Implications of the Implicit Misattribution Model for the Evaluative Conditioning of
Attitudes towards Spiders

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Arts in the
Graduate School of The Ohio State University

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2013

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Abstract

Evaluative conditioning (EC) involves developing or changing attitudes, i.e. evaluations

of objects, by the mere pairing of a target object with other objects of a given valence.

Our aim is to better understand evaluative conditioning and its underlying mechanisms so

as to develop applications for changing negative attitudes. One mechanism by which

evaluative conditioning is known to work, implicit misattribution, posits that evaluations

of the unconditioned stimulus (US) are mistakenly viewed as having been evoked by the

conditioned stimulus (CS) when they are paired together. The experiment examined

conditions under which evaluative conditioning regarding spiders might be effective and

ineffective from the perspective of the implicit misattribution model. An EC procedure

paired spider images with positive pictures and words. However, inducing implicit

misattribution was likely to be difficult, due to generally strong negative attitudes toward

spiders. That is, the source of the positive evaluation would obviously not be the spider.

To promote source confusion, the CS in one condition were spider images that were

previously rated as relatively more appealing. Comparison conditions included one in

which CS were relatively unappealing spider images and a control condition in which no

US-CS pairs appeared. 130 undergraduates participated for course credit. The main

dependent variable of interest was pleasantness ratings of photos of spiders. Regression

analyses examined main effects and interactions between condition and scores on a

commonly-employed questionnaire assessing Fear of Spiders. More positive attitude

change occurred in more-pleasant spider condition than in the condition involving less-pleasant spider images or the control condition. However, this effect was moderated such that only participants with lower fear of spiders showed attitude change relative to control. The effect also was observed for ratings of new spiders not previously seen during the EC procedure, indicating that generalization of attitudes occurred beyond CS spiders. The less-pleasant spider condition did not change attitudes relative to the control condition. Results support the implicit misattribution model and suggest strategies for promoting attitude change via evaluative conditioning in diverse applications, but also reveal potential limitations of the procedure. Individual differences in previously-held attitudes can affect the success of attitude change via EC due to their impact upon source confusion. To be effective, the EC procedure must promote source confusion and, hence, implicit misattribution.

Acknowledgments

I would like to thank my advisor Russell Fazio for his guidance and input in all of my

research. I would also like to thank the members of the Attitudes and Social Cognition

Lab and the Group for Attitudes and Persuasion at OSU for their insights, suggestions,

and support.

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Fields of Study

Major Field: Psychology

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Introduction

Attitudes, or how we evaluate things, are a fundamental part of how we navigate

our worlds. An attitude is an association between an object and its evaluation (e.g. good

or bad, like or dislike) and can be strong enough that it is activated automatically from

memory when an individual encounters that object (Fazio, 2001). Evaluation is so

essential to how we perceive things that it can happen instantaneously, without conscious

effort or control. Attitudes influence how we perceive objects, ideas, and people, and

importantly can predict behavior towards these things (e.g., Azjen & Fishbein, 1980).

People generally approach things they like and avoid things they do not like. They

engage in activities and behaviors they like and avoid those they dislike.

Attitudes can form in a variety of ways, including evaluative conditioning. In

evaluative conditioning (EC), an object (conditioned stimulus, or CS) is paired repeatedly

with another object with a positive or negative evaluation (unconditioned stimulus, or

US). The evaluation originally associated with the US also becomes associated with the

CS. In other words, an attitude can transfer from one object to another. One classic

demonstration of evaluative conditioning includes the change in evaluation of written CS

country names (e.g. Swedish, Dutch) by pairing them systematically with aurally-

presented positive and negative US words (e.g. gift, happy for positive; bitter, ugly for

negative) (Staats & Staats, 1958). Another early demonstration involved pairing the

onset of an electric shock (negative US) and offset of an electric shock (positive US) with the words "light" and "dark" (positive and negative CS, counterbalanced) (Zanna, Kiesler, & Pilkonis, 1970). EC can happen when a specific US is paired with a specific CS consistently and repeatedly, just as in Zanna et al. (1970), and cause attitude change through a signal-learning fashion. A traditional signal-learning mechanism, reminiscent of Pavlov's classical conditioning, indicates that the presence of the CS predicts the occurrence the specific US with which it was paired (Rescorla, 1988), which in turn generates a specific evaluative response (Cacioppo, Marshall-Goodell, Tassinary, & Petty, 1992). EC can also occur when multiple US of similar valence (all positive or all negative) are paired with a particular CS, as in the Staats and Staats (1958) research. Indeed, multiple similarly-valenced US can be paired only once each with one specific CS and still result in attitude formation (Olson & Fazio, 2001). When this multiple-US EC occurs, it may occur independently of conscious signal-learning, because little opportunity exists for awareness of a single specific US-CS connection to happen. Thus, seeing a CS may directly activate its evaluation, independently of any activation of the US itself.

