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Approach behavior can mitigate predominately univalent negative attitudes: Evidence regarding
insects and spiders.

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Abstract

Three experiments tested whether disliking of predominately univalently negative attitude objects could be reduced by a procedure pairing approach behaviors with subliminally presented images of the objects. Experiment 1 demonstrated that participants who approached images of insects rated insects less negatively than participants who did not approach insect pictures. Experiment 2 extended this effect to spiders and employed an implicit measure of spider attitudes. Experiment 3 examined the consequences of an approach induction for affect during actual approach behavior in a sample of individuals with elevated levels of spider fear by employing a Behavioral Approach Task (BAT). Fearful individuals who approached spider pictures reported less anxiety when encountering live spiders than participants who did not approach spider pictures. As such, the results provided evidence on explicit, implicit, and behavioral measures that negative and predominately univalent attitudes can be influenced by approach behaviors. Implications for attitude change interventions and potential contribution to the efficacy of exposure therapy are discussed.

Approach behavior can mitigate predominately univalent negative attitudes: Evidence with insects and spiders.

The simple act of approaching or avoiding an object is capable of influencing attitudes toward that object. The theoretical basis for this notion goes back at least to Darwin (1873), who documented connections between motor tendencies and expressions of affect and hypothesized that these links were gradually acquired over time. Empirical research has cumulatively demonstrated a bi-directional causal relationship between positive and negative evaluation and approach and avoidance behaviors, respectively (e.g. Cacioppo, Priester, & Berntsen, 1993; Chen & Bargh, 1999; Neumann, Förster, & Strack, 2003 for a review; Neumann & Strack, 2000; Solarz, 1960). Though various mechanisms might underlie such effects, the coherence between motor tendencies and evaluation can be explained in part by higher order classical conditioning. Specifically, it has been proposed that approach and avoidance behaviors, given their conditioned associations respectively with desire and positivity or repulsion and negativity, can themselves lead to conditioned positive or negative attitudes towards objects with which they occur (Cacioppo et al., 1993).

While early research looked at the impact of motor orientation on evaluations of novel, neutral stimuli (e.g. Chinese ideographs; Cacioppo et al., 1993), more recent studies have examined whether these effects might extend to objects for which individuals have pre-existing attitudes. For example, Wiers et al. (2011) found that avoidance training of pictures of alcoholic beverages reduced cravings and improved treatment outcomes among problem drinkers. Kawakami et al. (2008) found that approaching math-related images (e.g. calculators) influenced attitudes toward math in women who did not strongly self-identify with math. In another study, Kawakami et al. (2007) found that approach movements influenced racial attitudes. Specifically,

participants who enacted approach behaviors toward photographs of Black people showed less negativity on the Implicit Association Test (IAT; Greenwald, McGee, & Schwartz, 1998).

Moreover, this procedure also influenced participants' non-verbal behavior; participants who had approached photographs of Black people sat closer to a Black confederate during a subsequent interaction. Subsequent research has suggested that these effects can be mediated by increasing associations between the self and the target of approach (Phills et al., 2011).

In much recent research, individuals likely held quite ambivalent pre-existing attitudes toward the objects or people being evaluated. For instance, problem drinkers have been shown to hold complex attitudes toward drinking; indeed, treatments for alcoholism often target this ambivalence to encourage patients to make constructive changes (Miller & Rollnick, 1991). Participants in the relevant research (Wiers et al., 2011) were clinical patients undergoing treatment, strongly suggesting their attitudes towards alcohol were not exclusively positive. Similarly, even for women who dislike math, it is likely that math attitudes are multifaceted, informed not just by negative experiences and role associations, but also the understanding that math is useful and valued by society (Steele, 2003). Racial stereotypes often have both positive and negative components (e.g. Devine & Elliott, 1995). Also, as Kawakami et al. (2007) noted, racial attitudes are particularly complex, as evidenced by findings that implicit and explicit measures of attitudes are often seemingly at odds (Dovidio et al., 2000). That is, negative automatic associations sit alongside positive racial associations and internalized societal strictures to view people without bias, often resulting in an ambivalent and conflicted knowledge structure (Dovidio & Gaertner, 1998). Racial ambivalence has been observed to create polarization phenomena. For example in some research (Hass, Katz, Rizzo, Bailey, & Eisenstadt,

1991) cross-race interactions produced relatively extreme positive *and* negative evaluations depending on the quality of interaction.

