Appetite 105 (2016) 60–70

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Can evaluative conditioning decrease soft drink consumption?

Jena A. Shaw [a, *], Evan M. Forman [a], Hallie M. Espel [a], Meghan L. Butryn [a], James D. Herbert [a], Michael R. Lowe [a], Chantal Nederkoorn [b]

[a] Drexel University, 3141 Chestnut St., Department of Psychology, Philadelphia, PA, 19104, United States
[b] Maastricht University, Minderbroedersberg 4-6, 6211 LK, Maastricht, Netherlands

ARTICLE INFO

Article history:
Received 9 December 2015
Received in revised form
13 May 2016
Accepted 16 May 2016
Available online 18 May 2016

Keywords:
Evaluative conditioning
Implicit attitudes
Eating behavior
Soft drinks
Obesity

ABSTRACT

The present study examined the effect of a picture-picture evaluative conditioning (EC) procedure on soft drink (soda) outcomes, including negative implicit attitudes, consumption during a taste test, and real-world consumption reported during the week after the intervention. In the EC condition ($n = 43$), soda images were paired with disgust images and water images were paired with pleasant images, whereas in the control condition ($n = 41$), the same images were viewed without pairing. The EC condition showed a larger reduction in real-world soda consumption across the week following the intervention. However, individuals in the EC condition did not consume less soda during a taste test immediately following the intervention. EC only significantly increased negative implicit attitudes towards soda among individuals who already had relatively higher baseline negative attitudes. These findings generally favored the potential for EC to impact soda drinking habits, but suggest that a brief EC intervention may not be strong enough to change attitudes towards a well-known brand unless negative attitudes are already present.

Calorie-dense foods are easy to like – their sensory properties stimulate the brain's reward centers (e.g., Zhang, Balmadrid, & Kelley, 2003) and their consumption is frequently paired with positive affect both directly through consuming the foods while experiencing positive emotions and indirectly through advertising (e.g., Boyland & Halford, 2013). Not surprisingly, greater liking of calorie-dense foods is associated with consuming these foods more frequently (Raynor, Polley, Wing, & Jeffery, 2004). Dual process models suggest that the liking, or attitude, towards a stimulus (such as a calorie-dense food) and the resulting desire to approach or avoid that stimulus can be evaluated both consciously through explicit processes and unconsciously through implicit processes (Strack & Deutsch, 2004). Explicit processes, which can integrate information about short- and long-term goals to make approach decisions, are often at a disadvantage relative to implicit processes, which automatically prepare an individual to approach or avoid a stimulus based on implicitly-activated attitudes (Gawronski & Bodenhausen, 2006; Strack & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000). If an individual's explicit goals are incompatible with implicitly-activated behavioral impulses, the reflective system must inhibit the activated response, a process often referred to as exerting self-control, in order to achieve successful goal pursuit (Baumeister, Vohs, & Tice, 2007; Wilson et al., 2000).

Implicit attitude measures have been shown to directly predict both self-reported and observed food choices, even when controlling for explicit attitudes (Ayres, Conner, Prestwich, & Smith, 2012; Hollands, Prestwich, & Marteau, 2011). Further, implicit attitudes predict consumption more strongly in individuals with poor or depleted self-control (Friese, Hofmann, & Wanke, 2008; Haynes, Kemps, & Moffitt, 2015; Hofmann, Friese, & Roefs, 2009; Hofmann, Rauch, & Gawronski, 2007), and weight gain over time has been shown to be highest in those with both strong implicit preferences for calorie-dense foods and low self-control (Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010). Because self-control is resource-intensive and becomes weaker with repeated exertion (Baumeister et al., 2007; Muraven & Baumeister, 2000; Friese, Hofmann, & Schmitt, 2008), an individual's attempts to reduce consumption of calorie-dense foods that he or she evaluates positively will tend to fail over time. To facilitate successful dietary change, implicit attitudes themselves might instead be targeted to reduce the automatic tendency to approach these foods.

1. Altering implicit eating attitudes through evaluative conditioning

Evaluative Conditioning (EC) has been used to alter implicit

* Corresponding author. Present address: Perelman School of Medicine at the University of Pennsylvania, 3535 Market St., 3rd Floor, Philadelphia, PA, 19104, United States.
E-mail address: jenashaw@mail.med.upenn.edu (J.A. Shaw).

http://dx.doi.org/10.1016/j.appet.2016.05.016
0195-6663/

attitudes by repeatedly associating a stimulus (conditioned stimulus, CS) with stimuli that have an established affective valence (unconditioned stimulus, US). For example, images featuring a novel product (CS) might be repeatedly presented alongside images of positive stimuli such as smiling faces (US) to increase positive attitudes towards the new product. A recent meta-analysis including 214 studies found that the average effect of EC on implicit attitudes was medium in size ($d = 0.52$, 95% CI: 0.47–0.58), though it was smaller for familiar ($d = 0.20$) than for novel CSs ($d = 0.50$– 0.60; Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010).

