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Can attentional bias modification inoculate people to withstand exposure to real-world food cues?

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ABSTRACT

Two experiments investigated whether attentional bias modification can inoculate people to withstand exposure to real-world appetitive food cues, namely television advertisements for chocolate products. Using a modified dot probe task, undergraduate women were trained to direct their attention toward (attend) or away from (avoid) chocolate pictures. Experiment 1 (N = 178) consisted of one training session; Experiment 2 (N = 161) included 5 weekly sessions. Following training, participants viewed television advertisements of chocolate or control products. They then took part in a so-called taste test as a measure of chocolate consumption. Attentional bias for chocolate was measured before training and after viewing the advertisements, and in Experiment 2 also at 24-h and 1-week follow-up. In Experiment 2, but not Experiment 1, participants in the avoid condition showed a significant reduction in attentional bias for chocolate, regardless of whether they had been exposed to advertisements for chocolate or control products. However, this inoculation effect on attentional bias did not generalise to chocolate intake. Future research involving more extensive attentional re-training may be needed to ascertain whether the inoculation effect on attentional bias can extend to consumption, and thus help people withstand exposure to real-world palatable food cues.

A growing body of research has shown that people preferentially attend to palatable food cues in the environment. For example, a number of studies have reported an attentional bias for chocolate cues (Kemps & Tiggemann, 2009; Smeets, Roefs, & Jansen, 2009). These observations are consistent with both dual process models (Strack & Deutsch, 2004) and with Berridge's (2009) model of food reward. Dual process models emphasise automatic processing as a key driver of consumption (in addition to controlled processing). Automatic processing is fast, spontaneous and effortless, and drives behaviour without necessary conscious awareness. It includes an appraisal of an appetitive stimulus (e.g., a chocolate bar) in terms of its affective and motivational properties. That is, the stimulus automatically triggers affect laden associations, captures the individual's attention (attentional bias), and elicits a behavioural tendency to reach out and consume it. Within Berridge's (2009) model of food reward, palatable food cues "grab" attention, because of a learned association between such cues and the rewarding experience of eating. As a result of this reinforcement, palatable food cues become salient and attractive. Consequently, they automatically capture (i.e., bias) attention, which then guides behaviour toward food acquisition and consumption.

Accumulating evidence shows that attentional bias for palatable food cues can be modified. For example, using a modified dot probe task, Kemps, Tiggemann, Orr, and Grear (2014) showed that participants who were trained to direct their attention away from chocolate pictures ('avoid chocolate') showed a reduced attentional bias for such pictures, whereas participants who were trained to direct their attention toward these pictures ('attend chocolate') showed an increased bias. Using a modified anti-saccade task, Werthmann, Field, Roefs, Nederkoorn, and Jansen (2014) observed similar increases and decreases in attentional bias for chocolate. In addition, both Kemps et al. and Werthmann et al. found that participants who were trained to avoid chocolate pictures subsequently ate less of a chocolate food product than those who were trained to attend to such pictures. By contrast, Hardman, Rogers, Etchells, Houstoun, and Munafo (2013) found no effect of attentional re-training on cake intake, despite a trend for changes in attentional bias in the predicted direction.

The observed positive effects in these initial attentional bias modification studies are encouraging. However, if attentional bias

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modification is to have practical application, an important question is whether or not it can help people withstand exposure to real-world appetitive food cues. This is particularly important in the current food-rich environment where people are bombarded on a daily basis with palatable food cues, not only in shops, fast-food outlets, petrol stations and vending machines, but also through advertising on television, public transport, bill-boards and online.

Thus the aim of the present experiments was to investigate whether attentional bias modification can inoculate people to withstand exposure to real-world food cues. In particular, we examined whether the previously observed effects of attentional re-training on attentional bias for chocolate and chocolate intake are resistant to television advertisements for chocolate products. We specifically chose television advertising because it is a platform for food cue exposure with wide outreach (Alcorn, Buchanan, Smith, & Gregory, 2015). Despite the availability of other viewing platforms, many people still watch free to air television on a daily basis (Nielsen, OzTAM, & Regional TAM, 2016). Moreover, television food advertising has been shown to increase food intake (Halford, Gillespie, Brown, Pontin, & Dovey, 2004; Harris, Bargh, & Brownell, 2009), particularly in children (Boyland et al., 2016). We focused on one specific palatable food, namely chocolate, because it is a widely liked and consumed food product in Western culture, and one that is heavily marketed (Kelly et al., 2010).

In each of two experiments, we used a modified dot probe task to increase or decrease attentional bias for chocolate by directing attention either toward ('attend') or away ('avoid') from chocolate cues. Following the training, participants were exposed to a series of television advertisements for chocolate products or equally appealing non-food control products. Consumption of a chocolate product was measured by way of a taste test.