Thus, while these studies clearly show that approach and avoidance behaviors can impact attitudes that were previously ambivalent, little research has examined whether such behaviors can mitigate subsequent evaluations of objects that are completely or predominately univalent. Moreover, some research has provided evidence against the possibility. Centerbar and Clore (2006) found that inducing approach movements towards disliked stimuli tended to exacerbate that dislike. They argued that this was due to the aversive motivational incongruity experienced from approaching a disliked object. Thus, it is possible that object negativity represents a strong boundary condition of the effect of approach behaviors on positive attitude change. This would limit the potential utility of approach-based interventions designed to make attitudes towards disliked objects more positive.

This raises the question of whether under any circumstances approach behaviors can mitigate univalent negative attitudes. This might be the case if approach behaviors do not produce an aversive experience due to their subjective incompatibility with the object of approach. Notably, the stimuli presented by Centerbar and Clore (2006) were presented supraliminally. Any subjective incongruity between behavioral orientation and object might be circumvented if objects are presented subliminally (e.g. Kawakami et al., 2007, Study 2 and Study 4), thus allowing approach behaviors to increase positivity even for disliked objects. Whatever specific negative features are evident in the approached stimulus may be rendered minimally salient when presentations are extremely rapid, minimizing their impact on subjective responses. Another potential benefit of subliminal presentations is that processing of the stimulus is likely to be at the category level rather than exemplar level (i.e., individuals are likely

unable to process specific differentiating features of the object), facilitating generalization (Fiske & Neuberg, 1990).

The case of approaching negative objects is of particular significance as a method of attitude change because the subjective incongruence of approaching negative objects is an obstacle to mitigation. In the other case of avoiding positive objects, any subjective incompatibility between avoidance and the positive object is also aversive but serves to mitigate a positive pre-existing attitude. In other words, the aversive quality of avoiding positive objects is consistent with the valence of avoidance and facilitates mitigation. On the other hand, the aversive quality of approaching negative objects is inconsistent with the valence of approach and is an obstacle to mitigation. Therefore, it is of particular interest whether in the case of approaching negative objects such subjective incongruity can be circumvented by presenting stimuli very briefly.

The present series of studies provides a strong test of whether approach behaviors can indeed influence attitudes that are completely or predominately negative. In Experiment 1 we investigated whether such an effect might impact explicitly measured attitudes of stimuli that are normatively regarded as negative: insects. In Experiment 2 we sought to extend this effect to spiders, an even more fear provoking stimulus, and show that the change in attitude is apparent on an implicit measure. Finally, in Experiment 3 we sought to determine whether the effect might extend to a subset of individuals who report elevated fear and discomfort with spiders, and whether the approach procedure might influence behavioral and affective concomitants of attitudes in an in-vivo encounter with a live spider.

Experiment 1

As noted earlier, approach procedures have been shown to impact previously ambivalent attitudes: problem drinkers' attitudes toward alcohol, math-averse women's attitudes toward math, and non-Blacks' attitudes toward Blacks. Experiment 1 examined whether approach procedures could also impact attitudes that are much less ambivalent in nature: attitudes toward insects. While it is not necessarily the case that attitudes toward insects are purely univalent, insects are a category that evoke predominantly negative attitudes (and have been previously utilized in attitude research as presumptively negative attitude-objects [Greenwald, McGhee, & Schwarz, 1998]) that lack the complexity and sensitivity of racial attitudes. That is, the powerful social norms in America proscribing prejudice against Black people (Crandall, Eshleman, & O'Brien, 2002) simply are not at work when it comes to insects. Instead, in many Western cultures, insects are strongly associated with disgust, viewed as sources of contamination, and generally prohibited from being eaten. As such, insects are often coupled with a strong, visceral avoidance motivation (Rozin & Fallon, 1987).

To test whether an approach procedure could reduce the negativity of attitudes toward insects, we randomly assigned participants to either approach, avoid, or not respond to subliminally presented pictures of insects. We then asked participants to explicitly rate their attitudes towards insects. Building on past studies linking approach procedures with attitude change, we predicted that participants who approached insect pictures would rate insects more positively than participants who avoided or did not approach insect pictures.

Method

Participants.

Participants were 69 students enrolled in psychology courses at a large midwestern university and offered course credit for completing the study (36 female, 33 male). The ethnic composition of the sample was 76.8% Caucasian, 7.2% African American, 10.1% Asian, and 5.7% multi-ethnic or other.

Procedure.

