Changes in memory for previously neutral stimuli following the addition of threatening information

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ABSTRACT

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There are a number of aetiological pathways to the development of anxiety disorders, including those associated with stressful triggering situations. It has been suggested that life events can provide new meaning to past situations, leading to the delayed onset of a disorder. Whether or not a disorder will emerge is theoretically related to one's appraisal and memory of prior events, and memory biases are proposed to exist for threat-related information in association with anxiety disorders. Given that a new event may change the meaning of past events, it is possible that threatening information can change one's memory for once neutral events. The current study aimed to examine the effect of threatening information on memory for previously encoded (neutral) stimuli. Participants were 115 undergraduate students. Each participant learned 30 neutral objects (displayed in two boxes) and completed a recall memory test. They were then randomly assigned to either receive new threatening or new neutral information about half of the already-learned objects (one of the boxes); a second recall test was subsequently completed. Individuals in the Threat condition showed a greater proportion of memory for items that were manipulated to items that remained neutral than did individuals in the No-Threat condition. Results are discussed in terms of understanding memory bias and other cognitive features associated with anxiety disorders and of the onset and treatment of anxiety disorders.

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Anxiety disorders are thought to have a number of different aetiological pathways, including those associated with stressful triggering situations (Rachman, 1977). Theories implicating fear conditioning in the genesis of anxiety disorders have been studied for decades (for a review, see Lissek et al., 2005). These theories suggest that the development of anxiety disorders can be related to the classical conditioning of a fear response, often based on the occurrence of specific triggering events. For example, an individual who is bitten by a dog will likely respond with fear in that situation, and may later experience fear when they see another dog (conditioned response). In many individuals this fear will be extinguished, but in others fear becomes their primary response in situations involving dogs, and pathological anxiety can result (Eysenck, 1979). In a case such as the one described above, the fear is conditioned during or immediately following the occurrence of the triggering situation. Surprisingly, many psychological disorders can develop well after an individual encounters a specific stressor or situation that one would normally construe as potentially responsible for the onset of the problem. (Of course, a large proportion of anxiety disorders and other problems do not have an identifiable trigger or triggering situation, and these problems are not the focus of the current study).

Of psychological disorders which have a genesis related to a specific stressor or situation, for example posttraumatic stress disorder (PTSD), the majority have an onset that occurs immediately following the occurrence of the stressor (Buckley, Blanchard, & Hickling, 1996). However, in a small subset of cases, the disorder does not develop until

months, or even years have passed, such as in the diagnosis of PTSD with Delayed Onset. There are also anecdotal reports outside of the realm of PTSD of individuals developing fears after a substantial amount of time has passed. For example, one client who developed a fear of bee stings at least eight years following her only experience of a bee sting developed the fear only after having viewed a documentary about the production of honey. This anecdotal account provides evidence for the theory that fears can emerge suddenly with no apparent traumatic experience (Marks, 1969; Rachman, 1977), and can in fact be acquired through information or instruction rather than a specific traumatic event (Rachman, 1977). Although it has been confirmed that delayed onset occurs in PTSD, based on the above example as well as a number of other similar anecdotal descriptions, it is expected that other disorders may also have a genesis that can be delayed.

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; American Psychiatric Association, 1994) specifies a diagnosis of PTSD with Delayed Onset, which includes the criterion that at least six months have passed since the occurrence of the stressor. In some cases the disorder can develop after many years have passed without symptoms being present (Solomon, Kotler, Shalev, & Lin, 1989), and at least one case study has described an example of PTSD onset 30 years following the occurrence of the trauma (van Dyke, Zilberg, & McKinnon, 1985).

There is little research on disorders with delayed onset other than PTSD. Given that PTSD is related to the occurrence of a specific (or multiple specific), identifiable traumatic event(s), it is relatively easy to determine the event that is associated with the disorder; however, it is often very difficult to determine what specific events may have

had an impact on the genesis of other fears and anxiety disorders (Rachman, 1968). For this reason, the majority of evidence for the occurrence of disorders with delayed onset stems from research in the area of PTSD.