More generally, evaluative conditioning has thus been shown to work through multiple mechanisms, primarily propositional or primarily associative in nature. Propositional processes refer to a signal-learning mechanism, in which the CS comes to predict the US, which in turn activates the attitude through the expectation of the US. Propositional processes work through an "if-then" relationship, such that if a CS is present, then the US can be expected as well. One potential interpretive issue that can

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arise with signal-learning EC paradigms is that they are likely to produce contingency awareness of the US-CS pairing and, hence, may generate demand characteristics during the report of evaluation. Participants may notice a particular paired relationship and infer that they should respond more positively or negatively to a given CS. Associative processes act by creating links among different objects, concepts, and evaluations in memory. Upon encounter with a CS, associative processes can lead to activation of a US and its evaluation, due to their associative links in memory, but they can also lead evaluations to be directly linked to the CS, without requiring a link to a specific US (Gawronski & Bodenhausen, 2006). Associative processes can occur automatically and without conscious awareness, which makes them distinct from propositional processes and a classical conditioning signal-learning mechanism. More specifically, an associative process that ties a CS directly to an evaluation without the concurrent activation of a US suggests that a mechanism other than signal-learning is at work.

One evaluative conditioning paradigm developed by Olson and Fazio (2001) minimizes signal-learning and demand characteristics by making US-CS pairings more subtle and more likely to be learned implicitly. In this "Surveillance" paradigm, participants are given the role of being attentive and vigilant to particular targets that appear periodically. Supposed "distracter" stimuli appear throughout, including key US-CS pairings and filler items. Participants therefore see evaluative conditioning pairs, but in a manner that encourages implicit associative learning rather than explicit propositional learning. Another key aspect is that each particular positive or negative US only appears once, such that each particular CS appears with a series of unique USs of

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the same valence. Because each CS appears with multiple US and because participants have an assigned task of remaining vigilant for the appearance of specific target stimuli in the visual stream to which they are exposed, the likelihood of contingency awareness and propositional/signal-learning is substantially reduced.

Jones, Fazio, and Olson (2009) proposed an implicit misattribution model as a way to explain evaluative conditioning effects with an association approach. In this model, the evaluative response that is originally evoked by a valenced US is, in effect, confused by the perceiver as emanating from the CS. The more potential that exists for *source confusability* in a given pairing, i.e. the more likely the evaluative response is to be confused as stemming from the CS instead of the US, the more effective EC is in establishing an attitude toward the CS. Conversely, the less source confusability in a US-CS pairing, the less likely an attitude will be established toward the CS, because the participant perceives the activated attitude as more clearly originating from the US. Jones, Olson, and Fazio (2009) developed methods to facilitate source confusion that resulted in more effective attitude formation. A few ways they found to increase source confusability, and ultimately attitude change, included flashing the CS and US to encourage back-and-forth eye movements during the EC pairings, enhancing physical proximity between the US and CS, using moderately evocative US instead of strongly evocative US, and using large CS images and small US images. Forcing participants to look back and forth between the US and CS encourages rapid attention shifting between the two stimuli, increasing potential for source confusion of an evaluation. Close physical proximity facilitates greater spatio-temporal contiguity and more eye-gaze attention

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shifts, which could all contribute to source confusion. Strongly evocative US have a stronger association with an evaluation, compared to mildly evocative US. Having a more obvious attitude source, in the case of a strongly evocative US, reduces the potential for the evaluation coming from the CS. In the case of using a large CS image and a small US image, the larger stimulus is more salient than the smaller one, and thus appears to be the more likely source of any activated attitude. All of these tactics reduce the likelihood that an individual will (correctly) perceive an attitude as having been generated from a US, increasing the probability that the attitude will instead be mistakenly attributed to the CS. As a result, each trial of implicit misattribution facilitates transfer of the evaluation of the US to the CS, thus associating the CS with a particular valence.

Evaluative conditioning can establish positive or negative attitudes for novel or neutral objects, but the process can also *change* pre-existing attitudes and related behavior (Lebens et al., 2011; Olson & Fazio, 2006; Hollands, Prestwich, & Marteau, 2011). EC can affect both explicitly and implicitly measured attitudes, and even affect attitudes towards the self (Dijksterhuis, 2004). An effective method of producing attitude change could be quite useful as an intervention to modify unwanted attitudes, such as favorable attitudes towards potentially harmful things or behaviors, and unfavorable attitudes towards helpful things and behaviors. For example, someone could dislike exercise but wish to exercise more frequently, and changing his attitude towards exercise behavior could be beneficial.