Each participant was seated in a cubicle with a joystick and a computer that delivered the task instructions. Participants were told to watch the screen and push the joystick forward when the word “TOWARD” appeared, and to pull the joystick back when the word “AWAY” appeared. A perspective grid, adopted from research by Markman & Brendl (2005), was placed on the screen to enhance the extent to which joystick movements perceptually mirrored approach and avoidance. Participants first completed a conditioning phase, followed by a test phase and a subliminality check.

In the conditioning phase, participants were assigned to one of three conditions. In the approach condition, 60 trials of subliminally presented photographs of insects (color photos of a bee, two types of flies, and two types of beetle, each presented 12 times) were paired with approach prompts (“TOWARD”). In the avoid condition, 60 trials of subliminally presented photographs of insects were paired with avoid prompts (“AWAY”). In the control condition, 60 trials of insect photographs were subliminally presented, but were paired with a blank screen (i.e. no response). All conditions also involved an additional 120 masked trials, such that the number of trials entailing approach and avoidance actions were equivalent across conditions. Therefore, in the approach condition, 60 trials involved presentation of insects followed by the prompt “TOWARD,” 60 trials involved presentations of masked blank screens, followed by the avoid prompt (“AWAY”), and 60 involved presentations of masked blank screens, followed by another

blank screen (i.e. no response). In the avoidance condition, whether “TOWARD” and “AWAY” were preceded by insects or blank screens was reversed. In the control condition, 60 trials of blank screens preceded “TOWARD,” “AWAY,” and blank screen prompts. Each picture (or blank screen) appeared for 13 ms (one screen refreshment cycle), then was immediately followed for 52 ms by a white rectangular masked image filled with triangles, after which the movement prompt (or blank screen) appeared. This masking procedure has been found to effectively mask picture stimuli (Polifroni, 2006). Finally, in both conditions, 60 additional trials involved alphanumeric strings of various colors and fonts appearing without masks for 250-1250 ms. These trials were included to vary the regularity with which responses were required and to ensure that participants were vigilant for the presentation of the TOWARD and AWAY prompts. The order of all trials was randomized within participants. The inter-trial interval was 500 ms.

Participants were then told that they would now rate pictures of animals in order to pretest stimuli for an upcoming study. Participants were presented with 41 animals and asked to rate them on a bipolar scale ranging from -5 (extremely negative) to 5 (extremely positive). The stimuli included the five presented insect pictures, 21 other pictures of insects that had not appeared in the conditioning phase, and 15 non-insect small animals, such as a mouse, frog, and snake.

The test phase also included a subliminality check. Participants were informed that during the conditioning procedure some things appeared on the screen so briefly that they may or may not have been able to identify them, but may have been experienced as brief “flashes” followed by a white rectangle. The following open-ended questions were asked: “What do you think was being flashed?” and “What do you think the purpose of that part of the experiment was?” Following some demographic questions, participants were also asked what they thought

the purpose of the study as a whole was. Participants who reported having seen insects were excluded from analyses.

Results and Discussion

Four of the 69 participants were excluded from the analyses because of responses to the subliminality check. Each of these participants mentioned insects in response to the question about the briefly presented stimuli. No remaining participant indicated any suspicion that the conditioning phase was meant to influence the scale ratings in any way.

To test whether approach procedures impacted attitudes toward insects, one-way ANOVAs were conducted on the effect of condition on the scale responses to the five presented insects, other insects, and animals separately. Experimental condition had no effect on the ratings of non-insect animal stimuli ($F < 1$). For both the five presented insects and other insects, however, a statistically significant effect of condition emerged. Because these effects were of similar size and direction¹, and because the two measures correlated substantially ($r(65) = .70$, $p < .001$), the results will be presented for all insects together. A one-way ANOVA indicated that experimental condition influenced ratings of all insects ($F(2, 62) = 4.45$, $p < .05$). Post-hoc comparisons using the Least Significant Difference test indicated that statistically significant differences emerged between the approach condition ($M = -1.60$, $SD = .71$) and both the control condition ($M = -2.02$, $SD = .58$; $p = .01$) and the avoidance condition ($M = -2.16$, $SD = .63$; $p = .04$). These latter two conditions did not differ from one another ($p = .45$). A simple comparison of the approach and control conditions also reveals a significant effect ($t(40) = 2.08$, $p < .05$, $d = .64$). The results from the control condition confirm that participants' attitudes towards insects were generally negative and were statistically different than 0, the neutral response: $t(20) =$

15.98, $p < .001$. In fact, all participants in the control condition rated the insects negatively on average (range: -3.23 to -1.04).