Studies have shown that between five and ten percent of individuals who experience a traumatic event go on to develop PTSD (Bryant & Harvey, 2002; Gray, Bolton, & Litz, 2004; Wolfe et al., 1999). As previously mentioned, many of these cases are delayed in onset. For example, in a study of military veterans conducted by Bremner and colleagues (1996), 14 out of the 61 individuals who met criteria for PTSD did not meet these criteria until two or more years had passed since their military service. Furthermore, ten percent of individuals with delayed onset PTSD did not show symptoms immediately following the traumatic event (Carty, O'Donnell, & Creamer, 2006). The occurrence of one or more life stressors following a traumatic event may account for the delayed onset of PTSD in individuals who initially had some symptoms but did not meet full criteria for the disorder (Ehlers, Mayou, & Bryant, 1998; Herrmann & Eryavec, 1994; Soloman et al., 1989). Additionally, Ehlers and Clark (2000) propose that subsequent events occurring in one's life may give a previous trauma a new, more threatening meaning, which could in turn lead to the delayed onset of PTSD. This reappraisal of threat may be an important factor in delayed onset in PTSD. It remains to be seen whether or not threat appraisal or reappraisal may be related to potential delayed onset in other psychological disorders.

Memory for events in one's life, especially for those events which were interpreted as threatening, is an important factor in the development and maintenance of PTSD (Amir, Leiner, & Bomyea, 2010; Robinaugh & McNally, 2010) as well as many

other psychological disorders such as social phobia (e.g., Cody & Teachman, 2010; Morgan, 2010), OCD (e.g., Radomsky & Rachman, 2004) and panic disorder (e.g., Hagenaars, van Minnen, Hoogduin, & Verbraak, 2009). One potential contributor to whether or not individuals will go on to develop these disorders relates to their memory of particular events as well as their appraisal(s) of these events (i.e., what meaning they give to the events; Ehlers & Clark, 2000). Given that Ehlers and Clark (2000) have suggested that additional events occurring after an initial trauma can change the meaning of that trauma and potentially cause the onset of PTSD, it is possible that threatening information can impact or change one's memory for what were once neutral events.

Memory biases associated with anxious arousal may have an effect on one's memory for threat-related situations. Memory biases in the context of depression have been demonstrated in a variety of investigations; however, research designed to assess/detect memory biases in anxiety has been less consistent (for reviews, see MacLeod & Mathews, 2004, and Mitte, 2008). This discrepancy in findings between the two domains is perplexing given that cognitive psychology theories predict the presence of memory biases within the context of emotional arousal (e.g., Bower, 1981), which should include both low mood and anxiety. According to Bower's theory, information that is more emotionally arousing and more contextually related will result in an increase in attentional and memorial resources allocated to this context-relevant information. Presumably, this understanding further extends to the experience of other negative reactions such as disgust, especially since disgust has been shown to be correlated with anxiety in a variety of anxiety disorders (for a review, see Olatunji, Cisler, & Phillips, 2010).

Many studies have demonstrated a memory bias for threat-related information. For example, Radomsky and Rachman (1999) compared a sample of contamination fearful participants diagnosed with obsessive-compulsive disorder (OCD) to anxious and nonanxious controls and found that they had greater memory for contaminated (versus noncontaminated) objects, whereas the control groups did not. An additional study demonstrated a memory bias for threat-related information in OCD, and found this effect to be even stronger when perceived responsibility is high (Radomsky, Rachman, & Hammond, 2001). There have also been studies showing memory biases related to other anxiety-related problems such as panic disorder (Nunn Stevenson, & Whalan, 1984; Cloitre & Liebowitz, 1991; Cloitre et al., 1994) and generalized anxiety disorder (Coles, Turk, & Heimberg, 2007). In addition to these studies which have empirically demonstrated a memory bias for anxiety-provoking stimuli, anxious patients often report powerful and highly detailed memories of specific events in which they were extremely anxious or fearful.