Facilitating source confusability has been demonstrated as an effective tactic for conditioning attitudes towards novel, neutral stimuli. Using EC to establish attitudes

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toward novel objects is easier and more effective, however, than using EC to change pre-existing attitudes (Cacioppo et al., 1992). The implicit misattribution model would predict that *changing* pre-existing attitudes, particularly strong or extreme ones, would be more difficult. A change in valence from negative to positive or vice versa would be especially difficult. If an individual already has a pre-existing strongly negative attitude towards a given CS, he or she would be unlikely to misattribute a positive attitude from a US as having originated from that CS. Thus the pre-existing attitude reduces potential for source confusability, particularly if there is mismatch in valence between the US and the CS. The positive evaluation generated by a stimulus pairing is more likely to be correctly attributed to the positive US, resulting in minimal transfer of positive evaluation to the CS, and therefore minimal attitude change. An evaluation from a US could have been generated much more plausibly by a novel and/or neutral CS, in comparison, due to the CS lacking a competing existing attitude.

In the current research, we aim to test this reasoning regarding the implications of the implicit misattribution model for producing attitude change via evaluative conditioning. We also are interested in finding new ways to increase source confusability and thereby increase the effectiveness of EC in changing attitudes towards objects. In particular, could using different specific exemplars of the CS category in the conditioning procedure – ones that vary in how visually appealing they are -- lead to more or less attitude change for the object category overall?

To elaborate, let's consider the case of spiders -- an attitude object category that people generally dislike. However, spiders can be useful to have in a house to control

other pests and they are generally harmless to us. Moreover, a frightful reaction to a harmless animal can be disruptive and stressful. So, changing attitudes towards spiders might be beneficial. Regardless of this potential application, spiders are a useful prototypical negatively-evaluated category to test the conditions under which evaluative conditioning can produce attitude change. If pre-existing negative attitudes towards spiders contribute to difficulty in changing attitudes, then how could we increase the potential for source confusability? One potential solution is to use less-negative exemplars of spiders, which could add to source confusability. From a participant's point of view, the plausibility that a positive attitude could come from a relatively pleasant CS image of a spider is higher than if an ugly, disgusting, unpleasant CS spider image were in its place. If participants are more likely to change their attitudes towards these relatively-pleasant spiders than relatively-unpleasant spiders, their newly-changed attitudes could potentially generalize more readily towards the overall category of spiders.

We also expected that varying levels of fear of spiders across individuals would affect the effectiveness of EC. People's pre-existing fear of spiders could affect both their initial attitude towards spiders as well as the likelihood of their confusing a positive evaluation as coming from a picture of a spider. Individuals who have high fear of spiders are likely to have very strong, extreme, and automatic negative attitudes towards spiders. Thus, even more so than someone who only moderately dislikes spiders, people with high fear of spiders are likely to be especially unsusceptible to source confusability processes because they have a very strong, certain sense of what their attitudes are

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towards spiders, with little chance of confusing the positive evaluation triggered by a positive US as originating from a very clearly negative spider photo. Even the relatively pleasant images of spiders would be perceived to be quite negative, and not be able to encourage source confusability in these individuals. Individuals with relatively less fear of spiders, in contrast, might have more moderately negative or even positive attitudes towards spiders, and/or be more malleable in their attitudes. Gibson (2008) found that EC only produced attitude change in attitudes towards "mature" (i.e., well-known) consumer brands if participants initially had no strong preference. Similarly, individuals who report low fear of spiders and presumably have less negative initial attitudes may be more susceptible to source confusability and more likely to attribute a positive evaluation as potentially having emanated from a (relatively) pleasant spider photo.

Overview

This study examined the roles of pleasantness of CS photos and Fear of Spiders in the effectiveness of EC as a technique for modifying individuals' attitudes towards spiders. The experiment employed the "Surveillance" paradigm. Three conditions were implemented: a more-pleasant condition involving relatively appealing spider photos as CS, a less-pleasant condition involving relatively unappealing spider photos as CS, and a control condition involving no EC pairings. We predicted that the less-pleasant condition would not lead to less-negative attitudes towards spiders, compared to the control condition. We expected that the more-pleasant condition would produce less-negative attitudes towards spiders, but that reported Fear of Spiders could moderate this effect, due to its effects on source confusability.

Method

Participants

130 Ohio State University undergraduates (68 females, 62 males) participated for course credit. Five participants were unable to complete the task, due to discomfort experienced upon viewing the spider photos.

