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The effect of combined avoidance and control training on implicit food evaluation and choice

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ABSTRACT

Background: Continual exposure to food cues in the environment contributes to unhealthy eating behaviour. According to dual-process models, such behaviour is partly determined by automatic processing of unhealthy food cues (e.g., approach bias), which fails to be regulated by controlled processing (e.g., inhibitory control). The current study aimed to investigate the effect of combined avoidance and control training on implicit evaluation (liking), choice, and consumption of unhealthy snack food.
Method: Participants were 240 undergraduate women who were randomly allocated to one of four experimental conditions of a 2 (avoidance training: training versus control) x 2 (control training: training versus control) between-subjects design.
Results: The combined training group had a more negative implicit evaluation of unhealthy food than either of the two training conditions alone or the control condition. In addition, participants trained to avoid unhealthy food cues subsequently made fewer unhealthy snack food choices. No significant group differences were found for food intake.
Limitations: Participants were women generally of a healthy weight. Overweight or obese individuals may derive greater benefit from combined training.
Conclusions: Results lend support to the theoretical predictions of dual-process models, as the combined training reduced implicit liking of unhealthy food. At a practical level, the findings have implications for the effectiveness of interventions targeting unhealthy eating behaviour.

1. Introduction

The increasing worldwide prevalence of overweight and obesity during the last few decades has become a primary health concern. In contemporary Western societies such as Australia, 64% of adults are now classified as overweight and 29% as obese (WHO, 2014). A major contributing factor to these high rates of overweight and obesity is unhealthy eating behaviour, in particular, the overconsumption of foods high in fat, salt, and sugar (WHO, 2014). One potential influence on unhealthy eating is exposure to a vast array of visual cues associated with food through advertising on the internet, billboards, magazines, and television (Havermans, 2013; Polivy, Herman, & Coelho, 2008). Over time, exposure to unhealthy food cues can lead to biased automatic processing of such cues, which can translate into increased food intake if automatic responses to these cues are not inhibited (Cohen & Farley, 2008).

Contemporary dual-process models have been prominent in understanding why our health-related behaviours are not always consistent with long-term goals, such as weight loss (Hofmann, Friese, & Wiers, 2008; Strack & Deutsch, 2004). One of the key predictions is that behaviour is determined by a combination of automatic and controlled processing. Automatic processing is fast, effortless and associative. One such automatic process is an approach bias, which is the automatic action tendency to approach rather than avoid relevant cues in the environment (Wiers et al., 2013a). In contrast, controlled processing is slow, controlled and conscious. One aspect of controlled processing is inhibitory control, which is 'the ability to inhibit a behavioural impulse in order to attain higher-order goals' (Houben, Nederkoorn, & Jansen, 2012, p. 550). Taken together, it may be that a rewarding stimulus (e.g., a slice of chocolate cake) in the environment elicits an automatic response, such as an approach action tendency, which can predict unhealthy choice or intake if this process occurs too quickly and effortlessly to be regulated by the slower controlled processing system.

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Approach bias has been demonstrated for a range of appetitive substances, including alcohol (Wiers, Rinck, Kordts, Houben, & Strack, 2010), cigarettes (Wiers et al., 2013b) and cannabis (Cousijn, Goudriaan, & Wiers, 2011). Importantly, approach bias has also been associated with increased consumption of some of these substances (alcohol: Wiers et al., 2010; Wiers, Rinck, Dictus, & Van den Wildenberg, 2009; cannabis: Cousijn, Goudriaan, & Wiers, 2011). In the eating domain, approach bias has been reliably demonstrated for a variety of unhealthy foods (Brignell, Griffiths, Bradley, & Mogg, 2009; Havermans, Giesen, Houben, & Jansen, 2011; Kemps & Tiggemann, 2015; Kemps, Tiggemann, Martin, & Elliott, 2013; Veenstra & de Jong, 2010), and has been associated with increased unhealthy food intake (Kakoschke, Kemps, & Tiggemann, 2015; Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010). Thus, the evidence suggests that approach bias contributes to consumption of appetitive substances.

Furthermore, automatic processes underlying unhealthy behaviour can be manipulated using a computerised cognitive training paradigm. This is achieved in commonly used protocols such as the Approach-Avoidance Task (AAT), by presenting target pictures (e.g., unhealthy food) in a format that requires a push (i.e., avoidance) response and control pictures (e.g., animals) in a format that requires a pull (i.e., approach) response on the majority of trials. In the alcohol domain, the AAT has been used to train an avoidance of alcohol cues, which reduced implicit liking of such cues and subsequent beer consumption (Wiers et al., 2010). Importantly, these findings were extended to alcohol-dependent inpatients, whereby the training reduced relapse rates one year later (Eberl et al., 2013; Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011).