Many reasons have been proposed as to why some studies have been unable to detect a memory bias for anxiety. Radomsky and Rachman (2004) have emphasized the importance of ecological validity in studying memory biases in anxiety disorders. It has been suggested that methodological limitations (especially related to ecological validity) were present in some previous investigations, such as using words as anxiety-eliciting stimuli; issues such as these may be responsible for difficulties in detecting a memory bias (Radomsky & Rachman, 1999; Radomsky, Rachman & Hammond, 2001). Words do not usually have the ability to make people feel anxious (Baddeley & Wilkins, 1984), and are therefore not an ideal type of stimulus for eliciting fear reactions from participants.

The current study included an examination of memory processing and cognitive change. Since cognitive change related to anxiety and fear is common in cases of delayed onset in PTSD, this study was designed to test whether or not this can also be seen in association with other types of anxiety. Specifically, the current study looked at what effect new threatening information had on memory for previously encoded (neutral) stimuli. Most prior research in this area has been related to studying the misinformation effect in the context of eyewitness testimonies (Loftus & Palmer, 1974; Loftus, 1979; Wright, 1993). In such studies, participants are typically shown a slide show depicting the progression of an event (e.g., a car accident) and are subsequently read an additional brief description of the event that either confirms or misinforms the participant about a particular detail of the story (e.g., whether there was a stop sign or yield sign present). Many such studies have been conducted with results showing that the new information interferes with the participants' ability to remember the original information they encoded (Loftus & Palmer, 1974; Loftus, 1979). These results imply that if an individual is given further information after an event, their memory for that original event can be altered. However, McCloskey and Zaragoza (1985) argue, and provide evidence for, the notion that the original memory is not actually impaired – alternatively, when remembering information about an event, the new information learned about that event is integrated into their memory of the event. Based on the findings presented by McCloskey and Zaragoza (1985), one would hypothesize that providing new post-event information can lead to that information being integrated into a comprehensive memory of that event.

The current study examined whether or not memory for neutral stimuli could be altered by the addition of new information that made once-neutral stimuli become

threatening. Demonstrating this empirically would provide much needed information about one of many possible mechanisms involved in the aetiology of anxiety disorders, and especially in the genesis of anxiety disorders with delayed onset. In the current study, the construct of delayed onset was investigated by using spider fearful individuals and a tarantula as the threatening stimuli.

I hypothesized that if neutral stimuli were encoded and then made threatening at a later time (through the provision of new information), there would be a subsequent increase in memory (i.e., memory bias) for stimuli that became threatening compared to those that remained neutral. Specifically, I hypothesized that the provision of either new threat or new neutral information would result in a greater proportion of memory for items that were manipulated to items that remained neutral in the group receiving threatening information, than for those receiving further neutral information. Due to hypermnesia (i.e., memory for information increases over time even without repeated learning; Ballard, 1913; Erdelyi & Becker, 1974), an increase in total memory over time was expected. Given that memorial systems have a certain capacity (Miller, 1956) that is unlikely to be surpassed regardless of the threat level of the new information, it was expected that overall recall memory performance would not differ between conditions, but that the *proportion* of items remembered that were manipulated (versus non-manipulated) would be higher for the threat-related manipulation condition than for the neutral manipulation condition.

Method

Participants

Participants were undergraduate students at Concordia University who participated in this study in order to earn course credit. A total of 120 individuals participated in the study; however, the data from five of these individuals were not included in the analyses due to either very poor memory performance (n = 1), or extreme levels of distress during the manipulation phase of the study (n = 4), as determined using the outlier exclusion method suggested by Tabachnick and Fidel (2007). The remaining 115 participants were included in data analyses. They ranged in age from 18 to 57 (M = 23.58, SD = 6.50) years. The majority of participants were female (86%) and identified themselves as Caucasian (77%). Sixty-one of the participants identified English as their first language (53%), and 85 reported speaking English at home (74%), either as the only spoken language, or in combination with one or more additional languages.

Participants were randomly assigned to either a Threat or No-Threat condition (see *Procedures* below). Following random assignment, there were fifty-five individuals in the Threat condition, with a mean age of 23.80 (SD = 7.17) years. Eighty-two percent of the individuals in the Threat condition were female. In the No-Threat condition there were 60 individuals with a mean age of 23.38 (SD = 5.88) years, 90 percent of whom were female. There were no significant differences between the two conditions in terms of age, $t(113) = 0.34$, $p = .73$, or sex, $\chi^2(1) = 0.22$, $p = .64$.

