

Generalization of Evaluative Conditioning toward Foods:
Increasing Sensitivity to Health in Eating Intentions

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Abstract

Objective: Evaluative conditioning (EC), the pairing of objects (conditioned stimuli, CS) with positive and negative unconditioned stimuli (US) in order to induce attitude change, has proven to be a viable method of changing attitudes towards foods and corresponding eating behaviors. Positively conditioning healthy foods and negatively conditioning unhealthy foods should result in healthier food choices. Of interest currently is the extent to which EC can generalize beyond the conditioned foods to entire dimensions underlying food judgment, such as health and taste.

Methods: The current research included two EC experiments configured in accord with the Implicit Misattribution Model (IMM; Jones, Fazio, & Olson, 2009). Four healthy CS foods were paired with positive US and four unhealthy CS foods were paired with negative US. Participants then reported eating intentions for a variety of foods, including non-CS foods. **Results:** Experiment 1 demonstrated that conditioning a few exemplar food items increased sensitivity to health and decreased sensitivity to taste when judging a variety of additional foods. Experiment 2 replicated the generalization effect with regard to health sensitivity, but only when a task that preceded the EC procedure promoted, rather than interfered with, categorization of the CS foods by health. **Conclusions:** This research shows that EC can generalize to an entire dimension underlying food judgment and that this effect is facilitated by accessibility of the health dimension at the time of exposure to the EC pairings.

Keywords: evaluative conditioning, attitudes, food, diet, generalization

Obesity rates have steadily climbed. While many factors play a role, one clearly is overconsumption of unhealthy foods. Thus, researchers have examined ways to modify the consumption of healthy versus unhealthy foods (e.g., Michie, Abraham, Whittington, & McAteer, 2009). Because attitudes can influence behavior (e.g., Ajzen, 1991), attitude change may encourage healthy food choices. One relevant approach is evaluative conditioning (EC), which pairs a conditioned stimulus (CS) with an unconditioned stimulus (US) that has a positive or negative evaluation (see Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010 for a review). When the CS appears repeatedly with US, the valence associated with the US becomes associated with the CS. Food EC pairs healthy food that is to be positively conditioned (CS+) with positive stimuli (US+) and unhealthy food that is to be negatively conditioned (CS-) with negative stimuli (US-). The resulting attitude change promotes choosing the healthy food over the unhealthy food. This idea is not new. Pairing obese bodies or poor health outcomes with foods changed explicitly measured evaluations (e.g., Lascelles, Field, & Davey, 2003), as well as implicitly measured evaluations and behaviors regarding the foods (e.g., Hollands, Prestwich, & Marteau, 2011; Lebens et al., 2011). Despite this success, past food EC research has an important shortcoming. These studies have focused only on the specific CS foods involved in the EC procedure. The present experiments examine whether EC effects generalize beyond the CS to other foods and the underlying mechanism for such generalization.

Recently, understanding of EC has progressed significantly. Attitude formation or change via EC can occur through multiple mechanisms (Jones, Olson, & Fazio, 2010; Sweldens, van Osselaer, & Janiszewski, 2010), depending on particular experimental paradigms. One mechanism is signal-learning, which requires explicitly learning that the CS predicts the US occurrence (e.g., Lovibond & Shanks, 2002). Such learning can lead to propositional beliefs that

the CS shares the US's valence. Another mechanism does not involve explicit learning; instead, valence transfer occurs via implicit misattribution of the evaluation evoked by the US to simultaneously presented CS (Hütter & Sweldens, 2013; Jones, Fazio, & Olson, 2009).

The present research draws from this latter perspective and the Implicit Misattribution Model (IMM) in particular (Jones et al., 2009), which posits that EC can occur when people implicitly misattribute the attitude that actually emanated from the US as having come from the CS. The greater the source confusability, or likelihood of mistaking the CS as the source of the evaluation, the more likely EC will occur. Various features of the EC procedure (Olson and Fazio, 2001) are critical to implicit misattribution. The CS and US appear simultaneously in a context that avoids drawing attention to the pairings themselves. Participants respond to specific targets in a stream of non-rhythmically presented visual stimuli in which the pairings are embedded. The procedure uses multiple US for each CS and each US appears only once, also minimizing contingency awareness. Additional features encourage source confusion. For example, Jones et al. (2009) found that alternately flashing the CS and US on the screen during a pairing produced stronger EC effects than when they remained constant, due to eye gaze shifts that promoted source confusion.

As noted earlier, one important shortcoming of past food EC research is the specificity of the outcomes. The dependent measures have focused on the CS foods themselves. Might EC of a few food exemplars affect people's attitudes and likelihood of eating a large variety of foods?