Conditioning Paradigm

We adapted the "Video Surveillance" EC procedure developed by Olson and Fazio (2001). Participants were told that the study is about attention, vigilance, and rapid responding to target items on a computer screen. They were presented with two target

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items, two particular species of spiders (brown recluse and hobo spider), to which they were to respond by hitting the space bar on a keyboard. These target items could appear in picture or word form. Spider targets were used to provide a plausible reason for viewing a variety of spider stimuli during the task. These target items appeared in a series of other supposed "distractor" items and words that were presented in a non-rhythmic fashion. Stimuli appeared either singly or paired with other stimuli. Key CS-US stimuli pairs appeared unobtrusively throughout the task. Participants viewed 5 blocks, each consisting of 86 trials, for a total of 430 stimulus presentations that each lasted 1,500 ms. The key conditioning trials appeared 4 times per block, for a total of 20 presentations throughout the task. Each of the ten spider CS images appeared twice during the task, with a different positive US each time. For the conditioning trials, the CS and US stimuli flashed back and forth, which was found in previous work to facilitate source confusion and increase the effect of EC (Jones, Olson, & Fazio, 2009). CS and US disappeared briefly in an alternating fashion during the 1,500 ms trial. For example, both appeared simultaneously for 300 ms, then the first stimulus would disappear for 50 ms then reappear. 175 ms later, the second stimulus would disappear for 50 ms then reappear. The first stimulus disappeared and reappeared again, followed by the second stimulus in the same fashion. The resulting effect was that the stimuli appeared to flash quickly back and forth. Stimuli pairs in filler trials also sporadically flashed, so that the CS-US trials did not appear unusual in the procedure (Jones, Olson, & Fazio, 2009). Moderately evocative positive words (e.g., "commendable" and "worthwhile") and photos (e.g., chipmunk and waterfall), were used as positive US (Appendix A, Table 1)

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because these stimuli encourage source confusability more compared to strongly evocative stimuli (Jones, Olson, & Fazio, 2009).

Participants were assigned to one of three conditions: more-pleasant spider CS paired with positive US; less-pleasant spider CS paired with positive US; or control, in which no spider CS were paired with positive US. In all conditions, participants were exposed to the same spider pictures (both the more-pleasant and less-pleasant groups), but the key difference across conditions was which ones were paired with positive US, if any. Participants in the more-pleasant condition saw more-pleasant spider CS paired with positive US pictures and words and saw less-pleasant spiders alone. Participants in the less-pleasant condition saw less-pleasant spider CS paired with positive US and saw more-pleasant spiders alone. Participants in the control condition viewed all the spider pictures, both more- and the less-pleasant, alone.

Pilot testing with 44 undergraduate students yielded the more-pleasant and less-pleasant spider photos (Appendix A, Tables 2 & 3). The ten more-pleasant spider photos had an average pleasantness rating of -3.25 and the ten less-pleasant spider photos had an average pleasantness rating of -4.05 on a -5 (very unpleasant) to +5 (very pleasant) scale. Pleasantness ratings of the two groups of photos differed significantly from each other ($t(43) = 5.49$, $p < .001$). Although the more-pleasant group of spider images consisted of the most positively rated images we were able to locate and include in the pilot, they were still evaluated negatively. Nevertheless, the two classes of images identified in the pilot test clearly differed from one another and, hence, provided a viable means of testing the hypothesis.

Following the conditioning task, participants completed several survey questionnaires. Most importantly, they completed a rating task in which they evaluated the pleasantness (-5 = very unpleasant to +5 = very pleasant) of various animal photos, including not only spiders, but also insects and other filler animals. These other animals were included to reduce demand characteristics. Participants rated five of the less-pleasant and five of the more-pleasant spider images that they had been presented during the surveillance task, as well as five novel spiders they had not previously seen (Appendix A, Tables 4-6). The novel spider photos had pleasantness ratings close to the mean in pre-testing, and thus were relatively at the midpoint within the full range of spider photos. The 15 ratings were averaged to produce a composite spider rating score, the primary dependent measure.

Participants then completed the Fear of Spiders Questionnaire (FSQ) (Szymanski & O'Donohue, 1995), post-experimental questions, the Attentional Control Scale (ACS) (Derryberry & Reed, 2002) to be consistent with the cover story, and demographic questions. The FSQ, a commonly-used 18-item self-report questionnaire to assess spider phobia, includes items such as, "If I came across a spider now, I would get help from someone else to remove it" and "If I saw a spider now, I would feel very panicky." Participants stated their agreement on a 1-7 scale with each item. Three post-experimental questions assessed participants' level of contingency awareness in a funneled fashion, starting from whether they noticed anything out of the ordinary during the "surveillance" task, then whether they noticed any systematic about how particular words and images appeared together, and ending with whether they noticed anything

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about the words and images that appeared with spiders. Excluding participants who reported contingency awareness did not change the results, so this variable will not be discussed further.[1] The ACS was used for exploratory purposes. These exploratory analyses did not reveal any interpretable moderation of the EC effects reported in the results section.