Researchers in the eating domain have also begun to use the AAT. In an early study, Fishbach and Shah (2006) trained participants to avoid unhealthy food words (e.g., 'cookie') and approach healthy food words (e.g., 'apple'), which translated into healthier snack food choices. More recently, Brockmeyer, Hahn, Reetz, Schmidt, and Friederich (2015) successfully re-trained approach bias for unhealthy food, which reduced food cravings. Similarly, Becker, Jostmann, Wiers, and Holland (2015, Study 1) found that participants who were successfully trained to avoid unhealthy food were more likely to choose a healthy snack. Schumacher, Kemps and Tiggemann (2016) found that participants trained to avoid chocolate cues ate less chocolate, while Dickson, Kavanagh, and MacLeod (2016) found no difference in chocolate consumption between groups. Finally, Becker et al. (2015, Study 3) found that their training group actually ate more chocolate than the control group. Thus, research shows that approach bias for unhealthy food can be reduced, but the effect on eating behaviour is less consistent.

In terms of controlled processing, poor inhibitory control has been linked to several unhealthy behaviours. For example, research on alcohol has shown that for participants with low inhibitory control, positive implicit evaluations for alcohol predicted increased alcohol consumption (Friese & Hofmann, 2009; Friese, Hofmann, & Wänke, 2008; Houben & Wiers, 2009; Thush et al., 2008). In the eating domain, studies have consistently shown that poor inhibitory control predicts unhealthy eating behaviour, such as increased unhealthy snack food choice (Jasinska et al., 2012) and intake (Appelhans et al., 2011; Guerrieri et al., 2007).

Inhibitory control can be increased using tasks that involve pairing appetitive stimuli with a no-go cue (Veling, Holland, & van Knippenberg, 2008) or stop-signal (Verbruggen & Logan, 2009). In the alcohol domain, inhibitory control training reduced implicit liking and consumption of alcohol (Houben et al., 2012; Houben, Nederkoorn, Wiers, & Jansen, 2011; Jones & Field, 2013; Study 1). Similarly, in the eating domain, inhibitory control training reduced chocolate intake (Houben & Jansen, 2011), as well as implicit liking (Houben & Jansen, 2015; Lawrence et al., 2015b; Veling, Aarts, & Stroebe, 2013a; Veling et al., 2008), choice (Veling, Aarts, & Stroebe, 2013b; Veling, Stroebe, & Aarts, 2014), and unhealthy food intake (Lawrence, Verbruggen, Morrison, Adams, & Chambers, 2015a).

Although inhibitory control training appears to be an effective technique for changing eating behaviour, a recent meta-analysis found that the effect size on consumption is small, leading the authors to suggest that it may be useful to supplement inhibitory control training with another type of intervention (Allom, Mullan, & Hagger, 2015). Two recent studies tested the combination of inhibitory control training with implementation intention training, which aims to improve eating behaviour by reminding people of their dieting goal. One study found that participants who received both interventions lost more weight over four weeks than those who received either one alone (Veling, et al., 2014), while the other found that the combined training was no more beneficial than either training task alone at reducing the amount of sweets participants selected (Van Koningsbruggen, Veling, Stroebe, & Aarts, 2014).

According to dual-process models, it should be possible to change unhealthy eating behaviour by re-training either automatic (e.g., approach bias) or controlled processing (e.g., inhibitory control). To date, these two types of interventions have been used individually with mixed success. However, the key prediction of dual-process models is that training automatic and controlled processing together should be more effective at changing behaviour. There is some evidence to support this suggestion, as one correlational study has shown that women who had a stronger approach bias for unhealthy food cues combined with lower inhibitory control consumed more unhealthy snack food during a taste test (Kakoschke et al., 2015).

Thus, the current study aimed to determine whether combining avoidance training with inhibitory control training was more effective than either training task alone at reducing implicit liking, choice and intake of unhealthy food. It was predicted that participants trained to avoid unhealthy food cues and inhibit responses to such cues would show reduced implicit liking of unhealthy food, eat less food in a taste test, and be less likely to choose an unhealthy snack than those who received either training alone or those in the control group.

2. Material and methods

2.1. Participants

The sample consisted of 240 women, aged 18–25 years ($M = 20.61$, $SD = 2.43$), recruited from the undergraduate student population at Flinders University. The majority were within the healthy weight range (18.5–24.9 kg/m^2) with a mean BMI of 22.91 ($SD = 4.90$). Only women were recruited as they have shown a greater tendency to overeat (Burton, Smit, & Lightowler, 2007) and greater concern for weight and dieting goals (Keel, Baxter, Heatherton, & Joiner, 2007). Participants were included if they could speak English fluently, liked most foods, and did not have any food allergies, intolerances, or special dietary requirements. Participants were instructed to eat something 2 h before their scheduled testing session to ensure that they were not hungry, as hunger has been associated with both a cognitive bias for unhealthy food cues (Mogg, Bradley, Hyare, & Lee, 1998; Seibt, Hafner, & Deutsch, 2007) and lower inhibitory control (Nederkoorn, Guerrieri, Havermans, Roefs, & Jansen, 2009). All participants reported having complied with this instruction, and subjective hunger ratings (100 mm visual analogue scale ranging from 'not hungry at all' to 'extremely hungry'; Grand, 1968), fell slightly below the mid-point