Experiment 1

Method

Participants. 168 undergraduates (98 women) participated for partial course credit.

Procedure. This experiment used the “Video Surveillance” procedure developed by Olson and Fazio (2001) and revised by Jones et al. (2009). Participants were told that the study was supposedly about attention and rapid responding. They were to be vigilant for two target foods, chicken pot pie and crackers, responding by hitting the space bar. The targets, in picture or word form, and additional foods that were supposedly “distractor” stimuli were presented in a non-rhythmical fashion either singly or in pairs. Key CS-US pairs were embedded in this visual stream. The CS, selected from a pre-tested set (Young & Fazio, 2013), were foods normatively rated as either high in taste and low in health or low in taste and high in health. Four healthy CS+ foods appeared in word form (grapefruit, cauliflower, shredded wheat, yogurt) paired with US+; four unhealthy CS- food words (pizza, fried chicken, cheeseburger, cheesecake) appeared with US- (see the Supplemental Materials for the complete list of US). Each of the healthy (unhealthy) CS words appeared 5 times during the task, with a different US+ (US-) each time. The CS and US flashed back and forth, appearing briefly in an alternating fashion. Stimuli in some filler trials flashed similarly. Participants were assigned to either the EC condition with CS-US pairings or a control condition in which CS and US appeared equally often but singly.

Measures. After EC, participants rated the likelihood that they would eat an offered serving of each of 42 foods from -5 to +5 (very unlikely to very likely), including the 8 CS foods and 34 novel foods that they had not seen during EC. Normative ratings of the perceived healthiness and tastiness of each food were available from Young and Fazio (2013); see the Supplemental Materials for a complete list. For exploratory purposes, participants completed several subscales of the Food Choice Questionnaire (FCQ, Steptoe, Pollard, & Wardle, 1995); see Supplemental Materials for results. Participants then completed questions assessing their

contingency awareness (i.e., how aware they were of CS-US pairings). Contingency awareness was minimal; see the Supplemental Materials for detailed information and analyses.

Results and Discussion

Ratings for the 4 healthy and 4 unhealthy CS foods were averaged and subjected to a mixed-design analysis of variance with CS type (healthy, unhealthy) as a within-subjects factor and condition (control, EC) as a between-subjects factor. The analysis revealed a significant main effect of CS type, $F(1, 166) = 65.95$, $MSE = 4.79$, $p < .001$, $\eta_G^2 = .179$, and a significant interaction between CS type and condition, $F(1,166) = 6.26$, $MSE = 4.79$, $p = .01$, $\eta_G^2 = .020$. Control participants preferred tasty/unhealthy CS- ($M = 2.64$, $SD = 1.96$) over the healthy/less tasty CS+ ($M = 0.11$, $SD = 2.08$). Among EC participants, this preference for unhealthy/tasty CS- ($M = 2.04$, $SD = 2.40$) over healthy/untasty CS+ ($M = 0.70$, $SD = 1.87$) was reduced.

Participants' eating intentions regarding the 34 non-CS foods, the generalization measure, were examined in relation to the foods' normatively perceived healthiness and tastiness. Ratings were participant-centered. Hierarchical linear modeling (HLM) was used to examine how sensitive participants were to the health and taste dimensions in rating eating intentions. The two-level HLM analyses involved 5712 observations (168 participants) nested in 34 foods (see Supplemental Materials for details). Participants' eating intentions for the foods were significantly predicted by both tastiness ($\gamma_{01} = 0.77$, $t(31) = 13.56$, $p < .001$) and healthiness ($\gamma_{02} = 0.10$, $t(31) = 4.65$, $p < .001$). However, significant cross-level interactions between condition and normative tastiness and between condition and normative healthiness showed that EC participants' ratings corresponded to tastiness less ($\gamma_{11} = -0.12$, $t(5675) = 2.32$, $p = .02$) and healthiness more ($\gamma_{12} = 0.10$, $t(5675) = 2.28$, $p < .001$), compared to control participants (see Figure 1). Thus, EC led participants to be less sensitive to taste and more sensitive to health in

their eating intentions. To the authors' knowledge, this is the first EC study to demonstrate generalization from specific CS to entire dimensions underlying a class of attitude objects.

Why might the effects of EC in Experiment 1 have generalized beyond the specific CS foods from the surveillance procedure? Some participants may have implicitly categorized the CS foods by health, construing each CS+ as "healthy food" and each CS- as "unhealthy food." Each pairing of US+ with "healthy food" and US- with "unhealthy food" would shift attitudes towards the entire categories of healthy and unhealthy foods, promoting EC generalization.