Results

The main DV of interest was average pleasantness ratings of all spiders (i.e., collapsed across the 5 more-pleasant, 5 less-pleasant, 5 novel). A hierarchical regression was used to examine the effects of experimental condition, fear of spiders, and the relevant interaction. Because there were three conditions, condition was dummy-coded via two variables, with the control condition as the comparison standard. There was no significant main effect of either the less-pleasant or more-pleasant conditions relative to the control ($B = -.14$, $t(124) = -.52$, $p = .60$; $B = .33$, $t(124) = 1.29$, $p = .20$). Just as is to be expected, scores on the Fear of Spiders Questionnaire had a significant main effect on pleasantness ratings ($B = -.56$, $t(124) = -2.94$, $p = .004$). Those who reported more fear viewed the spider images as less pleasant. However, the interaction between the more-pleasant versus control condition dummy variable and fear of spiders was significant ($B = -.72$, $t(124) = -2.80$, $p = .005$), such that the more-pleasant condition led to less negative pleasantness ratings in participants who had lower fear of spiders (Appendix B, Figure 1).

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[1] Two independent raters coded participants' responses to the questions and judged whether they seemed to be aware of systematic spider CS-positive US pairings. Participants were judged to be contingency-aware if both raters agreed that they expressed awareness in response to the first and/or second questions ("Did you notice anything out of the ordinary in the way the words and pictures were presented during "surveillance"?" and "Did you notice anything systematic about how particular words and images appeared together?"). Sixteen participants met this criterion (18% of participants assigned to the experimental conditions).

At one standard deviation below the mean FoS score, the more-pleasant condition had significantly higher pleasantness ratings than the control condition ($B = 1.05$, $t(124) = 2.95$, $p = .004$). At one standard deviation above the mean, the effect of condition was not significant ($B = -.39$, $t(124) = -1.04$, $p = .30$). There was no significant interaction between the dummy variable corresponding to the less-pleasant condition and fear of spiders ($B = .04$, $t(124) = .12$, $p = .90$), when compared to the control condition. Thus, in participants with low fear of spiders, the more-pleasant condition led to less negative ratings of spiders compared to control, while the less-pleasant condition did not differ from control.

To compare the two experimental conditions to each other statistically, conditions were also dummy coded with the less-pleasant condition as the comparison standard. A significant interaction was obtained between the dummy variable comparing the two EC conditions and FoS ($\beta = -.75$, $t(124) = -2.81$, $p = .006$). At one standard deviation below the mean FoS score, the more-pleasant condition led to pleasantness ratings that were significantly greater than those in the less-pleasant condition ($B = 1.22$, $t(124) = 3.03$, $p = .003$). At one standard deviation above the mean FoS score, the two conditions did not differ ($B = -.28$, $t(124) = -.81$, $p = .42$).

Similar patterns of ratings occurred for the various subgroups of spider pictures, most critically for those that were novel. In particular, the significant interaction involving fear of spiders and the dummy variable contrasting the more-pleasant condition to the control condition was present for pleasantness ratings of the novel spiders alone ($B = -.66$, $t(124) = -2.46$, $p = .02$), providing evidence that the effect of EC on reducing the

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negativity of attitudes had generalized to new spider photo stimuli (Appendix B, Figure 2). At one standard deviation below the mean FoS score, the effect of condition was significant ($B = .95$, $t(124) = 2.54$, $p = .01$), whereas it was not significant at one standard deviation above the mean ($B = -.37$, $t(124) = -.95$, $p = .34$).

A similar significant interaction was present when comparing the two experimental conditions. Specifically, a dummy variable contrasting the more-pleasant condition to the less-pleasant condition interacted with fear of spiders when predicting the pleasantness ratings of the novel spiders alone ($B = -.83$, $t(124) = -2.97$, $p = .004$). At one standard deviation below the mean FoS score, the effect of the more-pleasant condition was significant ($B = 1.40$, $t(124) = 3.30$, $p = .0013$) compared to the less-pleasant condition. At one standard deviation above the mean FoS score, the two conditions did not differ ($B = -.27$, $t(124) = -.74$, $p = .46$).

One potential explanation for the finding that EC influenced attitudes among participants with lower FoS but not those with higher FoS is that the higher FoS participants did not differentiate between the less-pleasant and more-pleasant spider CS photos, while the lower FoS participants did. If higher FoS participants did not differentiate between these two groups, instead perceiving all the spiders as equally unpleasant, then the less-pleasant and more-pleasant spider conditions would be equally ineffective at changing attitudes not just because the more-pleasant images failed to increase source confusability for these participants, but because the two classes of images did not evoke different reactions. To consider this possibility, we examined the ratings of the more-pleasant and less-pleasant spiders provided by participants in the control

condition. Their attitudes should not have been affected by the task, given that there were no US-CS pairings. Across participants in this control condition, the more-pleasant spiders, as identified by our pre-testing, were indeed rated as significantly more pleasant than the less-pleasant spiders ($t(43) = 5.492$, $p < .001$). More relevant to the question under consideration, fear of spiders was significantly correlated with ratings of the more-pleasing spider photos, ($r(43) = -.35$, $p = .02$), the less-pleasing spider photos, ($r(43) = -.41$, $p = .007$), and the novel spider photos, ($r(43) = -.43$, $p = .004$). However, fear of spiders was not significantly correlated with the *difference* in ratings between the more-pleasant and less-pleasant spider photos ($r(43) = -.01$, $p = .95$). Thus, the data from the control condition confirm our initial classifications, across varying levels of fear of spiders.