Thus, Experiment 1 provided evidence that approaching insects reduced the negativity associated with them. The present results demonstrate that attitude change from enacting approach movements with respect to subliminally presented objects is not limited to cases in which ambivalence toward the object is high, or for objects about which social norms may encourage counter-attitudinal expressions. It is notable that avoiding the insects did not increase negativity towards insects. One possibility is the procedure had no effects here because insects are already typically responded to with an avoidance response, though this explanation remains tentative.

Experiment 2

Considerable research has demonstrated that humans are biologically prepared to be fearful of spiders (e.g. Mineka & Ohman, 2002). Indeed, spider fear is among the most common fears reported (Kessler et al., 2010). Perhaps consequently, spiders are often represented as sources of extreme threat in art, literature, and film (e.g. Tolkien, 1954; Rowling, 1998). Thus, spiders were selected as a more normatively negative object than the insects from Experiment 2 (a bee, two flies, and two beetles) or the general category of insects. Moreover, implicit measures of attitudes toward spiders suggest that even non-fearful individuals tend to have negative associations (Teachman & Woody, 2003; Ellwart et al., 2006). Thus, although there are certainly some people who have positive associations with spiders (“spider enthusiasts”; Ellwart et al., 2006), evidence indicates that most people hold predominately negative attitudes toward spiders. Spiders also tend to be strongly associated with avoidance behavior (Rozin & Fallon, 1987), and this tendency is amplified in spider fearful individuals (Rinck & Becker, 2007). As noted earlier,

unlike racial attitudes, which show negative associations that often conflict with motivations to avoid prejudice (Fazio et al., 1995), attitudes toward spiders are less likely to be particularly complex and informed by motivations to counter automatic tendencies. For instance, unlike measures of racial attitudes, implicit and explicit measures of spider attitudes tend to strongly correlate, implying that deliberative processes do not act as a countervailing force against automatic associations (Ellwart et al., 2006). That is, attitudes toward spiders are likely to be both negative and predominately univalent.

To test whether these negative and predominately univalent attitudes could be influenced by approach behaviors, we randomly assigned participants to either approach or not respond to subliminally presented pictures of spiders. Given that participants in the avoidance and control conditions in Experiment 1 did not differ in insect attitudes and because we are particularly interested in counterconditioning and its applications, we did not include an avoid condition in the current experiment. As the dependent measure, we assessed attitudes toward spiders implicitly (and exclusively) with the personalized variant of the IAT (Olson & Fazio, 2004). The use of subliminal presentations and the results of Experiment 1 demonstrating generalization to novel insects suggest that the training procedure operates at a broader category level, which is desirable in the context of an intervention. The IAT is useful to further establish this consequence of training, because it is well-suited to measuring category-level attitudes relative to other implicit measures such as evaluative priming (Fazio & Olson, 2003). Further a personalized IAT tests whether the conditioning procedure is capable of establishing changes in liking for the spiders that are evident in relatively automatic responses. Consistent with theoretical work linking approach behaviors with attitude change, and building on the results of

Experiment 1, we predicted that participants who approached spider pictures would hold more positive attitudes toward spiders than participants who did not approach spider pictures.

Method

Participants

Participants were 118 students enrolled in psychology courses at a large midwestern university and offered course credit for completing the study (44 female, 74 male). The ethnic composition of the sample was 82% Caucasian, 6% African American, 5% Asian, and 7% multi-ethnic or other.

Procedure

Each participant was seated in a cubicle with a joystick and a computer that delivered the task instructions. Participants were told the experiment was a test of attention and rapid responding; spiders were not mentioned at this point. Participants were randomly assigned to either the approach condition (in which they approached subliminally presented² spider pictures) or control condition (in which they approached blank screens). The conditioning procedure was nearly identical to that employed in the Experiment 1, with the exception that the stimuli were five color photographs of spiders. Each was a different type of spider against a neutral background (approx. 500 x 400 pixels). The parameters of individual trials and the number and types of trials were the same as described earlier, such that the approach and control conditions mirrored the analogous conditions in Experiment 1.