Experiment 2

People's likelihood of categorizing foods by healthiness may vary as a function, not only of the chronic accessibility of healthiness, but also its acute accessibility. Thus, promoting the construal of the CS in terms of healthiness may facilitate generalization. Each CS+ presentation would represent a pairing of the category "healthy food" with positivity, and vice versa with CS-. Moreover, as predicted by the IMM (Jones et al., 2009), when a tasty but unhealthy CS- food (e.g., pizza) is paired with a US-, source confusability should be greater if the food is thought of as unhealthy rather than tasty because this construal more easily allows for misattribution of the negativity evoked by the US- to the CS-. Thus, construing food by health should enhance source confusion and promote implicit misattribution, leading to stronger EC and more generalization.

To test this reasoning, Experiment 2 included a task designed to create a mindset that would encourage or discourage categorization of the CS foods by healthiness (see Olson, Kendrick, & Fazio, 2009, for a similar manipulation in an EC context). The hypothesis was that EC generalization would be more evident when categorization by health is promoted.

Method

Participants. 92 undergraduates (30 women) participated for partial course credit.

Procedure. As part of a 2 x 2 (task x EC) design, participants first completed a task in which they pressed keys to quickly categorize foods. In the mealtime control task, participants categorized foods by whether they were breakfast or dinner foods. In the health task, participants categorized foods as healthy or unhealthy. Foods appeared as labels (e.g., “banana”); they included healthy CS+, unhealthy CS-, and a set of fillers, none of which were the foods comprising the dependent measure. Participants then completed video surveillance and the same measures as in Experiment 1.

Results and Discussion

CS eating intentions were analyzed with a mixed-design ANOVA with CS food type (healthy, unhealthy) as a within-subjects factor and task type (mealtime, healthiness) and EC (control, EC) as between-subjects factors. This analysis revealed a marginally significant 3-way interaction among food type, task type, and EC, $F(1,88) = 2.86$, $MSE = 5.25$, $p = .10$, $\eta_G^2 = .018$ (see the Supplemental Materials for a figure). The preference for unhealthy CS over healthy CS was significantly smaller for EC participants (compared to control participants) if they had categorized foods by health, $F(1,88) = 4.22$, $MSE = 10.49$, $p = .04$, $\eta_P^2 = .046$, but not if they had categorized foods by mealtime, $F(1,88) = .101$, $MSE = 10.49$, $p = .75$, $\eta_P^2 = .001$.

HLM was used to examine how eating intentions regarding the non-CS foods related to the foods' normatively perceived tastiness and healthiness. The two-level HLM analyses involved 3128 observations (92 participants) nested in 34 foods. Participants' ratings were significantly predicted by tastiness ($\gamma_{01} = 0.65$, $t(31) = 10.44$, $p < .001$) and marginally predicted by healthiness ($\gamma_{02} = 0.06$, $t(31) = 1.98$, $p = .06$). As expected, there was a significant 3-way task x EC x healthiness interaction ($\gamma_{32} = 0.44$, $t(3085) = 7.20$, $p < .001$; see Figure 1). To decompose this interaction, health task and mealtime task participants were analyzed in separate HLMs. EC,

relative to the control, accentuated correspondence between eating intentions and healthiness for those who had categorized foods by health ($\gamma_{12} = 0.30$, $t(1493) = 7.66$, $p < .001$), but not for those who had categorized foods by mealtime.¹ See the Supplemental Materials for details. This study replicated Experiment 1's EC effects on CS foods, but only among those who had categorized foods by health. More interestingly, this experiment also replicated the generalization effects, in that same condition.

General Discussion

The current research demonstrates that EC effects can generalize to entire dimensions underlying evaluative judgment and behavioral intentions, provided that those dimensions are salient and form a basis for construal of the CS during EC. The IMM suggests that source confusion was the likely mechanism for EC to affect CS ratings. As for generalization, if participants had construed each CS+ as "healthy food" and each CS- as "unhealthy food," each US-CS pair also conditioned those food categories, accounting for the effects on other foods. This research supports the Implicit Misattribution Model and provides evidence that evaluative conditioning is a promising method of facilitating healthier diets by increasing people's sensitivity to health in their food choices. Though previous studies have demonstrated EC effects on attitudes and behaviors regarding the CS foods, this research is the first to show generalization effects beyond those CS. It establishes important boundary conditions for when this procedure would be more or less effective and, by doing so, illuminates the likely mechanism responsible for generalization. Future research may develop EC into an intervention that facilitates the fulfillment of healthy diet goals.