Discussion

Although we found no overall effect of the more-pleasant spider CS condition on attitude change towards spiders, this condition did lead to more effective EC among participants who reported low fear of spiders, while the less-pleasant spider CS condition did not. This finding makes sense in the context of the implicit misattribution model. Source confusability was likely to be highest in the more-pleasant condition among individuals with low fear of spiders. People who reported having low fear of spiders were likely to have less extreme, less strong, and less negative pre-existing attitudes towards spiders, though on average they still endorsed quite negative attitudes towards spiders on an absolute scale. These individuals were therefore more likely than individuals with high fear of spiders to confuse an evaluation from a positive US as

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having originated from a relatively pleasant spider photo. As a result, they endorsed less negative attitudes toward the particular spider photos that were positively conditioned and were even more susceptible to changing their attitude toward spiders as a category. This generalization was evident in our finding that low fear of spider participants in the more-pleasant spider CS condition endorsed less-negative attitudes toward novel spider photos that had been neither conditioned nor previously seen in the procedure, compared to participants in the control and less-pleasant conditions.

However, participants who reported high fear of spiders were likely to have more extreme, strong, and negative pre-existing attitudes towards spiders, which contributed to their reduced potential for source confusability, even when the more-pleasant spiders were used as CS. For these participants, even the more-pleasant spiders were perceived to be very negative. When these (or any) spider photos were presented with positive US, high-fear participants had little potential for confusing or misidentifying the source of their positive evaluation, so their attitudes towards spiders did not become less negative, whether they were rating conditioned spider photos or previously unseen ones.

The ineffectiveness of the less-pleasant spider CS condition in changing attitudes compared to control, even in people with low fear of spiders, reinforces the difficulty of producing attitude change via EC and emphasizes the importance of facilitating potential source confusability. When spider photos were relatively unpleasant, participants apparently were more likely to correctly attribute the source of their positive evaluation to the positive US, thereby maintaining their negative attitudes towards both CS spiders and spiders as a category. When source confusability was minimized via strong negative

pre-existing attitudes towards the CS and those CS being particularly unpleasant exemplars of a category of attitude objects, successful EC was very unlikely to occur.

More generally, we have evidence that source confusability maximization is important for effective attitude change. Because attitudes are more difficult to change than to establish (Cacioppo et al., 1992), maximizing source confusability appears to be an important strategy to make attitude change towards negatively-evaluated objects at all possible. Two specific components that can affect attitude change potential are the evaluative extremity of representative exemplars of a particular category and the individual difference of pre-existing attitudes towards that category. Due to the apparent constraint from pre-existing attitudes, attitude change via EC seems to be very difficult among people who have strong pre-existing attitudes in the opposite direction of the desired valence. However, EC could potentially be useful for enhancing pre-existing attitudes that are of the desired valence so as to make them stronger. It could also be useful for bringing a moderately positive or moderately negative attitude closer to a neutral evaluation, as we did in this study.

EC may also be useful for reducing ambivalence (that is, simultaneous positive and negative attitudes) in a desired direction by strengthening the positive (negative) attitude so that it is more impactful and influences behavior more than the negative (positive) attitude. By its very nature, ambivalence suggests a greater potential for source confusion with either positive or negative US, which may render ambivalent attitudes particularly susceptible to EC.

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Although counterattitudinal change among people with very strong pre-existing attitudes may be challenging, the finding that we can use EC to shift negative attitudes toward spiders at all, using the implicit misattribution model for guidance, suggests that this may still be possible. Potential strategies for changing attitudes even in people with strongly negative pre-existing biases could focus on making the CS even more pleasant, such that they are likely to induce source confusability. One potential strategy for high-FoS participants, then, could be using cartoon or line drawings of spiders as CS, since they are relatively more neutral than realistic photos, or might even be perceived positively. However, even if conditioning cartoon or drawn spiders is effective for all participants, regardless of fear of spiders, we may encounter the problem of generalizing to realistic spiders. A possible solution for this is to use a gradual progression of CS, with more cartoon/drawn spiders in the beginning and adding more and more realistic spider photos as the procedure progresses. Another potential strategy could be using obscured or blurred photos of spiders, which might serve to blunt automatic negative reactions and thereby allow source confusion processes to occur. Using subliminal presentations of negative stimuli is another promising method to approach the problem of using EC to induce attitude change of disliked or feared objects (Jones, Vilensky, Vasey, & Fazio, in press).