Mean scores on the Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995), Spider Phobia Beliefs Questionnaire (SBQ; Arntz, Lavy, van den Berg, & van Rijsoort, 1993), Vancouver Obsessional Compulsive Inventory (VOCI;

Thordarson et al., 2004), Beck Anxiety Inventory (BAI; Beck & Steer, 1990), Beck Depression Inventory-2 (BDI-II; Beck, Steer, & Brown, 1996), and Disgust Scale (DS; Haidt, McCauley, & Rozin, 1994) were analyzed (see *Measures* below for details, and Appendix A for full measures) in order to assess the nature of the sample and to assess randomization (see Table 1 for means and standard deviations). Scores on these questionnaires were compared between conditions in order to detect any differences in anxiety, disgust, contamination, spider-related beliefs, or depression. There were no significant differences between the two conditions on spider-related fears, as evidenced by scores on the FSQ, $t(113) = -1.18$, $p = .24$, the SBQ, $t(113) = -0.77$, $p = .44$, the SBQ beliefs about spiders subscale, $t(113) = -0.99$, $p = .32$, or SBQ thoughts about spiders subscale, $t(113) = -0.35$, $p = .73$ There were no differences between conditions on measures of obsessive-compulsive symptomatology (VOCI scores, $t(113) = -1.00$, $p = .32$), the VOCI contamination subscale, $t(113) = -0.94$, $p = .35$, anxiety (BAI scores, $t(113) = -0.32$, $p = .75$), or depressive symptomatology (BDI-II scores, $t(113) = -0.49$, $p = .62$). A significant difference was found between conditions on the Disgust Scale, $t(113) = -2.47$, $p = .015$, with individuals in the No-Threat condition reporting a higher level of disgust sensitivity than those in the Threat condition. Due to this unexpected difference, scores on the Disgust Scale were entered as covariates for relevant analyses.

Measures

Recall memory test. On two occasions during the study participants completed a free recall memory test. They were given three minutes to verbally name as many objects as they could remember from the objects presented in the two boxes earlier in the study

Table 1

Mean Scores by Group on FSQ, SBQ, VOCI, BAI, BDI, and DS

	Condition					
	Threat *n* = 55		**No-Threat** *n* = 60		**Total** *n* = 105	
Questionnaire	**Mean**	***SD***	**Mean**	***SD***	**Mean**	***SD***
FSQ	20.64	27.01	27.12	31.57	24.02	29.53
SBQ	881.31	1036.17	1043.67	1205.03	966.02	1125.49
SBQ-B^{+}	661.89	644.92	794.62	774.45	731.14	715.44
SBQ-T^{++}	219.42	414.50	249.05	486.49	234.88	451.77
VOCI	27.05	21.23	31.52	25.93	29.38	23.80
VOCI-CTN^{+++}	4.64	5.39	5.68	6.46	5.18	5.97
BAI	9.04	7.45	9.50	7.95	9.28	7.68
BDI	7.98	7.54	8.65	6.97	8.33	7.22
DS	15.45*	4.71	17.68*	4.96	16.62	4.95

Note. $^{+}$Denotes the subscale of the SBQ that measures spider-related beliefs, $^{++}$denotes the subscale of the SBQ that measures spider-related thoughts, $^{+++}$denotes the subscale of the VOCI that measures contamination-related symptomatology; * indicates a significant difference (p <.05).

(see *Procedures* below). The experimenter recorded their answers verbatim, requesting clarification where necessary.

Subjective Units of Distress (SUDS; Wolpe, 1958). The SUDS scale was used for individuals to rate their current level of distress on a 100-point scale, with 0 being no distress at all, and 100 being the most distress imaginable. This scale is typically used to rate anxiety levels (Wolpe, 1958), but a parallel rating system was also used for other purposes in this study. Specifically, participants were asked to use a 0-100 scale to rate their current negative emotions such as level of anxiety (typical SUDS rating), urge to wash their hands, and disgust (feelings of disgust as well as how willing they would be to eat their lunch out of each of two boxes shown to them earlier). Participants were also asked about how happy they felt, how relaxed they felt, how hungry they were, and the likelihood of them using similar boxes to the boxes in the study at home. These questions were asked in order to draw focus away from questions pertaining to anxiety and disgust and create uncertainty about the purpose of the study, intending to increase believability of the manipulation.

