DV = phobias for snakes vs. spiders

Teach, G, & W ~~JESP~~ JAP

NEW

Input self

IATs: good-bad (att) danger-safety disgusting-appealing afraid-unafraid

(10) DOMAIN: A/1= race, B/2= ethnicity C/3 = gender-sex D/4 = food or drink

E/5 = other consumer F/6= political G/7 = drugs or tobacco

H/8 = self esteem J/9= personality/self K/10 = clinical pg 226

L/11= relationships M/12= other? (not a tony category)

(11) BEHAVIOR: single=1, average=2, 3 = unknown pg 228

EMs: No ECCs

(12) IAT TYPE attitude=1, belief=2, self=3, not reported = 4 p229 att + other assoc IATs

n/a (13) EM TYPE: attitude=1, belief=2, self=3, not reported = 4

(14) OVERALL METHOD: not=0, observed=1 pg 228

Check: Maybe 3 or 1

(15) METHOD: RepPast=1, future=2, emotion=3, judge=4, obs=5, neuro=6, other=7 pg 228

(16) SCORE: millisecond=0, log=1, algorithm=2, NotReported=3 pg 230: "reciprocally transformed"

(17) words=0, pictures=1, NotReported=2 pg 229

(18) number of IATs: 4 p229

(19) IAT ORDER: NotReported=0, iatfirst=1, iatsecond=2, iatthird=3 pg 228

n/a (20) EXPLICIT ORDER: NotReported=0, explicitfirst=1, expsecond=2, explthird=3

(21) BEHAVIOR ORDER: NotReported=0, behfirst=1, behsecond=2, behthird=3 pg 228

(22) IAT vs. behavior: NotReported=0, before=1, after=2, counter=3 pg 228

n/a (23) EXPLICIT vs. beh: NotReported=0, explicitfirst=1, expsecond=2, counter=3

(24) IAT SESSION: same=0, different=1 pg 228

n/a (25) EXPLICIT SESSION: same=0, different=1

(26) IAT SOCIAL DESIRABILITY 1-7 3, pg 228

(27) EXPLICIT SOCIAL DESIRABILITY 1-7 n/a

(28) BEHAVIOR CONTROLLABLE: **1-10** 2, pg 228

(29) IAT SPECIFIC 1-7 5, pg 228

(30) EXPLICIT SPECIFIC 1-7

(31) OPPOSITION 1-5 2, pg 228

(32) RACIAL, 0=not, 1=racial pg 226

(33) type of iat: single=1, dual=2, personalized=3 pg 228

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Implicit Associations for Fear-Relevant Stimuli Among Individuals With Snake and Spider Fears

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This study investigated an implicit measure of cognitive processing, the Implicit Association Test (IAT; A. G. Greenwald, D. E. McGhee, & J. L. K. Schwartz, 1998), as a measure of fear-related automatic associations. Sixty-seven students with snake or spider fears completed 4 IAT tasks in which they classified pictures of snakes and spiders along with descriptive words indicating valence, fear, danger, or disgust. Results indicated that all 4 tasks discriminated between fear groups in terms of their implicit associations, and fear-specific effects were significant even after controlling for the impact of valence evaluation. Findings are discussed in terms of applications of the IAT methodology to examine cognitive processing and schemata in anxiety and potential uses for assessing anxiety disorders.

With the expanding popularity of cognitive theories of emotional disorders, investigators have tried to determine how cognitive processes are implicated in the onset and maintenance of emotional dysregulation. In particular, researchers over the last two decades have increasingly focused on information-processing differences among individuals suffering from anxiety. The general cognitive model of anxiety posits that maladaptive schemata influence information processing to make the individual more attentive to potentially threatening cues, more likely to interpret ambiguous cues as threatening, and more likely to recall cues relevant to the fear schema (e.g., Beck, 1976; Beck & Emery with Greenberg, 1985). Although researchers have made substantial progress in clarifying the nature of some cognitive processes, such as attentional and encoding biases, there remains great difficulty in characterizing other processes, such as memory effects. These complexities have made it difficult to form a coherent picture of the cognitive functioning of anxious persons.