¹ Another experiment conducted by the authors provided converging evidence for these results using a manipulation that required consideration of health or mealtime categories at the time of the EC video surveillance task rather than prior to EC. Participants were asked to keep a running mental tally of the number of healthy and unhealthy (or breakfast and dinner) foods that appeared during each of the five blocks, reporting their counts at the end of each block. EC led to stronger generalization effects in the health condition than in the mealtime condition.

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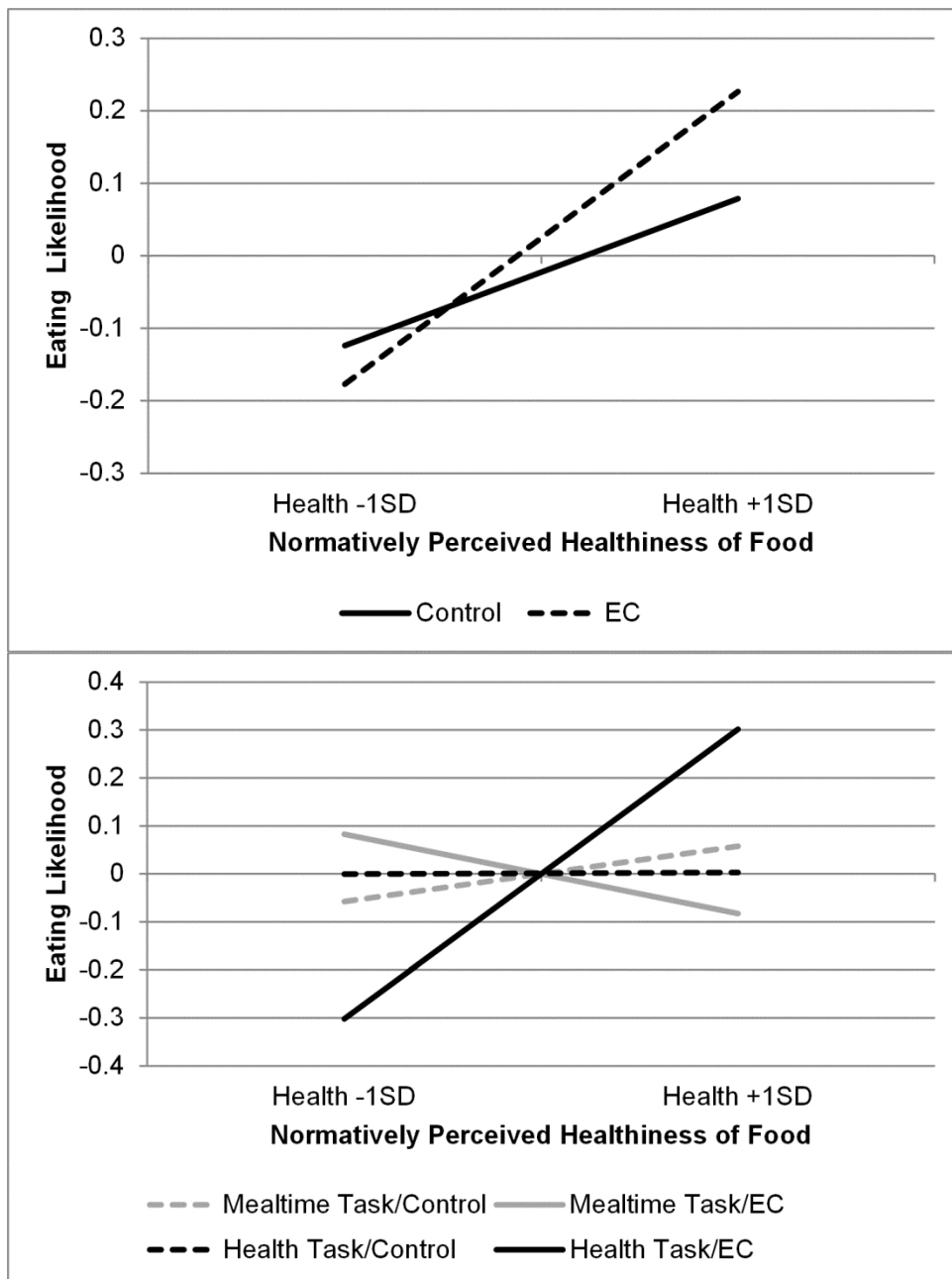


Figure 1. Predicted eating intentions regarding foods of varying healthiness among participants in Experiment 1 (top panel) and 2 (bottom panel), based on HLM coefficient terms. Eating likelihood ratings are participant-centered.