Vancouver Obsessional Compulsive Inventory (VOCI; Thordarson et al., 2004). The VOCI is a 55-item scale that assesses a range of obsessive compulsive symptoms such as checking, contamination, hoarding, "just right" feelings, indecisiveness, and obsessions. Participants use a 5-point Likert scale with scores ranging from 0 to 4 to indicate how much each statement is true of them. Test-retest reliability in a student sample was shown to be 0.91, and the internal consistency for the VOCI is $\alpha = 0.96$ (Radomsky et al., 2006). The VOCI also has good convergent and divergent validity

(Thordarson et al., 2004; Radomsky et al., 2006). The internal consistency for the VOCI in the current study was $\alpha = 0.95$.

Disgust Scale (DS; Haidt, McCauley, & Rozin, 1994). The DS is a 32-item scale measuring an individual's sensitivity to a variety of disgust-related stimuli. Each item is accompanied by both a true or false question and a rated item indicating how disgusting participants believe the item to be using a 3-point Likert scale. Inter-item reliability has been shown to be excellent (Cronbach's $\alpha = 0.84$; Haidt, McCauley, & Rozin, 1994). The internal consistency for the DS in the current study was $\alpha = 0.46$.

Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995). The FSQ is an 18-item questionnaire designed to assess spider-related fears. Participants use an 8-point Likert scale to respond to questions pertaining to two factors: avoidance and/or help-seeking behaviours, and fear of harm. The internal consistency for the FSQ is $\alpha = 0.92$ (Szymanski & O'Donohue, 1995). Additionally, this scale has been demonstrated to be useful when assessing low levels of fear, and is therefore a good questionnaire to use when studying nonclinical samples (Muris & Merckelbach, 1996). The internal consistency for the FSQ in the current study was $\alpha = 0.97$.

Spider Phobia Beliefs Questionnaire (SBQ; Arntz, Lavy, van den Berg, & van Rijsoort, 1993). The SBQ is a 78-item scale that assesses fearful beliefs about spiders as well as one's reaction to encountering spiders. Participants are asked to rate each item on a scale of 0 to 100. The scale is composed of two subscales: the spider-related beliefs subscale (items 1-42), and the self-related beliefs subscale (items 43-78). Both subscales have demonstrated good internal consistency, both with Cronbach's α's = 0.94 (Arntz,

Lavy, van den Berg, & van Rijsoort, 1993). The internal consistency for the SBQ in the current study was $\alpha = 0.98$, with both subscales having α's = 0.97.

Beck Depression Inventory-2 (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item questionnaire that assesses symptoms of depression that have occurred during the past two weeks. Participants use a 4-point scale with scores ranging from 0 to 3 to indicate the frequency at which they have experienced symptoms such as sadness, changes in appetite and sleep, and suicidal ideation. The internal consistency of this scale in undergraduates is $\alpha = 0.93$. Good divergent and convergent validity for the BDI-II have also been demonstrated (Beck, Steer, & Brown, 1996). The internal consistency for the BDI-II in the current study was $\alpha = 0.89$.

Beck Anxiety Inventory (BAI; Beck & Steer, 1990). The BAI is a 21-item questionnaire designed to assess symptoms of anxiety. Participants use a 4-point Likert scale with scores ranging from 0 to 3 to indicate the frequency at which they have experienced symptoms such as sweating, racing heart, and dizziness. The internal consistency of this scale is $\alpha = 0.92$. Additionally, scores on the BAI have been found to be more related to scores on other measures of anxiety ($r = 0.48$) than depression ($r = 0.25$) when testing clinical populations (Beck, Epstein, Brown, & Steer, 1988). The internal consistency for the BAI in the current study was $\alpha = 0.89$.