In one review of the literature on memory biases, MacLeod and Rutherford (1998) concluded that anxiety is frequently associated with implicit bias (i.e., emotional influences on memory in the absence of conscious or explicit recall of the precipitating information), but they found little compelling evidence for anxiety-related explicit bias, which involves a conscious effort to remember information. Other reviewers have disagreed, arguing that the findings are simply too confusing to draw any conclusions (e.g., Dalgleish & Watts, 1990) or even that "there is actually very little evidence to support the presence of an implicit memory bias among either high trait anxiety individuals or clinically anxious individuals" (Russo, Fox, & Bowles, 1999, p. 439).

The incongruent results found for memory biases are problematic given that the cognitive model is centered on the organizing influences of basic cognitive structures in memory (i.e., schemata). Further, without a clear understanding of memory effects, it is difficult to interpret the more consistently observed biases in attention and judgment. Most tests of memory bias have used paradigms that examine bias in recall or recognition of fear-relevant items. Although this represents one important aspect of biased information processing in memory, these paradigms are not able to evaluate more basic, underlying biases in memory structure (such as automatic associations in memory) that more closely reflect anxious schemata. Recall that schemata, which lie at the heart of the cognitive model, are generally conceived of as mental templates or cognitive structures in memory that automatically guide the way we perceive and interpret our experience (e.g., Fiske & Taylor, 1991; Myers, 1994). Thus, investigating memory biases that seem to occur at this very basic, structural level in memory (akin to schematic processing) may help to clarify the nature of fearful associations and enable more comprehensive evaluation of the cognitive model of anxiety.

The information-processing work testing for biases among spider phobia has tended to focus on attentional biases, using the modified Stroop task. There have been some interesting applications of other cognitive methodologies, such as writing of situation-specific scripts (Wenzel & Holt, 2000), abstract anticipatory memory for threatening imagery scripts (Kindt, Brosschot, & Boiten, 1999), and thought-suppression studies (Muris, Merckelbach, Horselenberg, Sijsenaar, & Leeuw, 1997; Zeitlin, Netten, & Hodder, 1995), but a coherent picture of phobia-specific processing has not yet emerged from these efforts.

The Stroop research has produced somewhat more consistent results, although the parameters of the interference effect are unclear. In one study, Watts and colleagues (Watts, McKenna, Sharrock, & Trezise, 1986) found that individuals with spider

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ory should be opposing. Specifically, spider-fearful individuals would more quickly associate spiders with negative descriptors, whereas snake-fearful individuals would more quickly associate snakes with negative concepts. We included four different IAT tasks (valence evaluation, fear, danger, and disgust) to determine which evaluative or semantic qualities related to the fear response would be evident at the level of basic associations. Moreover, in order to test whether the IAT could capture automatic associations related specifically to fearful responding, we assessed whether the fear, danger, and disgust IAT tasks would continue to discriminate the fear groups after controlling for the effects of valence evaluation.

Method

B prescreen

Participants

28 29

19 24 21 14 22 15

Approximately 1,000 Yale University undergraduates were prescreened on the 9-item animal subscale of the Fear Survey Schedule—III (Wolpe & Lang, 1964), which requires participants to rate their level of fear toward particular animals on a 5-point Likert-type scale. The goal was to select participants who were highly fearful of snakes but reported low fear of spiders, or who were highly fearful of spiders but reported low fear of snakes. Students who differed in their reported fear of snakes and spiders by at least three points (e.g., fear level of 4 for one animal *and* 1 for the other) were contacted and invited to participate in the study. Compensation involved either money ($7) or partial course credit. Sixty-seven college-aged participants (30 snake-fearful, 7 men; 37 spider-fearful, 12 men) were included in the final analyses. The gender ratio in this study approximates the prevalence rates found for specific phobias in the general population.

