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Bias modification training can alter approach bias and chocolate consumption

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ABSTRACT

Recent evidence has demonstrated that bias modification training has potential to reduce cognitive biases for attractive targets and affect health behaviours. The present study investigated whether cognitive bias modification training could be applied to reduce approach bias for chocolate and affect subsequent chocolate consumption. A sample of 120 women (18–27 years) were randomly assigned to an approach-chocolate condition or avoid-chocolate condition, in which they were trained to approach or avoid pictorial chocolate stimuli, respectively. Training had the predicted effect on approach bias, such that participants trained to approach chocolate demonstrated an increased approach bias to chocolate stimuli whereas participants trained to avoid such stimuli showed a reduced bias. Further, participants trained to avoid chocolate ate significantly less of a chocolate muffin in a subsequent taste test than participants trained to approach chocolate. Theoretically, results provide support for the dual process model's conceptualisation of consumption as being driven by implicit processes such as approach bias. In practice, approach bias modification may be a useful component of interventions designed to curb the consumption of unhealthy foods.

1. Introduction

The Western food environment is populated by readily available food in large portion sizes (Chaput, Klingenberg, Astrup, & Sjödin, 2011). Contemporary diets are characterised by inadequate fruit and vegetable intake, and large proportions of foods high in fat and sugar (WHO, 2014a). In time, excessive consumption of these unhealthy foods can implicate the development of serious health problems (e.g., overweight and obesity, cardiovascular diseases; WHO, 2014a). One contributor to the consumption of unhealthy foods may be frequent exposure to food cues in the environment, through internet, television, billboards and vending machines (Havermans, 2013; Wansink, Painter, & Lee, 2006). Exposure to environmental food cues through these channels can trigger a desire to eat despite the absence of hunger, and over time, can result in biased processing (cognitive biases) that may contribute to consumption (Cohen & Farley, 2008; Havermans, 2013; Lake & Townshend, 2006). Therefore, a better understanding of these cognitive biases is required in order to develop appropriate techniques for reducing the consumption of unhealthy food.

The idea that implicit cognitive processes contribute to consumption is consistent with the contemporary dual-process model of health behaviour (Strack & Deutsch, 2004), which suggests that behaviour is governed by two interacting and competing systems: the impulsive and reflective systems. The impulsive system, the focus of the present research, involves fast, automatic, unconscious processes; in contrast, the reflective system is slower, and involves consideration of prior knowledge and long-term goals. Impulsive processes use associative memory to drive individuals to automatically attend to and approach certain stimuli (e.g., appetitive food). Contributing to this behaviour are cognitive motivational biases such as attentional and approach biases (Wiers, Gladwin, Hofmann, Salemink, & Ridderinkhof, 2013). Attentional bias is a form of biased cognitive processing whereby attention is selectively directed toward self-relevant rather than irrelevant cues in the environment (Field & Cox, 2008). A number of studies have demonstrated a role for attentional biases in unhealthy food intake (Kakoschke, Kemps, & Tiggemann, 2014; Nijs, Muris, Euser, & Franken, 2010; Werthmann et al., 2011). Another form of biased cognitive processing which has been less widely researched is approach bias. This is thought to drive individuals to physically approach rather than avoid self-relevant cues in the environment.

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Approach bias involves the automatic action tendency to physically 'reach out' towards appetitive cues (Cousijn, Goudriaan, & Wiers, 2011). Recent research has turned to the role of approach biases in consumption behaviour.

In the area of addiction, approach biases have been linked to maladaptive consumption behaviour, but the evidence is somewhat mixed (Kersbergen, Woud & Field, 2015). Approach biases have been documented for alcohol (Ernst et al., 2011; Palfai & Ostafin, 2003; Peeters et al., 2012; Wiers, Rinck, Kordts, Houben, & Strack, 2010), tobacco (Bradley, Field, Healy, & Mogg, 2008; Mogg, Bradley, Field, & De Houwer, 2003) and cannabis (Cousijn et al., 2011; Field, Eastwood, Bradley, & Mogg, 2006). Although some studies have demonstrated that approach biases can broadly predict consumption patterns for some substances (e.g., cannabis and alcohol; Cousijn et al., 2011; Cousijn et al., 2012; Palfai & Ostafin, 2003), in other studies the relationship between approach action tendencies and consumption is less clear (Fernie et al., 2013; Field, Caren, Fernie, & De Houwer, 2011).

Similar to evidence from the addiction domain, the relationship between approach biases for food and consumption needs further clarification, as findings vary between studies. Several studies have demonstrated a role for approach biases for food cues. In Kemps and Tiggemann's (2015) recent study, obese women displayed an approach bias for both high- and low-calorie food compared to normal-weight controls, and in Havermans, Giesen, Houben and Jansen's (2011) overweight sample, men showed an approach bias for high-calorie food whereas women did not. In a normal weight sample, Veenstra and de Jong (2010) found that restrained eaters showed approach action tendencies for both high- and low-fat food whereas unrestrained eaters did not.