A particular application of attitude change that has been suggested is for EC to be used as a treatment for phobias. Phobias are defined as excessive or unreasonable fear or anxiety in the presence or anticipation of a specific object or situation (DSM-IV-TR). Phobias can significantly interfere with individuals' normal routines or functioning, by

preventing them from approaching certain objects or situations, or causing them a great deal of distress when they encounter that object or situation. One way to conceptualize phobias is to think of them as very extreme negative attitudes toward relatively harmless objects. Using an attitude approach to understand phobias could generate new ideas for interventions or treatments in order to alter the negative attitude and thereby change the phobia. In its current form, the surveillance EC paradigm does not appear to be a potential effective treatment for people with spider phobia. Because they have extremely negative attitudes towards spiders, they are especially unlikely to experience source confusability.

Currently, the most effective treatment for phobias is exposure therapy, which has shown improvement in up to 90% of patients after a single session (Öst, 1989). Although specific phobias are one of the most easily treated psychological problems, people with specific phobias are less likely to seek treatment compared to other anxiety disorders (Antony & Swinson, 2000). The estimated percentages of phobics who reported seeking treatment vary from 8-31% (Stinson, 2007; Fyer, 1998; Regier et al., 1993), so a large majority of people who suffer from phobias do not seek and undergo treatment. One possible reason for the low treatment rate for specific phobias is that phobics are too afraid of the exposure procedure. One study found that 27% of spider phobics enrolled in a clinical trial refused in vivo (live) exposure when it was made available to them (Garcia-Palacios, Botella, Hoffman, & Fabregat, 2007). Apparently, the very fear that they experience when in the presence of spiders leads them to avoid the procedure that would most help them. New interventions could help people overcome this initial

hesitation. An EC procedure that did somehow succeed in promoting source confusion among such individuals might encourage a willingness to proceed with exposure treatment.

If the attitudes of spider phobics are changed as a result of exposure therapy, EC may be used to strengthen these newly-changed attitudes. After undergoing an exposure treatment, phobics who respond well to the treatment will have habituated to spiders successfully and shifted their attitudes. Because they now have presumably less extreme negative attitudes towards spiders, they will be more likely to experience source confusion during EC. Thus, appropriately-timed EC may prove to be a useful supplement to exposure treatment, strengthening and/or furthering attitude-changing effects of exposure. Interestingly, a recent clinical trial in which EC was administered at the end of a spider exposure treatment session revealed that the supplemental EC procedure enhanced the persistence of the gains produced by the exposure treatment (Vasey & Fazio, 2012). Honing an optimal EC supplemental treatment could result in the best long-term outcome for phobics.

Some limitations exist for drawing general conclusions about EC in this present study. Spiders evoke both fear and disgust for many people, and even the more-pleasant spiders were rated as negative by most participants. Would we find the same moderation pattern for other negatively rated attitude objects? Would the same effects occur for neutral or positive CS? That is, do the effects of more/less pleasant CS generalize to objects that start at a different valence from spiders? Do individual differences in pre-existing attitudes have a similar moderating effect for all objects? Furthermore, CS in

this spider study were conditioned only in the positive direction. It is unclear at this time whether relatively unappealing photos will facilitate negative conditioning in a similar manner.

This research has demonstrated that while using evaluative conditioning to change attitudes towards negative objects is challenging, it is still possible in certain conditions. We have demonstrated the value of using the implicit misattribution model as a theoretical framework for considering the potential effectiveness of EC as a social influence technique. The model emphasizes the importance of increasing source confusability in order to optimize the potential for attitude change. Applying the principles of the implicit misattribution model should contribute substantially to the discovery, development, and refinement of ways to encourage attitude change via evaluative conditioning.

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Appendix A: Tables

Pictures	Words
Waterfall	Useful
Sailboat	Calming
Campsite	Desirable
Diploma	Appealing
Happy couple	Relaxing
Astronaut	Beneficial
Woman with baby	Worthwhile
Mountain peak	Valuable
Boy with ice cream	Terrific
Chipmunk	Commendable

Table 1. Positive Unconditioned Stimuli (US)