After the conditioning phase, participants completed a filler task to introduce a delay (approximately 12 minutes) between the conditioning phase and the IAT during which participants attended to a series of various images (unrelated to spiders) and responded whenever

a target appeared. This delay busied the participants and ensures that any effects of approach are not highly transient effects of temporary construct activation. Participants then completed a personalized variant of the IAT (Olson & Fazio, 2004). Moreover, because there is no obvious contrast category to spiders, the implementation involved the single category version of the IAT (Karpinski & Steinman, 2006), as well as personalization. Participants were instructed to categorize various photographs by pressing one of two response keys. The category labels were “Spiders,” “I like,” and “I Don’t Like.” Instructions made clear that pictures of spiders should be categorized as “Spiders”, while any other type of picture should be categorized on the basis of whether participants liked the stimulus or not. These included both positive (e.g. puppies, popsicles, and fireworks) and negative (e.g. graves, garbage, and road-kill) images. Participants completed a series of practice blocks, then completed eight 30-trial IAT blocks, in which 10 trials required the categorization of spiders. In half of these blocks, “Spiders” and “I Like” shared a response key; in the others, “Spiders” and “I Don’t Like” shared a key.

Finally, to assess individual differences in attitudes towards spiders, participants completed the Fear of Spiders Questionnaire (FSQ), a trait-level measure of spider fear shown to have good psychometric properties (Szymanski & O’Donohue, 1995). The FSQ includes 18 questions and uses a 6-point Likert scale, such that scores range from 0 to 108 when coded 0-6. The FSQ was not expected to be influenced by the conditioning procedure, in that it reflects past experiences with and typical responses to spiders. Instead, it was included as an individual difference measure of spider fear that might play a moderating role.

Results and Discussion

To analyze the IAT, data from the first two trials were dropped, and reaction times less than 300 ms or over 3000 ms were recoded to 300 ms and 3000 ms, respectively. Response time

means of each critical block type were computed. Means for blocks in which “Spiders” shared a response key with “I Don’t Like” were subtracted from means for blocks in which “Spiders” shared a response key with “I Like.” Thus, higher numbers reflect greater dislike for spiders.

In line with previous research indicating generally held negative attitudes toward spiders, IAT results indicated that spiders were much more easily associated with “I Don’t Like” than “I Like.” The mean disliking index was clearly greater than zero ($M = 86.9, SD = 87.6, t(117) = 10.77, p < .001$). However, the extent of disliking varied as a function of experimental condition. As predicted, participants in the approach spiders condition ($m = 69.8, sd = 47.4$) evidenced less spider dislike than those in the control condition ($m = 102.4, sd = 110.4; t(116) = 2.04, p < .05, d = .39$).

As expected, given its focus on past experiences and responses to spiders, the FSQ was not affected by the conditioning procedure ($t(116) < 1$). The FSQ correlated positively with the IAT disliking index ($r = .22, p < .05$). The role of the FSQ as a potential moderator of the conditioning effect was examined using regression analysis in which condition was dummy coded (control = 0, approach = 1) and entered with the FSQ as a predictor of the IAT disliking index. Their interaction was added at a second step. At the first step, the analysis indicated statistically significant effects of the FSQ (std. $b = .22, t = 2.47, p < .05$) and condition (std. $b = -.19, t = 2.16, p < .05$). No interaction between the two was evident (std. $b = -.09, t = 0.61, p = .54$), and the effects of FSQ and condition remained significant. Thus, there was no indication that the conditioning procedure was particularly effective or ineffective at any given level of spider fear.

In summary, Experiment 2 indicated that participants who approached spider pictures developed less negative attitudes toward spiders than participants who did not approach spider

pictures. This effect did not differ across levels of self-reported spider fear. As such, these results build on those of Experiment 1 by providing evidence that attitudes toward spiders – which are presumably even more negative and univalent than attitudes toward insects – can be influenced by approach behaviors. Moreover, we demonstrated that this effect is evident not only when attitudes are measured explicitly, but also when attitudes are assessed with an implicit, reaction-time based measure.

Experiment 3

Experiment 3 sought to extend the findings in Experiment 2 in two ways. First, although the effect of approach behaviors in Experiment 2 was shown in a sample of participants who viewed spiders negatively, an even stronger demonstration would involve a sample of individuals who report considerable discomfort with spiders. Thus, in Experiment 3 we recruited a sample of individuals with elevated levels of spider fear. Demonstrating an effect of approach behaviors on spider attitudes in this sample would provide more robust support for the notion that approach procedures can indeed influence negative and predominately univalent attitudes.