To reduce the possibility of response bias on self-report measures, participants were not informed as to why they were selected (i.e., their particular snake–spider fear pattern). They were simply invited to participate in a study of information processing and animal fears. In addition, the prescreening measure asked students to rate their fear level toward a variety of animals (not only snakes and spiders), and there was a delay of several weeks between completion of the prescreening measure and the initial phone contact from an experimenter.

Materials

Questionnaires. Participants completed two established measures of specific animal fears. The Snake Questionnaire (SNAQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974) is a 30-item, true–false measure in which participants rate their feelings toward snakes and their avoidance and escape behaviors. Similarly, the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) is an 18-item Likert-type measure (on a 7-point scale) that asks questions about participants' avoidance and fear of harm from spiders.

IAT

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IATs. The IAT is a task in which individuals classify words or pictures into superordinate categories. Two sets of category pairs are presented simultaneously; one pair represents the target categories of interest (in this case, spiders and snakes), and a second represents descriptive categories (such as good and bad). During the test, participants see four category labels on the screen simultaneously: a target and descriptor category paired on one side of the screen (e.g., spiders and bad), and the opposite target and descriptor category paired on the other side of the screen (e.g., snakes and good). Stimuli representing any of these four categories can appear in the center of the screen on a classification trial, and the task is for participants to indicate on which side of the screen each stimulus belongs (i.e., what category it fits into). Thus, participants classify stimuli from the four concepts using just two responses (right or left side of screen), with each side assigned to two of the four concepts. Word stimuli are used for the descriptor categories, and pictorial stimuli of snakes and spiders are used for the target categories (selection of stimuli is discussed below). Equal numbers of stimuli from each of the four categories appear during each IAT task, so that participants classify both words and pictures in all four of the snake–spider IAT tasks.

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Stimuli are expected to be classified more quickly when the target and descriptor category pairings match the individual's automatic associations with the target (snake–spider) categories versus when the target and descriptor category pairings are mismatched. For example, the present study focused on individuals' fearful associations for snakes and spiders. A person who has negative automatic associations for snakes is expected to classify a picture of a snake relatively quickly when the target category "snake" appears on the screen alongside a negative descriptor category, such as "danger," because of the match to this person's automatic associations. However, this same antisnake person should classify a picture of a snake relatively slowly when the category "snake" appears on the screen paired with the descriptor "safety," because this is incongruent with the person's automatic negative associations with snakes. In each case, the person's implicit associations to one target category are assessed relative to his or her associations to the other target category; in essence, the IAT measures the relative strength of the paired associations. So, in the present study, automatic associations with snakes were measured relative to automatic associations with spiders.

Figure 1 illustrates how a computer screen might appear during a critical classification trial. In this pairing, the target category "snake" and the descriptor category "danger" have been paired on the left side, and "spider" and "safety" categories have been paired on the right. In the example presented in Figure 1, the correct response is to classify the stimulus into the spider category on the right side of the screen using the right-sided key. An incorrect response would be followed by feedback that the classification was inaccurate, before immediately proceeding to the next classification trial.

In a subsequent set of classifications, snake would be paired with safety, and spider would be paired with danger. Thus, participants classify the pictorial and word stimuli when the target animal categories are paired with associatively matched descriptor categories and again when the categories are paired with mismatched descriptor categories. The measure of interest is the difference between latency of responding when matching categories (e.g., snake–danger) are paired versus response latency when mismatching categories (e.g., snake–safety) are paired. The hypothetical trial shown in Figure 1 should match the automatic associations for snake-fearful participants because, for these participants, the association of snakes with danger and spiders with safety is a better match than the association of snakes with safety and spiders with danger. In contrast, the trial should be a mismatched association for spider-fearful participants because the opposite pattern of associations reflects their automatic negative associations with spiders. Thus, snake-fearful participants would be expected to complete the hypothetical classification trial in Figure 1 faster than spider-fearful participants because the category pairings more closely match the negative snake associations.