Within this literature, studies investigating the impact of EC on eating and other health behaviors are relatively rare (Hollands et al., 2011), and the majority have focused on the acquisition of preferences for novel flavors, foods, and food brands. (e.g., Kerkhof, Vansteenwegen, Baeyens, & Hermans, 2009; Zellner, Rozin, Aron, & Kulish, 1983). Although helping people to acquire positive associations for novel foods might be beneficial to health in some cases, weight loss is most commonly achieved by modifying the frequency or quantities with which familiar foods are consumed. Therefore, in spite of the smaller effect sizes seen with other familiar CS stimuli, investigation of whether attitudes towards familiar foods can be altered by EC is most central to determining whether this procedure represents a viable intervention to support eating behavior change.

A small number of recent studies suggest that EC may be effective for changing implicit attitudes and consumption of familiar foods and beverages. A 2011 study by Hollands, Prestwich, and Marteau used EC to pair images of snack foods with images of aversive health consequences, and found that this procedure reduced implicit snack preferences relative to a no pairing control. In a subsequent reward choice, the EC intervention group was more likely to select fruit instead of snack foods. Two studies found EC to be effective for increasing negative alcohol attitudes in regular drinkers and demonstrated that individuals receiving the intervention consumed less alcohol during a taste test and across the week following the intervention relative to a control condition (Houben, Havermans, & Wiers, 2010; Houben, Schoenmakers, & Wiers, 2010).

However, the conclusions of other studies investigating the effects of EC on consumption have been less definitive. A study investigating the effect of EC on relative preferences for Coke or Pepsi was only able to produce change in implicit attitudes towards the soda brands among individuals whose initial implicit preferences were neutral. A follow-up experiment that recruited individuals with neutral brand attitudes found that EC only predicted reward choice between Coke and Pepsi under cognitive load (Gibson, 2008).

A 2011 study by Lebens et al. used EC to pair snack food and fruit images with negatively and positively valenced body images, respectively. Compared to a random pairing control condition, the EC intervention lowered positive implicit attitudes towards snack foods. However, calories from snack and fruit selections in a subsequent virtual shopping task did not differ by condition. The null effects on this behavioral measure may have been attributable to the appropriateness of the virtual supermarket task to measuring change in the intended items. The availability of a large number of options not related to the conditioning trial, as well as the instruction to purchase enough food for an entire day within a small budget, may have obscured the ability to examine differences in selection of the target foods. Only 10.7% of calories from the foods selected by participants came from either of the targeted food groups (snacks or fruits). However, since few studies have investigated the effect of EC on food choices, it is difficult to determine whether the lack of behavioral effects is attributable to the type of measure used or should be considered a true null finding.

Overall, these findings suggest that EC has the potential to alter attitudes towards familiar foods and beverages. However, because only a small number of studies have been conducted, it is difficult to determine whether the presence of null findings for behavioral outcomes suggests that EC's effect on behavior is unreliable or merely reflects differences in study procedures. Only two studies investigated whether EC can influence behavior beyond the time of the intervention (Houben, Havermans, et al., 2010; Houben, Schoenmakers, et al., 2010), which is essential to determining whether EC might facilitate long-term behavior change. Both studies used retrospective recall methods, so it is not possible to determine whether the intervention influenced reporting accuracy or actual consumption.

In addition, previous studies have examined the short-term effect of EC on the tendency to select the target food/beverage and the frequency with which that food/beverage is reported to be consumed across the follow-up period. No studies have measured whether altering attitudes towards a food or beverage affects the amount consumed when the food/beverage is tasted, which could affect intake above and beyond the tendency to select that food. For example, when consuming a food/beverage that has been paired with negative stimuli, individuals might consume less than if they had not experienced such a pairing. However, it is also possible that existing associations with the food/beverage's taste would override the newly conditioned attitudes. This is therefore an important outcome for investigating the extent of the potential impact of EC on consumption.

2. The current study

The current study sought to replicate findings demonstrating the effect of EC on implicit attitudes and short-term behavior. We also sought to extend previous research by measuring the impact of EC on real-world consumption across a one-week follow-up period using a momentary reporting method that would be less vulnerable to retrospective reporting biases, and by measuring amount consumed during both short- and long-term behavioral measures to be able to more accurately determine the size of EC's impact on dietary intake. Non-diet, sugar-sweetened soft drinks ("soda") were selected as the intervention target because their consumption is associated with increased calorie intake, weight gain and obesity (Couch, 2011; Hu, 2013; Vartanian, Schwartz, & Brownell, 2007). Soda is consumed regularly by approximately half of the U.S. population (Gallup Polling, 2012), which suggests that an intervention that reduces soda consumption could have widespread benefits.

This study compared an EC intervention in which images of soda and water were paired with negative and positive images, respectively, with a control condition in which the same images were presented without pairing. Negative images evoking disgust were selected because previous research suggested that this emotional component increases the effectiveness of EC for appetitive stimuli (Olatunji, Forsyth, & Cherian, 2007; Verwijmeren, Karremans, Stroebe, & Wigboldus, 2012).

We hypothesized that participants in the EC condition would consume less soda than the control during a mock taste-test immediately following the intervention and across the week following the intervention. We also predicted that participants in the EC intervention condition would have more negative implicit attitudes towards soda following EC. As seen in Hollands et al. (2011), we expected that individuals who had stronger negative baseline implicit attitudes towards soda would be less affected by the intervention because they would have less room for attitude change. Because previous research had shown that explicit attitudes are less affected by EC (Gawronski & LeBel, 2008; Hollands