Second, Experiment 3 sought to extend the findings in Experiment 2 by demonstrating the effect of approach behaviors on the behavioral and affective concomitants of these attitudes while viewing a live spider. If approach behaviors are capable of changing attitudes towards spiders, one would expect these attitudes to be reflected in how an individual acts and feels when coming face to face with a spider. Furthermore, in order to point toward the potential clinical utility of approach procedures for phobic attitudes, it is important to demonstrate that an approach orientation can impact an individual's affect and behavior in a situation resembling the clinical conditions of exposure therapy. To accomplish this, participants were asked to complete

two behavioral approach tasks (BATs), in which they gradually encountered two live tarantulas in a manner similar to early stages of an exposure therapy protocol (Rowe & Craske, 1998). We predicted that, in this sample of individuals with elevated levels of spider fear, participants who underwent the approach conditioning procedure would demonstrate less anxiety when subsequently encountering a live spider than participants in the control condition.

Method

Participants

Participants were recruited from undergraduate psychology courses at a large midwestern university and were offered course credit for completing the study. All participants completed the Fear of Spiders Questionnaire (FSQ) as a prescreening measure, and scored higher than the median ($FSQ > 41$) among a larger sample of 802 students enrolled in psychology courses. This recruitment strategy yielded a total of 72 participants. Four of these participants no longer scored higher than the median when assessed at the outset of the experiment and were consequently excluded from the analysis, resulting in a sample of 68 participants (46 female, 22 male)³. The ethnic composition of the sample was 78% Caucasian, 4% African American, 12% Asian, and 6% multi-ethnic or other.

Procedure

Participants were randomly assigned to either the approach condition (in which they approached spider pictures, $n = 33$) or control condition (in which they approached blank screens, $n = 35$). The conditioning phase was identical to that of Experiment 2.

After the conditioning phase, participants completed two behavioral approach tasks (BATs) in which they encountered a live tarantula⁴ in small plastic container. State anxiety

during BATs was measured by having participants verbally report Subjective Units of Distress (SUDS; Wolpe, 1969) ratings on a scale of 0 to 100⁵. Participants began 12 feet from the spider container, then were asked to gradually approach, stopping 5 feet, 2 feet, and 0 feet from the container. Participants reported SUDS ratings at each step. Finally, participants were asked to crouch down such that the spider container was at their eye level, look directly through the plastic at the spider, and give a final SUDS rating.

Results and Discussion

To test whether the approach procedure was effective in influencing average SUDS ratings across the two BATs, a mixed model analysis of variance was conducted. Predictor variables included in the model were condition (approach vs. control) and distance from the spider (12, 5, 2, 0 feet, and eye-level). Condition was analyzed as a fixed effect, while distance was analyzed as a repeated measure. Dependent variables included in the model were average SUDS ratings reported at each of the 5 distances from the spider.

As expected, results indicated a significant effect for distance from the spider, with subjects reporting more distress as they got closer to the spider: $F(4,115) = 35.07, p < .001$. More importantly, the effect of condition was significant: $F(1,317) = 13.00, p < .001, d = 0.88$. That is, participants in the approach condition reported significantly lower SUDS ratings over the five distances when encountering live spiders, compared to participants in the control condition. The average mean SUDS rating for participants in the approach condition was 39.4, compared to 46.7 in the control condition. Plots of the mean SUDS ratings at each distance across conditions are presented in Figure 1.

To test whether FSQ score moderated the conditioning effect, FSQ score and the interaction between FSQ score and condition were added to the model as fixed effects. As

expected, there was a significant effect for FSQ score, with higher FSQ scores predicting higher SUDS ratings ($F(1,291) = 116.30, p < .001$). The effect of condition was also significant ($F(1,292) = 6.25, p < .01$). There was no significant interaction between condition and FSQ score ($F(1,291) = 0.16, p = .69$). Thus, as in Experiment 2, the effect of the conditioning procedure did not vary across levels of spider fear, but recall that the range of FSQ scores in Experiment 3 was truncated.

In summary, Experiment 3 demonstrated that individuals with elevated levels of spider fear who underwent the approach conditioning procedure reported less anxiety when encountering live spiders than control participants. There was no indication that this effect varied as a function of trait-level spider fear.

General Discussion

The results from this series of experiments indicate that an approach orientation can impact attitudes that are negative and predominately univalent. Specifically, Experiment 1 showed that participants who approached insect pictures held less negative attitudes toward insects, measured explicitly, than participants who did not approach insect pictures. Experiment 2 extended this effect to spiders, an even more fear provoking stimulus, and showed a change in attitudes on an implicit measure. Experiment 3 extended these findings by demonstrating the effect of an approach procedure on the behavioral and affective concomitants of these attitudes, showing that participants who had been induced to engage in approach movements while spider images were subliminally displayed reported less anxiety when encountering live spiders than control participants. Moreover, Experiment 3 demonstrated these effects in a sample of individuals most likely to hold negative and univalent views of spiders: those with elevated levels of spider fear. To our knowledge, this is the first finding of this nature in the literature.