Manipulation Believability Questionnaire (MBQ). The MBQ is an 8-item questionnaire that was created for this study based on similar measures previously used by our team. It assesses how believable participants found the manipulation to be (e.g., "Based on the information you were given, how convinced are you that the [paper/spider] is usually kept in one of the boxes"), as well as how distressed they were by the

manipulation (e.g., "How upset were you about the [paper/spider] having been in one of the boxes of objects you touched?"). Participants responded to each question by selecting one of five multiple choice responses (e.g., definitely convinced, mostly convinced, somewhat convinced, a little convinced, not at all convinced). Two separate versions were used, one for each condition (Threat versus No-Threat), with the only differences being the wording of questions that specifically address the information from the manipulation (i.e., spider versus paper).

Materials

The stimuli used in this study were 30 small objects purchased from a dollar store (see Appendix B for a full list). Each object fit the following criteria: no larger than 10 cm in its largest dimension, at least one dimension larger than 4 cm, easily nameable (i.e., identifiable by the general population), not clearly associated with contamination (e.g., a sponge), and not too similar to other objects in the study (i.e., not easily confused with other study objects).

Two cardboard boxes with lids were used in the study. They were 30.5 by 38.1 by 25.4 cm in size, and were identical other than being different colours (brown and white). The paper that was presented to the control group was a stack of three packages of plain white printer paper, still in their original wrapping. The tarantula that was presented in the threat condition was presented in a clear terrarium containing soil, two water dishes in the corners, and the tarantula (a Chilean Rose tarantula).

Procedure

Participants were informed that they were taking part in a study that aimed to expand past research on free association, and provided informed consent to participate

(see Appendix C for the consent form). Each participant was told that their responses during certain tasks would be compared to those of a clinical sample to see how their responses differ. The task they were asked to complete consisted of picking up a series of 30 objects that had been placed in two separate boxes (one white, one brown; 15 items per box). The participants were asked to pick up the objects one at a time, alternating between the two boxes, with the experimenter dictating the order in which the objects were to be picked up. They were further instructed to use the hand that corresponded to the box location (i.e., left hand for the box on their left and right hand for the box on their right) when picking up the objects (for complete verbal instructions, see Appendix D).

The following variables were counterbalanced across all participants: the side of the table on which each box was presented, the group of items in each box, the order in which each set of objects was presented (see Appendix B for item lists and orders), the side that participants were asked to take the first item from, and which box (left or right) would become the manipulated box. This was done in order to ensure that effects found in this study could not be readily attributed to order or location effects associated with any of these factors.

For each object that participants picked up, they were asked to generate and say out loud a novel sentence describing the object, and then place the item back in its original box. These sentences were recorded verbatim by the experimenter (see Appendix E for the record form). After providing a sentence for each of the objects, they completed a distracter task. During the distracter task, participants were asked to count backwards out-loud in multiples of seven starting at 46,305 for three and a half minutes. Following the distracter task, a baseline free recall memory test was administered (see *Measures*).

Following the baseline recall memory test, participants were given additional information about the two boxes. All participants were told that one of the boxes is only used for the purposes of this study, which will be referred to as the un-manipulated box from this point forward. Participants were randomly assigned to either the control (No-Threat) condition or the experimental (Threat) condition. The experimenter was blind to group assignment until this point in the study. The condition the participant was assigned to determined what they were told the typical contents of the second box were, which will be referred to as the manipulated box from this point forward. Depending upon the condition to which the participant was assigned (No-Threat or Threat), the experimenter brought either a stack of packaged paper or a tarantula housed in a terrarium into the room, after having told the participant that it was time for a break. In the No-Threat condition, the experimenter brought the paper into the testing room and told the participant the following: "I just needed to bring in this paper so I won't forget to put it back after we're finished. Our lab keeps it in this box (experimenter points to the manipulated box) so I constantly have to unload it and reload it when I am testing people for this study. It seems so silly that I have to put it back in the box instead of somewhere else, but I guess when people get used to something being somewhere they don't want it to change". In the Threat condition, the experimenter brought the tarantula into the room and told the participant the following: "I just needed to bring in our tarantula because I have to clean his tank after this. It's such a pain. We have to clean it like every week and I always get stuck doing it. I guess it's probably because we figured out that he loves being in this box (experimenter points to the manipulated box) while we clean his tank. He crawls all over the place and is so much more active than usual. So since the objects

are used for my study, I get stuck doing it". Following the manipulation, participants were asked to rate their current anxiety level, urge to wash their hands, and feelings of disgust. As an additional measure of disgust, participants were also asked how willing they would be to eat their lunch out of each of the two boxes (for a complete list of questions asked see Appendix F). After completing the aforementioned questions about their current emotional state, participants completed a second recall memory test.

