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No effects of explicit approach-avoidance training on immediate consumption of soft drinks☆

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ABSTRACT

Four experiments (n = 300) examined motivational effects of approach-avoiding training (AAT) procedures on consumption of sugary soft drinks, implicit preferences and explicit preferences. Experiments varied in the number of training trials, the implementation of approach-avoidance goals during the training, and the frequency and timing of the consumption measure. AAT had no effects on any measure, and Bayesian analyses provided substantial evidence for a null model of AAT effects. A manipulation check showed that AAT affected behavioral tendencies towards the drinks in line with the training procedure (Experiment 3). It is concluded that explicit training of approach and avoidance reactions to soft drinks is not an effective procedure to modify immediate consumption of that drinks. Possible reasons and differences to previous AAT studies are discussed.

1. Introduction

Obesity and related health problems such as diabetes are widely acknowledged as a prevalent and rising health risk in Western (Ogden, Carroll, Kit, & Flegal, 2014). Although many factors contribute to this rising tide, increasing consumption of sweetened soft drinks has been identified as an important contributor to negative health outcomes (Mensink et al., 2018; Vartanian, Schwartz, & Brownell, 2007). Even though the health risks are established, campaigns to change people's attitudes and behavior towards soft drinks via education and thereby mitigate some of their negative effects have shown limited success (Block, Chandra, McManus, & Willett, 2010). Therefore, other, more effective motivational interventions are needed to address this issue.

In recent years, psychologists have invented new computerized interventions that aim to change automatic or implicit motivational processes involved in consumptive behaviors (Wiers, Gladwin, Hofmann, Salemink, & Ridderinkhof, 2013). These new interventions are here collectively referred to as *approach-avoidance training* (AAT), because they seek to modify motivational action tendencies by a retraining of approach- and avoidance-related behavioral responses. The rationale of AAT is that approach-avoidance tendencies can be changed with the repeated execution of a behavior that is congruent or incongruent with a motivational tendency to approach and avoid. The training procedure has its precursor in attention bias modification (ABM), which modifies covert attentional processes by directing attention repeatedly towards and/or away from specific stimuli (Hakamata et al., 2010; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). In contrast to ABM, however, AAT aims to change overt approach and avoidance responses and the motivational processes that energize these responses.

Most AAT studies have used movements of a joystick lever for a retraining of approach-avoidance tendencies. Most procedures assert that pulling a lever towards the body is associated with an approach motivation, while pushing a lever away from oneself is associated with avoidance (Eder & Rothermund, 2008). Executing a lever push or pull in response to a specific stimulus activates the associated motivational orientation, and through this link, a motivation to approach or avoid the stimulus. After sufficient training, the stimulus becomes associated with the motivational orientation that was activated by the trained response.

Consistent with this theorizing, many studies obtained evidence that a training of approach- and avoidance-related action tendencies can affect social (e.g., Kawakami, Phills, Steele, & Dovidio, 2007), emotional (e.g., Amir, Kuckertz, & Najmi, 2013), and consumptive outcomes (e.g., Schumacher, Kemps, & Tiggemann, 2016). For instance, in one study participants sorted words that were related to the category “healthy” (e.g., apple, yogurt) with a lever pull (an approach movement) and words related to the category “tasty” (e.g., cookie, fries) with

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a lever push (an avoidance movement). When participants approached healthy items and avoided tasty items during the sorting task, they subsequently chose more frequently healthy than fatty food when given a choice than a comparison group with the reversed movement assignment (Fishbach & Shah, 2006).

Most impressively, AAT was shown to affect consumptive behaviors involved in alcohol addiction. A seminal study (Wiers, Rinck, Kordts, Houben, & Strack, 2010) trained 42 hazardous drinkers to avoid alcohol-related pictures with a lever push and to approach soft drinks with a lever pull. Results showed less actual beer consumption in a subsequent test-and-rate task among the participants trained to avoid alcohol as compared with controls who were trained to approach alcohol. However, this effect only showed up in a subsample of heavy drinkers for which the AAT procedure proved effective. A subsequent study used a similar training procedure for a treatment of a clinical sample of 214 alcoholic inpatients (Wiers, Eberl, Rinck, Becker, & Lindenmeyer, 2011). Training the patients to avoid alcohol pictures and to approach picture in four training sessions changed alcohol-approach associations (as indexed with an Implicit Association Test) and reduced self-reported subjective craving relative to control conditions with no or sham training (with no contingency between alcohol pictures and lever responses). Notably, patients in the training group showed 13% less relapse one year after the treatment, suggesting that AAT procedures can have a long-lasting effect on consumptive behaviors. Eberl et al. (2013) replicated this finding with a different clinical sample (475 alcohol-dependent patients) and obtained evidence from a moderation analysis that the training effect on the treatment outcome was mediated by a change in the approach bias elicited by the alcohol stimuli (but see also Snelleman, Schoenmakers Tim, & Mheen, 2015). Note, however, that the alcoholic inpatients in these studies received additional therapy; the finding of a long-lasting effect must hence be interpreted with some caution. Sharbanee and colleagues (2014) examined the mechanisms underlying effects of AAT procedures on alcohol consumption using a sample of 74 undergraduate social drinkers. Specifically, they examined whether an effect of AAT procedures on alcohol consumption was mediated by a change in action tendencies (indexed by an approach-avoidance movement task with no contingency between alcohol content and lever movements) or by changes in selective attention to alcoholic beverages (measured with a selective attention task). For instance, participants could have learned to better ignore alcohol-related stimuli during the training phase relative to a control group with no training. Results showed that participants consumed less beer in a test-and-rate task following a training to avoid alcohol relative to an approach training. Importantly, this effect was mediated by a training-induced change in action tendencies, while changes in selective attention had no effect. These results fit with the idea that alcohol AAT procedures diminish beer consumption by a reduction of a habitual approach bias to alcohol (Wiers et al., 2013). However, other studies found no relationship to an alcohol-approach bias (Janssen, Larsen, Vollebergh, & Wiers, 2015; van Hemel-Ruiter, de Jong, & Wiers, 2011) and one study with alcohol-dependent patients found even less relapse when there was a strong alcohol-approach bias (Spruyt et al., 2013). Thus, the relationship between behavioral measures of an approach bias to alcohol-related stimuli and alcohol intake is not clear.