Recent research has investigated the modification of approach biases to alter consumption behaviour. For example, several addiction studies have demonstrated that approach biases for alcohol (Eberl et al., 2013; Wiers et al., 2010, 2011) can be altered. These studies showed that approach biases for alcohol can be modified for hazardous drinkers in a university sample (Wiers et al., 2010) and in clinical samples of alcoholic patients, with training leading to lower relapse rates at one-year follow-up (Eberl et al., 2013; Wiers et al., 2011). Some research has also demonstrated that altering approach action biases can influence consumption. In the addiction domain, Wiers et al. (2010) found that approach bias modification was related to decreased consumption of alcohol in a taste test, and Wittekind, Feist, Schneider, Moritz, and Fritzsche (2015) found that approach bias modification training led to decreased cigarette consumption and dependence.

There is preliminary evidence that approach biases for food cues can also be altered. Two studies have focused on chocolate, a potentially 'addictive' product, as it is the most frequently craved food in Western society and has been linked with feelings of guilt after consumption (Hetherington & MacDiarmid, 1993; Hill, Weaver, & Blundell, 1991; Weingarten & Elston, 1991). In particular, Kemps, Tiggemann, Martin, and Elliott (2013) demonstrated that participants could be trained to approach or avoid chocolate by pairing approach and avoidance words with chocolate cues. This study did not examine the effect of approach bias modification on chocolate consumption. However, Becker, Jostmann, Wiers, and Holland (2015; Experiment 3) did. Although they found no change in approach bias scores after chocolate avoidance training, they did find that, contrary to predictions, participants who had received this training ate more chocolate in a subsequent taste test than control participants.

Therefore, the present study aimed to further examine whether approach bias modification training can alter approach bias for chocolate and correspondingly affect subsequent consumption. Specifically, we sought to alter approach bias for chocolate food images relative to other highly palatable food images. We specifically chose sweet non-chocolate foods as our comparison stimulus category, as they could be closely matched to chocolate foods (e.g., biscuits, cakes, ice-creams), and contained similar motivational relevance, which has been shown to affect training success (Eberl et al., 2013; Veling, Aarts, & Stroebe, 2013). This created a cleaner, clearer comparison of pictorial stimulus categories than the use of comparison categories like stationery items and other 'neutral' objects, as have been used in previous studies (Becker et al., 2015; Cousijn et al., 2011; Wittekind et al., 2015).

First, it was predicted that participants trained to approach chocolate would show an increased approach bias to chocolate stimuli after training, whereas participants trained to avoid chocolate stimuli would show a reduced bias. Second, it was predicted that participants trained to avoid chocolate cues would consume less of a chocolate muffin in a taste test than participants trained to approach chocolate cues.

2. Method

2.1. Participants

Participants were 120 female Flinders University undergraduate students who took part for course credit or an honorarium. Only women were recruited because they have shown a higher tendency to overeat (Burton, Smit, & Lightowler, 2007) and greater incidence of food cravings than men (Weingarten & Elston, 1991). Participants ranged in age from 18 to 27 years ($M = 19.7$, $SD = 2.08$). All participants reported liking chocolate, and ate a mean of 1.53 chocolate bars ($SD = 1.43$) and 2.70 other chocolate containing items ($SD = 2.19$) per week. BMI of the sample ranged from 15.8 to 44.7 kg/m^2, with a mean of 23.0 ($SD = 4.22$). In the current sample, 65.8% of participants were of normal weight (18.5–25 kg/m^2), 19.2% were overweight (25–30 kg/m^2) and 5.8% were obese (>30 kg/m^2; WHO, 2014b). BMI did not correlate with approach bias scores at pre-training or post-training, neither for chocolate nor non-chocolate stimuli ($rs < .15$, all $ps > .05$).

As hunger can confound approach biases for food cues (Seibt, Häfner, & Deutsch, 2007), participants were instructed not to eat or drink anything other than water for two hours prior to the study. Most participants complied with this instruction, and the average time period since participants last ate was 2.63 h ($SD = .77$). Participants rated their current hunger levels on a 100 mm visual analogue scale ranging from '*not at all hungry*' to '*extremely hungry*'. Mean hunger ratings were around the midpoint of the scale ($M = 47.2$, $SD = 20.7$). Hunger ratings did not correlate with approach bias scores at pre-training or post-training, neither for chocolate nor non-chocolate stimuli ($-.05 \leq r \leq .03$, $ps > .05$). Further, hunger ratings did not correlate with consumption either separately for chocolate or blueberry muffins, nor combined ($rs < .16$, $ps > .05$).

2.2. Design

The study used a 2 (training condition: approach, avoid) x 2 (time: pre-training, post-training) mixed experimental design. Training condition was a between-subjects factor and time was a within-subjects factor. Participants were randomly allocated to the approach-chocolate ($n = 60$) or avoid-chocolate ($n = 60$) training conditions.

2.3. Materials

2.3.1. Approach-avoidance task: stimulus materials

Following Wiers, Rinck, Kordts, Houben, and Strack (2010), we