Participants concluded the study by filling out a number of self-report questionnaires to assess various symptoms of anxiety, disgust, spider fear, and depression. These questionnaires were administered in order to assess the nature of the student sample, as well as to confirm that there were no important differences between groups on these measures. For descriptions of the administered questionnaires, see *Measures* above (full questionnaires available in Appendix A). Following the completion of these questionnaires, participants were debriefed about the true purpose of the study as well as the rationale for use of mild deception (for the debriefing script, see Appendix D). Individuals in the experimental condition were informed that the tarantula never in fact touched the objects in the box and, for a small number of participants who were reportedly anxious due to the presence of the tarantula, were asked to remain in the laboratory until these feelings of anxiety had diminished. Additionally, all participants signed a second consent form prior to their departure (see Appendix C) agreeing that their data could still be used despite the use of deception in the study.

Results

Missing data

Very few missing data points were evident. When missing data points were identified on a questionnaire, the mean of the individual's other responses on the same questionnaire was used to replace the missing data point (Tabachnick & Fidel, 2007). There were no missing data points on any other variables (e.g., memory tests, questions pertaining to current mood state) due to the nature of how these data were collected during the study (i.e., through verbal responses).

Manipulation check

After the manipulation phase of the experiment, participants were asked to respond to a number of questions about their current feelings of anxiety, disgust, and contamination. As expected, there was a significant difference between groups on self-reported explicit feelings of disgust, $t(113) = 3.32$, $p = .001$, $d = 2.80$, as well as on less explicitly stated feelings of disgust (i.e., one's willingness to eat their lunch out of the un-manipulated versus the manipulated box), $t(113) = 4.10$, $p < .001$, $d = 3.50$. On both of these measures, participants in the Threat condition showed higher levels of disgust. Twenty-three individuals in the Threat condition reported higher than minimal levels of disgust (41.8%). Interestingly, multiple individuals in the No-Threat condition ($n = 10$, 16.7%) also reported feeling more than minimal levels of disgust; as this was an unexpected occurrence, ratings of disgust were entered as a covariate in further analyses. There were no differences between groups in terms of anxiety level, $t(113) = -0.063$, $p = .95$, $d = -0.06$, or feelings of contamination, $t(113) = -0.73$, $p = .47$, $d = -0.69$[1].

[1] Levene's test of homogeneity of variance was significant ($p < .05$) for all manipulation check variables; therefore, *t* and *df* values reported assume unequal variances.

Individuals in both groups were asked to complete a questionnaire following the completion of the study (MBQ), which asked about believability of the manipulation as well as self-reported distress due to the manipulation. Individuals in the No-Threat condition reported being less upset by the regular use of the boxes than those in the Threat condition, $t(113) = -4.33$, $p < .001$, $d = -0.62$; those in the Threat condition were also more distressed by the regular use of the boxes, $t(113) = 3.50$, $p = .001$, $d = 0.60$. Along with these expected differences between conditions, additional differences were found between conditions in terms of believability. Specifically, individuals in the Threat condition found the manipulation information easier to understand than those in the No-Threat condition, $t(113) = 2.03$, $p = .046$, $d = 0.23$, but were less convinced by the information they were given, $t(113) = 4.11$, $p < .001$, $d = -0.93$. Although a difference between conditions was evident in ease of understanding the manipulation information, both conditions on average rated the information as 'completely understandable'. Additionally, although believability was lower in the Threat condition than in the No-Threat condition, individuals in the Threat condition on average reported being 'somewhat convinced' by the manipulation information. Therefore, these results do not suggest that the manipulation was not believed at all.

