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Attention training for reducing spider fear in spider-fearful individuals

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ABSTRACT

Cognitive theorists propose that attentional biases for threatening information play an important role in the development and maintenance of anxiety disorders. If attentional biases for threat figure in the maintenance of anxiety, then the experimental reduction of the bias for threat (attention training) should reduce anxiety. We randomly assigned 41 spider-fearful individuals to receive either attention training ($n = 20$) or control procedures ($n = 21$). We used a modified dot-probe discrimination paradigm with photographs of spiders and cows to train attention. Training reduced attentional bias for spiders, but only temporarily. Although both groups declined in spider fear and avoidance, reduction in attentional bias did not produce significantly greater symptom reduction in the training group than in the control group. However, reduction in attentional bias predicted reduction in self-reported fear for the training group. The reduction in attentional bias for threat may have been insufficiently robust to produce symptom reduction greater than that produced by exposure to a live spider and spider photographs alone. Alternatively, attention training may be an unsuitable intervention for spider fear.

1. Background

Cognitive theorists propose that attentional biases for threatening information play an important role in the development and maintenance of anxiety disorders (Beck & Clark, 1997). Using a variety of methods, researchers have consistently found attentional biases for threatening information among individuals with anxiety disorders (for reviews Harvey, Watkins, Mansell, & Shafran, 2004; Williams, Mathews, & MacLeod, 1996). If attentional biases for threat maintain anxiety, then the experimental reduction of the bias for threatening information (attention training) should reduce anxiety. Recently, investigators have begun to study attention training by modifying the dot-probe paradigm.

MacLeod, Mathews, and Tata (1986) developed this paradigm to measure attentional biases for threat among anxiety disorder patients. Participants view two stimuli (a threat-related word/photograph and a neutral word/photograph) presented in two areas of a computer screen. Immediately thereafter, a probe replaces one of the stimuli. Participants respond to the probe as quickly as possible. An attentional bias for threat-related stimuli occurs when participants are faster to respond to the probe when it replaces a threat stimulus than when it replaces a nonthreat stimulus, thereby implying that the participant's attention is directed to the location occupied by the threat stimulus. The dot-probe discrimination task is a variant of the dot-probe paradigm. It requires participants to identify the nature of the probe (e.g., the symbol: or ..; the letter E or F) as quickly and accurately as possible.

In attention training, the dot-probe paradigm is fixed so that the probe nearly always replaces either the threat-related or neutral stimulus. When participants complete this modified dot-probe, they learn that they can increase the speed of response if they attend to the stimulus that best predicts the location of the probe.

MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) were the first investigators to modify the dot-probe paradigm to produce an attentional bias for either negative or neutral words in healthy individuals. They found that those participants trained to attend to negative material, when compared to participants trained to attend to neutral material, reported greater increases in negative mood and anxiety after completing a stressful anagram task. That is, the training procedure produced an attentional bias for negative material that rendered participants vulnerable to responding anxiously to a subsequent laboratory stressor.

More recent work has demonstrated that attention training with the modified dot-probe paradigm can reduce attentional bias for threat as well as symptoms of anxiety among students (Mathews & MacLeod, 2002; See, MacLeod, & Bridle, 2009), and people with social anxiety (Amir, Weber, Beard, Bomyea, & Taylor, 2008; Amir et al., 2009; Li, Tan, Qian, & Liu, 2008; Schmidt, Richey, Buckner, & Timpano, 2009), generalized anxiety disorder (Amir, Beard, Burns, & Bomyea, 2009), and sub-clinical obsessive–compulsive disorder (Najmi & Amir, 2010).

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In our experiment, we adapted procedures of MacLeod et al. (2002) and Mathews and MacLeod (2002, experiment 8) to examine the effect of attention training on levels of spider-related anxiety in spider-fearful individuals. Spider-fearful individuals have consistently demonstrated attentional biases for spider-related information on reaction time and eye-tracking measures of attention (Kindt & Brosschot, 1997; Mogg & Bradley, 2006; Pflugshaupt et al., 2005; Rinck, Reinecke, Ellwart, Heuer, & Becker, 2005). These biases for threat also decline following successful treatment (van den Hout, Tenney, Hyugens, & de Jong, 1997). Although no one has attempted to modify pre-existing attentional biases for spiders in spider-fearful individuals, Harris and Menzies (1998) used the modified dot-probe paradigm to induce a bias either toward or away from spider-related words in non-fearful participants. In this case, induction of a bias in both directions was successful although the induction of a bias toward spider-related words did not increase spider fear. However, training was perhaps too brief (40 dot-probe trials) to produce a robust change in attentional bias.