With regard to the 'attend' condition, based on previous attentional bias modification research in the food domain (Kemps et al., 2014; Werthmann et al., 2014), we predicted an increase in attentional bias for chocolate following attentional re-training. In addition, there is some recent evidence that exposure to television food advertisements can bias processing of food-related information using other tasks (e.g., word stem completion task; Kemps, Tiggemann, & Hollitt, 2014a). Accordingly, we expected that training attention toward chocolate cues and exposure to televised chocolate advertisements would have additive effects on attentional bias for chocolate and chocolate intake.

However, our main focus was on the 'avoid' condition. Specifically, if the inoculation procedure is successful, we would expect that participants who underwent avoidance training would show a reduction in attentional bias for chocolate, regardless of whether they viewed advertisements for chocolate or control products. Inoculation would further be evident from participants in the 'avoid' condition consuming relatively less of a chocolate product during the taste test than participants in the 'attend' condition, irrespective of which advertisements they viewed. Thus we tested the following two a priori hypotheses. First, we predicted that there would be a significant reduction in attentional bias for chocolate in the 'avoid' condition, even after exposure to television advertisements for chocolate products. Second, we predicted that participants in the 'avoid' condition would consume relatively less of a chocolate product than those in the 'attend' condition, even after exposure to television advertisements for chocolate products.

1. Experiment 1

1.1. Method

1.1.1. Participants

Participants were 178 female undergraduate students recruited from Flinders University, Adelaide, South Australia, via online and poster advertisements. We specifically restricted participation to women to preclude possible gender effects on attentional bias and consumption (Havermans, Giesen, Houben, & Jansen, 2011). Participants were between 18 and 25 years old ($M = 20.19$, $SD = 2.12$) and mostly of normal weight. Mean BMI was 23.20 kg/m^2 ($SD = 5.13$); 6.3% of the sample could be classified as underweight (BMI < 18.5 kg/m^2), 72.1% as normal weight (18.5–25 kg/m^2) and 21.6% as overweight (BMI > 25 kg/m^2). All participants reported that they liked chocolate, in response to the yes/no question "Do you like chocolate?", and consumed on average 1.53 ($SD = 1.48$) chocolate bars and 3.08 ($SD = 2.34$) chocolate-containing food items per week. Participants received course credit or an honorarium in lieu of their time and commitment.

1.1.2. Design

The experiment used a 2 (training condition: attend, avoid) × 2 (advertisement: chocolate, control) × 2 (time: pre-test, post-test) between-within subjects design. Participants were assigned to the training × advertisement conditions by way of randomised computer login codes. In this way, both participants and experimenter were blind to experimental conditions. Participant numbers for each of the training × advertisement conditions were: attend/chocolate ad (N = 45), attend/control ad (N = 45), avoid/chocolate ad (N = 44) and avoid/control ad (N = 44).

1.1.3. Materials

Dot probe stimuli. The stimuli for the modified dot probe task were 48 digital coloured photographs comprising 24 pictures of chocolate or chocolate-containing food items (e.g., chocolate bar, brownie) and 56 pictures of other palatable food items not containing chocolate (e.g., cake, pizza). We specifically chose other palatable foods as comparison stimuli to equate the palatability and motivational relevance of the two stimulus categories. All pictures were scaled to 120 mm in width, whilst maintaining the pictures' original aspect ratio. Two categories of picture pairs were constructed: 24 critical (chocolate – non-chocolate) and 16 control (non-chocolate – non-chocolate) pairs. Within each pair, pictures were matched as closely as possible for perceptual characteristics (brightness, complexity), as well as ratings of valence, arousal and category representativeness, obtained through pilot testing (Kemps et al., 2014). Two subsets of the 24 critical pairs were constructed, each consisting of 16 pairs made up of 8 common pairs and 8 unique pairs. Subsets were counterbalanced across participants and conditions. Another 14 picture pairs with no food related content (e.g., car, beach ball) were created for practice and buffer trials.

Advertisements. Two sets of five television advertisements were created. One set (chocolate condition) contained four advertisements for chocolate products (e.g., chocolate bar, chocolate biscuits) and one non-food product to reduce demand effects. The other set (control condition) contained five non-food advertisements (sunscreen, clothes, car, tissues, insurance). The advertisements were sourced from free-to-air commercial television channels.

The particular advertisements were selected on the basis of a pilot study. Twenty women viewed and rated 34 advertisements for chocolate and non-food products on likeability ("how much do you like the advertisement?") and food-relatedness ("how much does the advertisement relate to food?") on 10-point Likert scales ranging from 'not at all' to 'very much'. Four advertisements rated high on food-relatedness ($M = 9.36$, $SD = 0.63$) were matched for overall likeability to four advertisements rated low on food-relatedness ($M = 1.13$, $SD = 0.26$) to construct clearly separate sets of chocolate and control advertisements. Mean likeability ratings for the chocolate and control advertisements were 6.30 ($SD = 1.23$) and 6.55 ($SD = 1.38$), respectively, $t(6) = 0.27$, $p > 0.05$.