Additional research suggest that AAT procedures can also influence preferences towards non-alcoholic beverages. Participants in one study (Zogmaister, Perugini, & Richetin, 2016) played a video game in which they repeatedly approached one of two juices by dragging it towards themselves with a corresponding movement of the computer mouse (involving an arm flexion), while avoiding the other. Both beverages were novel and thus not known by the participants. Following sufficient training, there was more implicit liking of the approached drink (measured with an IAT), which increased with the measured participants' thirst. There was also a corresponding change in explicit preference ratings but, curiously, this effect was negatively related to participants' thirst. In sum, this research shows that AAT procedures can also change preference towards novel drinks in implicit and explicit preference tests. Note, however, that this research did not include a consumption test of the drinks.

Considering the demonstrated impact of AAT on clinically relevant addiction behavior towards alcoholic soft drinks and the research showing potential effects on soft drink consumption in general, AAT procedures seem to offer a powerful tool to reduce sugary drink consumption and its health consequences which circumvents issues with traditional educational campaigns. Therefore, research is required that provides direct evidence that AAT can affect the consumption of unhealthy drinks.

2. The present research

The aim of the present research was to demonstrate effects of AAT procedures on consumption of sugary soft drinks. Participants were recruited for consumer research in which they were to test-and-rate two lemonades. The training task was to approach one of two colored lemonades with a lever pull and to avoid the other with a lever push. After sufficient training, they were given an opportunity to taste both lemonades. This consumption test was our main outcome measure. However, we also included explicit and implicit preference measures of the lemonades. In line with the research reviewed above, we hypothesized that participants would consume less of the lemonade that was repeatedly avoided during the training (the avoided drink) relative to the lemonade that was repeatedly approached during the training (the approached drink). We also expected that the avoided drinks would be liked less in an implicit measure (affective priming task) and in an explicit measure (preference rating). Note that a direct within-subject comparison of an approach condition with an avoidance condition should maximize effect sizes in comparison to other control conditions (e.g., a sham training). Furthermore, the potential for problematic confounding variables (such as systematic differences in prior food experiences or drinking habits) is strongly reduced in a design that compares two sugary lemonades as targets for AAT. We therefore planned with sample sizes to have sufficient statistical power for the detection of a medium-sized training effect and stronger. Such an effect size would be consistent with the use of AAT protocols for clinical intervention and applied settings, as it is unlikely that smaller effects would have a measurable impact on outcomes under such circumstances (Wiers et al., 2013).

3. Experiment 1

Participants were trained to repeatedly approach one lemonade and to avoid the other lemonade based on their color. Task instructions for the training were to respond to a glass filled with red or yellow lemonade by either pulling a joystick lever towards the body (approach) or away from the body (avoidance). A zooming effect (i.e., drawing the lemonade closer or far away on the screen) was not introduced as response effect because a previous study suggested that visually approaching stimuli are appraised less positively (or more negatively) relative to receding or static stimuli (Hsee, Tu, Lu, & Ruan, 2014). However, we randomly mixed in response trials in which participants had to respond to the words ‘towards’ and ‘away’ with a corresponding lever movement. This intermixing was highly effective in previous research to disambiguate the reference point (here: the participant's body) and the approach-versus avoidance-related meanings of the action (Eder & Rothermund, 2008). Following the training, participants were asked to taste both lemonades. Then, implicit and explicit liking measures were presented in counterbalanced order.

3.1. Method

3.1.1. Participants

A total of 65 volunteers (49 female, M_{age} = 27.5, SD = 8.9) from the