Such an approach-based intervention might be desirable, for instance, for objects of phobias. The most effective treatment for phobias and many other anxiety disorders – namely, exposure therapy – requires individuals to encounter the very stimuli and situations that they fear and detest most. Those afraid of heights are asked to look over balconies; individuals with contamination fears are encouraged to touch dingy bathroom sinks, and so on. By demonstrating that an approach procedure can influence predominately univalent attitudes, these results have potential implications for the treatment of phobias and other anxiety disorders. The most efficacious psychotherapies for these disorders critically involve exposure to feared stimuli. Indeed, these treatments boast some of the highest response rates of any psychotherapy (Barlow et al., 2007). The problem for many phobic individuals, however, is that they are caught in a Catch-22 of sorts. Although phobic individuals often desperately wish to reduce their anxiety, their anxiety prevents them from committing to the treatment that would do just that. Clinicians and researchers have noted that reluctance to confront the phobic object is a major obstacle to participation in exposure therapy (e.g., Choy, Fyer, & Lipsitz, 2007). If, however, a phobic individual's attitude could be altered (resulting in a reduction in anxiety) prior to deciding whether to seek treatment, it is quite possible that they would be more likely to assent to exposure. The results from the present research point toward this possibility. Moreover, the fact that this procedure is particularly noninvasive, with subliminally presented phobic stimuli, makes it likely to be tolerated by even the most strongly phobic individuals. More research in clinical settings, however, is necessary to examine the extent to which approach procedures impact decisions to seek treatment in individuals with clinical levels of spider phobia.

By producing reductions in anxiety, approach conditioning procedures might also increase the efficacy of exposure treatments. That is, if an individual's anxiety is lowered prior to

exposure, that individual might be more prepared to learn during trials. For instance, reduced arousal might produce fewer urges to engage in safety behaviors, like reassurance-seeking or avoiding direct eye-contact with the phobic stimulus, that have been shown to maintain anxiety and reduce treatment efficacy (McManus et al., 2008). Future research should determine whether pre-treatment approach procedures indeed lead to improved outcomes, and should examine potential mediators (such as the use of safety behaviors) involved.

Future work should also investigate whether different approach procedures can produce more robust changes in attitudes. While the effect of approaching spiders was significant in the present studies, there is certainly room for improvement. It is possible that modifications to the approach procedure (e.g. increased number of trials) could produce stronger changes in attitudes. Another question is whether the nature of the approach movement could be altered for better efficacy. Some research suggests that the particular muscular movements entailed are less significant than the construal of the movement as approach or avoidance (Markman & Brendl, 2005; Neumann & Strack, 2000). However, particular movements may be inherently associated with approach and avoidance; for example, arm extensions and flexions are associated with the onset and offset of pain, respectively, in the pain-tensor reflex, and in the apparent absence of a psychological construal of movement as approach or avoidance, extensions increased the negativity of concurrent evaluations while flexions increased their positivity (Cacioppo, et al., 1993). In our research, we enacted approach with arm extensions because this is a natural way to use a joystick, but it may be that arm flexions are more potent. More involved, comprehensive bodily approach movements, the inclusion of a representation of the self on the screen (e.g. Markman & Brendl, 2005), and the strategic selection of appropriate stimuli are but a few potential avenues that might conceivably increase efficacy. The current research does not

demonstrate that observed changes in attitude or behavior are meaningfully consequential for phobics, and the observed effect sizes are not large. Further refining the procedures is a necessary first step for evaluating such an intervention's potential.

One limitation of this research is that the methodology could not assure that every presentation of insects or spiders for every participant was indeed subliminal. Though pretesting suggested awareness was unlikely, we cannot rule out the possibility that some presentations of images were correctly identified, or that any awareness that occurred contributed to the effect on attitude change. Some have argued that such conditioning effects are contingent upon propositional reasoning that requires awareness (e.g. De Houwer, 2009). Though this contentious issue is beyond the scope of this paper, we will note that it is not central to the question of whether such procedures can successfully mitigate negative attitudes. Very rapid presentations of disliked images have the advantage of provoking category-level activation of targeted concepts while minimizing aversive subjective reactions and the salience of negative features of the particular stimuli employed. The effect of identification of the stimuli or correct guessing thereof remains unknown.