Figure 1 illustrates a trial in which participants are asked to categorize a spider picture. The process would be identical if a word had appeared in the center of the screen to be classified. For example, imagine that the photograph in Figure 1 was replaced by the word "lethal." Participants would categorize this stimulus into the category "danger" using the same method used for the photographs. Before the target and descriptor categories are paired (as shown in Figure 1), participants practiced categorizing photographs into the "spider" and "snake" categories and words into the opposing descriptor categories (e.g., danger–safety) in separate practice trials.

All participants completed four snake–spider IAT tasks, each lasting approximately 3–4 min. There were two critical trial blocks in each IAT task—one block of trials where the sets of target and descriptor categories were matched (e.g., snake plus disgusting and spider plus appealing for a snake-fearful participant) and one block in which the sets of target and

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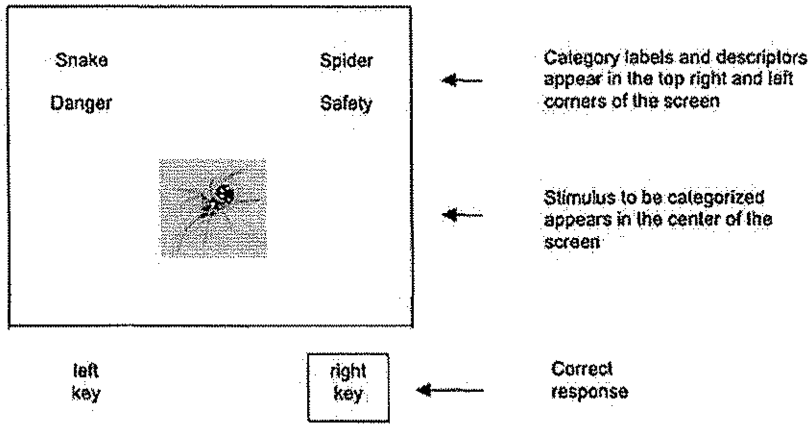

Figure 1. Schematic depiction of the Implicit Association Test procedure. Participants classify the stimulus using either the right or left key. The correct classification of the spider picture is on the right key in this example. This classification trial would represent an associatively matched pairing for a snake-fearful individual (because snakes are associated with danger) and an associatively mismatched pairing for a spider-fearful individual (because these individuals do not associate spiders with safety).

descriptor categories were mismatched (e.g., snake plus appealing and spider plus disgusting for the same snake-fearful participant). As the above example demonstrates, whether target plus descriptor category pairs were congruent (matched) or incongruent (mismatched) depended on whether the participant was snake- or spider-fearful. Each critical block consisted of 48 classification trials. Of these, the first 12 were practice trials, and the remaining 36 constituted the experimental data.

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IAT stimuli. The investigators generated a large selection of words to serve as potential stimuli for each of the following descriptive constructs: danger, safety, disgusting, appealing, afraid, unafraid, bad, and good. These stimuli were approximately matched for length and then prerated on 7-point Likert-type scales by a group of students ($N = 21$) for ease of categorization. Ease of categorization was selected, rather than word familiarity, because researchers have established that the implicit attitudes demonstrated with the IAT cannot be explained by differential familiarity with the word stimuli used to represent the target categories (Dasgupta et al., 2000; Ottaway et al., in press). The best three items for each descriptor category were chosen. Table 1 displays the final selection of descriptors with their associated stimuli.

