH of the exposed food item and EAH of non-exposed food items in overweight and obese adolescents. It is hypothesised that EAH is less in the exposure condition relative to a control condition, both for exposed and non-exposed foods (generalisation). Further, the role of habituation of cue reactivity (WSH and BSH of salivation and self-reported eating desires) and the violation of US expectancies in the prediction of EAH are tested, hypothesising that WSH and BSH of habituation are positively associated with EAH if habituation is critical for extinction, whereas CS-US expectancies are related to EAH if inhibitory learning is critical. As a secondary outcome measure, the effects of cue exposure on eating psychopathology and the added benefit of a retrieval cue herein are examined at one-month follow-up.

2. Material and methods

2.1. Participants

41 participants, aged 12–18 years were recruited from the local Area Health Authority and the paediatric obesity outpatient clinic of Zuyderland in Kerkrade, the Netherlands (see Fig. 1). Participants were eligible when having sufficient Dutch speaking skills and being overweight according to criteria for children, as defined by scoring above the age and sex-specific BMI cut-off (BMI of 25 in adults; Cole, Bellizzi, Flegal, & Dietz, 2000). After being informed by the researcher, children and parents received one week to consider participation. After written consent was given by the child and parents, the participant was put on a waiting list for a group of participants. As soon as six participants could make it one the same two intervention dates, the group was set by the experimenter. The

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