Similarly, we do not believe one undergoing an approach intervention must be kept totally ignorant of the stimuli being approached. This would, in addition to complete subliminality, require vagueness and possibly deception in presenting the task, which may be especially problematic in applied contexts. Although sometimes best minimized in a research context, it may even be that awareness of the intervention's nature has additional therapeutic value if it is known and perceived as valid. Regardless of such speculation, the aforementioned advantages of rapid presentation are largely unrelated to what the participant knows about the task; we do not hypothesize that the participants' ignorance of the intervention's nature is a

necessary condition of its efficacy. Nevertheless, consideration of how such an intervention would be presented, in particular with respect to the rapid presentation of phobic objects, in a treatment context is an important aspect of evaluating its feasibility.

In closing, the present set of studies provides new evidence that approach behaviors can impact attitudes that are negative and predominately univalent. As such, these results point toward promising improvements in the treatment of phobias and anxiety disorders. Hopefully, extensions of this work will help anxious individuals get past their understandable initial reluctance to exposure therapy, countering negative attitudes enough to get them through the clinic door, and on a better path toward conquering their fears.

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Footnotes

1. A mixed ANOVA with condition as a between-subjects variable and insect type (presented vs. non-presented) as a within-subjects variable confirmed that the effect of condition did not vary between presented and non-presented insects. The interaction between the two factors was non-significant: $F(2, 62) = 1.03, p = .36$.
2. To ensure that the spider pictures were indeed presented subliminally in the conditioning phase, we conducted a pilot test with 12 student participants. Participants completed the trials associated with the approach condition described above, then were presented with a recognition test to determine whether they could identify any of the spider pictures presented. In this recognition test, 40 stimuli were presented in random order with the question “Did you see this image?” 5 of the 40 stimuli were the actual spider pictures presented in the trials, while the other 35 were foils from various categories of animals, including 5 pictures of spiders not presented during trials. Results indicated that none of the 12 participants reported ‘yes’ responses to any of the pictures of spiders, either those originally presented or the foils. These results suggest that presentation of spider images in trials were indeed subliminal.
3. When the data are analyzed using all 72 participants, there is no change in the significance of any findings.
4. The spiders used in the study were tarantulas from the *Brachypelma* genus: *Brachypelma smithi* (The Mexican Red-Knee Tarantula), and *Brachypelma albopilosum* (The Honduran Curlyhair Tarantula). Members of this genus were used because of their reputation for docile temperament and because of the distinct differences in sizes and appearance across spiders.

5. Participants were provided the following anchors when reporting their SUDS ratings: “A score between 0 and 25 would indicate very little or no anxiety, 50 moderate anxiety, 75 strong anxiety, and 100 severe anxiety, or the most anxiety imaginable.”

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Figure 1

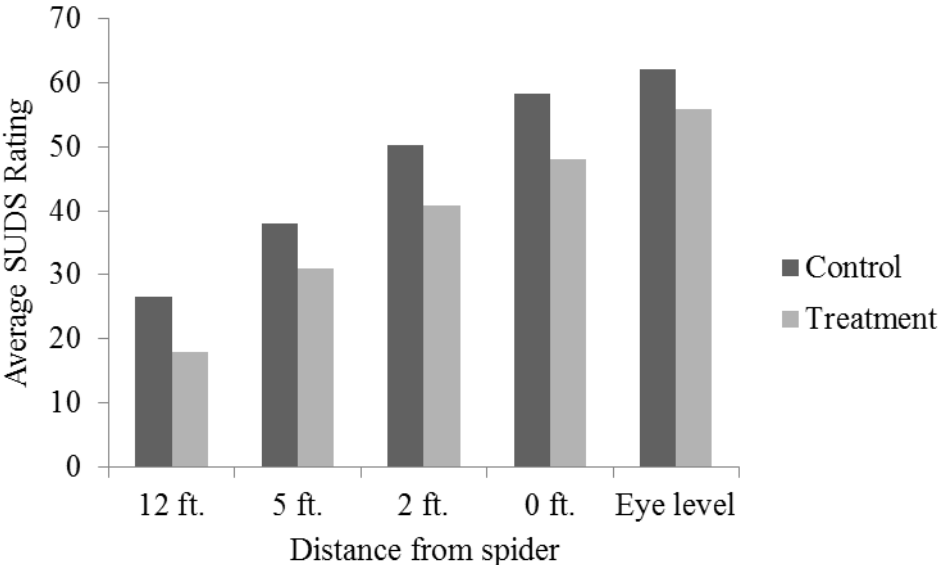


Figure 1. Differences in average SUDS ratings across BATs for treatment and control groups.