Snakes and spiders were selected for the relative target categories because they can be effectively compared as both are common specific animal fears. In our pilot work, we established that the stimuli used to represent the snake and spider categories were evaluated equally negatively and were matched for level of fearfulness and disgust. In this way, we could be confident that the snake and spider categories were generally comparable to one another in terms of their negative valence and fear-evoking appearance. The purpose of this pretesting was to minimize alternative explanations for differential responding to the animal categories due to potential differences in their perceived likeability. To generate stimuli, photographs of snakes and spiders were downloaded from various websites. A broad range of animal photos were downloaded to reflect the variety of different species within an animal group (e.g., spiders of different colors and degree of hairiness). The same group of 21 students who prerated the word stimuli rated each photograph on 7-point Likert-type scales for ease of categorization, as well as for the degree of fear, disgust, and pleasantness evoked. For the snake and spider categories, the three items that were best matched on all of the above characteristics were selected. This insured that differences in IAT reaction times between the fear groups could not be attributed to difficulties in classifying the stimuli or to differentially threatening or negative items. All photos used in the IAT tasks were standardized to a height of 10 cm, with the width varying between 8 and 16 cm (to maximize clarity of the object). All were high resolution and in full color. Thus, for each descriptor category, three words were used as stimuli, and for each target category (snake or spider), three pictures were used as stimuli. Pictorial stimuli are available from Bethany A. Teachman on request.

There were a number of reasons why we chose to use pictorial rather than text-based representations of animals. First, there has been disagreement in the literature about the importance of physical versus semantic content of threatening stimuli (MacLeod & McLaughlin, 1995; McNally, 1995). Some researchers have found an equal bias toward pictures and words of phobic stimuli (Kindt & Brosschot, 1997), whereas others have found no effect for words and question the external validity of written stimuli (Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994). Second, Marks (1987) noted that whereas fear responses are frequently elicited by pictorial phobic stimuli, a fear reaction to phobia-relevant words alone is rare. Third, our pilot work suggested that pictures might yield more robust results. Therefore, based on their more reliable provocation of anxiety, pictorial animal stimuli were used as target stimuli for all tasks.

Table 1
Descriptor Categories and Associated Subordinate Stimuli for Implicit Association Test (IAT) Tasks

Descriptor category label	Stimuli to be classified		
Danger	Threatened	Harm	Lethal
Safety	Protected	Secure	Home
Disgusting	Gross	Repulsive	Sickening
Appealing	Tasty	Attractive	Tempting
Afraid	Scared	Frightened	Alarmed
Unafraid	Calm	Relaxed	Tranquil
Bad	Awful	Terrible	Evil
Good	Great	Wonderful	Nice

Apparatus

The experiment was conducted on IBM-matched desktop computers and programmed using Inquisit (Draine, 1999) running in either Windows 95 or Windows NT. Participants sat approximately 24 inches from a 17-inch high-resolution monitor and gave responses for the left-side categories by pushing the "A" key with their left forefinger and responses for the right-side categories by pushing the "5" key (on the numeric keypad) with their right forefinger.

Procedure

The order of tasks was randomized in each set of IAT tasks. Additionally, within each IAT task, the order in which the associatively matched versus mismatched blocks appeared was co~~unterbalanced~~. Furthermore, we counterbalanced the order in which the IAT tasks versus the explicit questionnaires were completed, the order that the explicit snake and spider fear questionnaires were completed, and the order in which participants completed the sets of IAT tasks. To minimize the effects of fatigue, there was a 5-min break between the sets of IAT tasks during which participants had an opportunity to rest and read magazines.

Given the novelty of the task, all participants initially completed an unrelated practice IAT task (categorizing green vs. white objects) to familiarize them with the procedure. Participants were told that they would be completing a series of classification tasks during which they were to place words and pictures into categories that appeared on different sides of the screen. They were further instructed that the classification was completed by pressing one of two computer keys (and the experimenter demonstrated the process), and they were told that this was a response time task so they should try to proceed as quickly and as accurately as possible. To encourage accurate responding, error messages were flashed on the screen following incorrect classifications. In addition, error rate and average response times were displayed at the end of each task. The purpose of providing error feedback was to maintain motivation throughout the task. Because participants were instructed to classify the stimuli as quickly and as accurately as possible, the error feedback helped to sustain this goal. Further, given that the dependent measure involved comparison of response times for the matched and mismatched conditions, it was desirable to make the speed and accuracy goals salient across both conditions.