Researchers have yet to test whether one can attenuate pre-existing attentional biases in spider-fearful participants and whether any attenuation results in symptom reduction. We hypothesized that attention training designed to produce a bias toward nonthreatening pictorial stimuli will result in decreased levels of spider fear, and behavioral avoidance among spider-fearful individuals. We also hypothesized that degree of reduction in attentional bias for spiders will predict degree of reduction in spider fear, and behavioral avoidance among spider-fearful individuals.

Additionally, we examined whether participants learned to attend to neutral stimuli or to disengage attention from threatening stimuli. During the attention training, our participants saw pairs of cow and spider photographs (trained pairs). Subsequently, when we tested participants' attentional biases with the unmodified dot-probe discrimination task, participants saw trials with cows and spiders as well as birds and spiders (untrained pairs). By contrasting participants' reaction times for the trained pairs with the untrained pairs, we hoped to determine whether the learned bias results from attentional capture by the cow photographs or from attentional disengagement from the spider photographs. If participants show a reduction in bias for spiders for the trained stimulus pairs and not the untrained stimulus pairs after training, this would suggest that they are learning to attend to the cow photographs. Therefore, when that stimulus is absent, they do not exhibit the learned bias. If, however, participants show a reduction in bias for spiders for the trained and untrained pairs after training, this would suggest that the participants are learning to disengage from the spiders.

2. Method

2.1. Participants

Forty-four spider-fearful individuals (34 female; 38 White, 3 Asian, 3 Black) between the ages of 18 and 50 were recruited from the Boston area through craigslist.com. One-hundred and three individuals responded to our advertisements and those individuals who scored in the upper 25th percentile of the Spider Questionnaire (SPQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974), according to the separate norms established for males and females were invited to participate. Two participants did not return after the first visit. One participant was excluded for failure to follow study instructions. These participants are not included in any further presentation of results. The remaining 41 participants were randomly assigned to training ($n = 20$) or control procedures ($n = 21$). Neither the experimenter nor the participant was aware of the experimental condition until the end of the experiment. Mean age of participants was 26.3 years. Training and control groups did not differ in age, self-reported spider fear, or behavioral avoidance at baseline (Table 1). Participants were paid $55 for participating.

Table 1
Baseline characteristics of the training and control groups.

	Training	Control	*t*	*p*
Age				
M	26.0	26.7	.28	.78
SD	7.48	8.73		
SPQ				
M	21.5	21.1	.29	.77
SD	4.53	4.30		
BAT score				
M	3.15	3.57	.99	.33
SD	1.27	1.43		

2.2. Apparatus

Stimuli were presented on a T42 IBM laptop with a 28.5 cm × 21.5 cm screen, and E-prime (Schneider, Eschman, & Zuccolotto, 2002) presented the computer tasks and recorded reaction times in milliseconds. Button-press responses to the dot-probe discrimination testing and attention training/control procedure were recorded on a serial response box, Model 200a, manufactured by Psychology Software Tools, Inc. Participants sat approximately 65 cm from the monitor for all computer tasks.

2.3. Measures

Spider Questionnaire (SPQ): The Spider Questionnaire is a 31-item questionnaire developed to assess fear of spiders (Klorman et al., 1974).

Visual analogue scale (VAS): Immediately before and after the training or control procedure, participants rated their feelings on 10 dimensions (relaxed, tense, happy, sad, awake, tired, calm, afraid, attentive, bored) by making an X on a 100 mm line ranging from 0 (not at all) to 100 (extremely).

2.4. Tasks

2.4.1. Behavioral Avoidance Test (BAT)

Participant's willingness to approach a caged, tarantula (Chilean Rose, *Grammastola rosea*) was measured. Participants were rated on a scale from 0 (not avoidant) to 5 (extremely avoidant). Those participants unwilling to enter the room with the spider received a score of 5. Participants only willing to enter the room briefly received a score of 4. Participants willing to stay in the room with the caged spider for 3 min received a score of 3. Participants willing to sit next to the spider's cage for 3 min received a score of 2. Participants willing to sit next to the open spider's cage for 3 min received a score of 1. Participants willing to touch the spider received a score of 0. Additionally, Subjective Units of Distress (SUDs) ratings of fear from 0 (no fear) to 100 (the most fear ever experienced) were obtained at each level of approach undertaken by the participant.

2.4.2. Dot-probe discrimination task

Dot-probe discrimination testing consisted of 96 trials delivered in one block. Each trial began with a fixation asterisk displayed in the center of the computer monitor for 1000 ms. Following the disappearance of the asterisk, two photographs appeared just above and below center screen. Five-hundred milliseconds later, the photographs disappeared and a probe (the letter E or F) appeared in one of the locations previously occupied by the photographs. The participant's task was to identify the letter by pushing the corresponding button (E or F) on a serial response box as quickly and as accurately