Table 2. Conditioned Stimuli (CS): More-Pleasant Spiders

Table 3. Conditioned Stimuli (CS): Less-Pleasant Spiders

Table 3 continued

Table 4. Dependent Measure Photos: More-Pleasant Spiders

Table 5. Dependent Measure Photos: Novel Spiders
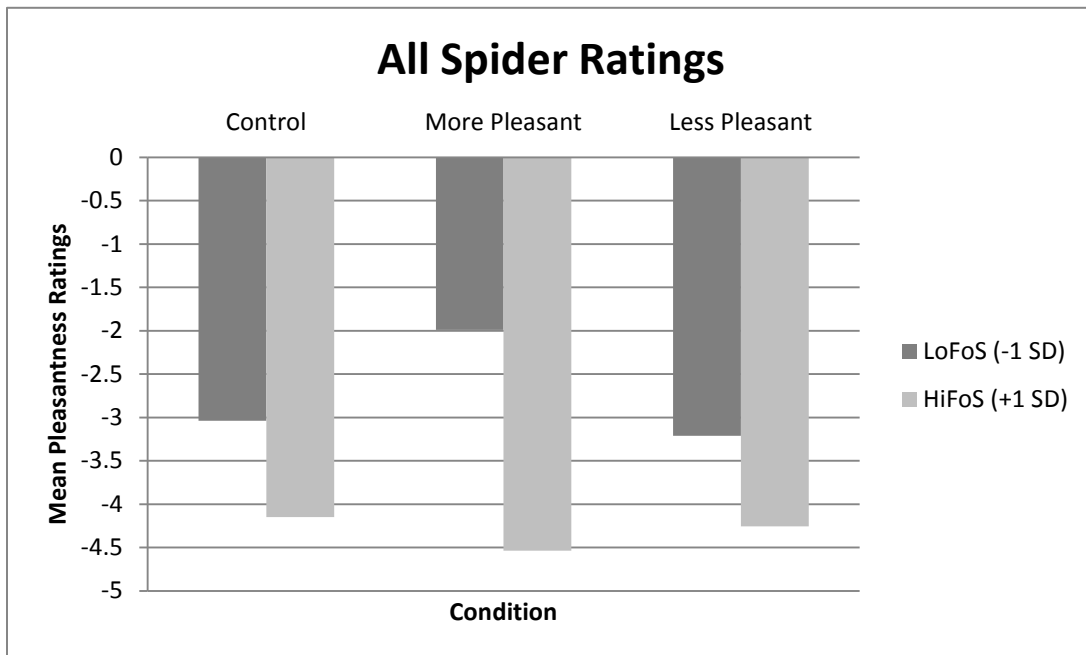
Table 6. Dependent Measure Photos: Less-Pleasant Spiders

Figure 1. Predicted pleasantness ratings across all spider photos as a function of condition and Fear of Spiders (FoS). Less negative scores indicate rating the spider photos as less unpleasant.
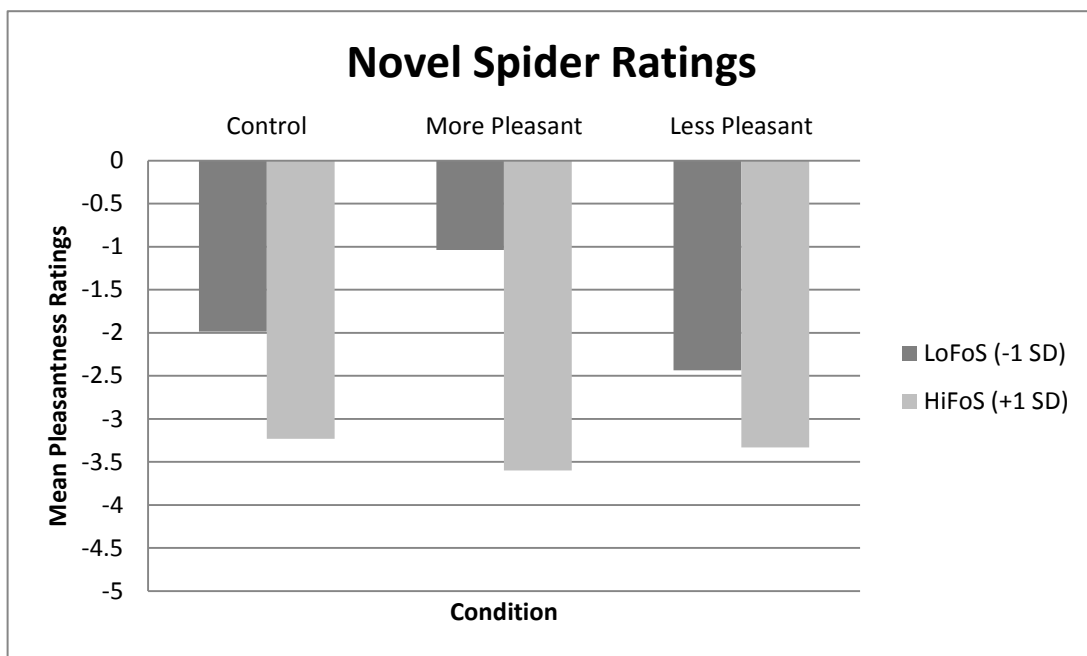
Figure 2. Predicted pleasantness ratings across the five novel spider photos as a function of condition and Fear of Spiders (FoS). Less negative scores indicate rating the spider photos as less unpleasant.