Results

Data Reduction

Prior to conducting the planned analyses, distributions of the IAT latency data were examined to check for outliers. Unusually slow responding on a trial (i.e., slow classification of the stimulus) typically indicates momentary inattention, whereas abnormally fast responding generally reflects anticipatory responding (in advance of actual perception of the stimulus). Accordingly, response latencies less than 300 ms or greater than 3,000 ms were counted as errors and recoded as 300 or 3,000 ms. These values reflect the standard cutoff times established by Greenwald et al. (1998) and are designed to be inclusive of individual trial data, so that variability in response time can be accommodated without including data that likely reflect inadequate performance on the task. In addition, participants' data were deleted if the error rates (i.e., % of stimuli classified incorrectly) on the critical IAT blocks were greater than 20%. As a result of these checks, data from 4 participants were omitted. The remaining trial latency data were reciprocally transformed (1,000/latency in ms) before being averaged ~~over each block. Analyses were conducted using these transformed~~ data (which can be interpreted as number of items per second) because this conversion stabilizes latency variance and normalizes the distribution. Given that the pattern of results is the same for both the untransformed and transformed data, we report only the transformed data here. Further details on this transformation are provided in Greenwald et al. (1998).

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Questionnaires

Comparisons between our sample and those of previously published studies provide assurance that the fearful groups were strongly (and comparably) fearful, even though they were not formally diagnosed as phobic. Specifically, on the SNAQ, the snake-fearful group scored approximately two standard deviations above the normal college student sample described by Klorman et al. (1974; our means were 15.7 ± 5.9 and 5.6 ± 3.9, respectively, for the snake and spider fearful groups), and around the 95th percentile of samples reported by both Klieger (1987) and Klorman et al. (1974). In a Swedish sample of snake and spider phobics (using a translation of the SNAQ), the mean score on the SNAQ for their snake phobic sample was 24.44 ± 2.95, and for the spider phobic group, the mean was 8.06 ± 6.07 (Fredrikson, 1983). Our snake phobic group mean is at a lower level than their phobic group, but this may be a consequence of using the translated version of the SNAQ, because our means are comparable to English samples. The finding that our spider fear group performs at an equivalent level on the SNAQ as was found in the Swedish sample suggests that similar relative fear differences exist in the two samples.

On the FSQ, the spider-fearful group scored approximately one standard deviation below the mean of spider phobics in the Muris and Merckelbach (1996) study. Specifically, our sample means were 68.3 ± 23.7 (spider-fearful) and 31.9 ± 14.3 (snake-fearful), whereas their mean for spider phobics was 89.1 ± 19.6. Although it is not possible to directly evaluate magnitude of fear across our spider- and snake-fearful groups, the comparable findings across studies using the same questionnaires indicate that they are similar high-fear groups. In addition, SNAQ scores were significantly higher for the snake-fearful group than for the spider-fearful group, $t(66) = 8.46$, $p < .0001$, $d = 2.08$,[1] and the reverse pattern was found for the FSQ, $t(66) = -7.39$, $p < .0001$, $d = 1.81$.

Given the importance of determining that our participants were appropriately classified in their respective animal fear groups, we also conducted the analyses reported below after removing 2 participants whose SNAQ and FSQ profiles did not match their prescreening profile (i.e., they were not clearly in the snake- or spider-fear cluster). The results were not different in any way, so we report results for the full sample here.

IAT Effects: Snake–Spider Tasks

To determine whether the IAT measures of automatic associations would capture differences in responding to specific-fear stimuli, repeated-measures analyses of variance (ANOVAs) were conducted for each of the four snake–spider IAT tasks. The IAT critical blocks (average transformed response latencies for matched vs. mismatched blocks) served as a within-subjects factor,

[1] The effect size d is described in Rosenthal and Rosnow (1991) and is commonly used for t tests to index the magnitude of an effect independent of sample size. As recommended by Cohen (1988), a magnitude of d between 0.2 and 0.5 reflects a small effect, 0.5 to 0.8 reflects a medium effect, and above 0.8 reflects a large effect.