Memory Performance

The mean number of items recalled at each time point and in each box by condition (as well as change scores over time) are listed in Table 2 below. The mean number of items recalled in the first memory test was 18.45 ($SD = 2.82$), and in the second memory test, it was 20.27 ($SD = 2.87$).

Table 2

Mean Recall Memory Scores by Group, Time and Box Type

	Time 1		Time 2		Change Score	
Box Type	**Threat**	**No-Threat**	**Threat**	**No-Threat**	**Threat**	**No-Threat**
Manipulated	9.13 (1.62)	9.57 (2.06)	10.09 (1.60)	10.37 (2.07)	0.96 (1.19)	0.80 (1.50)
Un-manipulated	8.85 (1.82)	9.32 (1.88)	9.65 (1.96)	10.38 (1.80)	0.80 (1.19)	1.07 (1.21)
Both	17.98 (2.60)	18.88 (2.97)	19.75 (2.70)	20.75 (2.96)	1.76 (1.71)	1.87 (2.02)

Independent samples *t*-tests were conducted in order to assess for condition differences in overall memory performance. Results showed a trend towards a significant difference between conditions for the total number of items recalled at time one, $t(113) = -1.73$, $p = .09$, $d = -0.54$, time two, $t(113) = -1.90$, $p = .06$, $d = -0.82$, and for total memory recall $t(113) = -1.92$, $p = .06$, $d = -0.84$ across the two time points, with individuals in the Threat condition showing poorer memory performance than those in the No-Threat condition.

Overall analyses

A 2 (condition) by 2 (box type) by 2 (time) mixed design analysis of covariance (ANCOVA) was conducted in order to determine if changes in memory occurred differentially between the experimental and control conditions. Due to condition differences on DS scores and unexpected state disgust ratings within conditions, both of these variables were entered into the analysis as covariates. Neither DS scores or state disgust ratings were significantly related to memory performance, $F(1, 111) = 0.10$, $p = 0.75$, partial $\eta^2 = .00$ and $F(1, 111) = 0.01$, $p = 0.95$, partial $\eta^2 = .00$, respectively. Results showed a main effect of time, $F(1, 111) = 6.31$, $p = 0.01$, partial $\eta^2 = .05$, with individuals remembering more items overall at time 2 than at time 1. Main effects for both box type (manipulated versus un-manipulated) and condition (Threat versus No-Threat) were not significant ($F(1, 111) = .00$, $p = .96$, partial $\eta^2 < .001$, and $F(1, 111) = 2.71$, $p = .10$, partial $\eta^2 = .02$, respectively). The interaction of time, box type, and condition showed a trend towards significance, $F(1, 111) = 2.77$, $p = .099$, partial $\eta^2 = .02$, with individuals in the Threat condition showing an increase in memory for items in the manipulated box versus the un-manipulated box compared to individuals in the No-

Threat condition (see Figure 1)[2]. Figure 2 depicts a graphical representation of the difference scores between boxes (the number of items remembered from the manipulated box minus number of items remembered from the non-manipulated box) by both time and condition.

A planned comparison was conducted in order to further understand the nature of the interaction between box type, condition, and time. The independent variable in this comparison was condition (Threat versus No-Threat), and the dependent variable was the proportion of the number of items remembered from the manipulated box to the number of items remembered from the un-manipulated box at time 2. Proportionate memory was the chosen variable for analysis because it appeared to be an appropriate measure of memory performance over time while taking into account memory's limited capacity. This value was calculated and entered separately for each participant prior to analysis. A one-way ANCOVA was conducted in order to include the covariates listed in the aforementioned mixed ANCOVA, as well as a covariate of the proportion of the number of items remembered from the manipulated box to the number of items remembered from the un-manipulated box at time 1 (i.e., initial memory performance). Adjusted means were 1.10 (SD = 0.28) for the Threat condition, and 1.02 (SD = 0.28) for the No-Threat condition. Results of this ANCOVA showed a significant difference between conditions, $F(1, 114) = 4.83$, $p = .03$, partial $\eta^2 = .04$[3], with individuals in the Threat condition showing a higher proportion

[2] When state disgust was not included as a covariate, results showed a main effect of time ($F(1, 111) = 6.94$, $p = 0.01$, partial $\eta^2 = .06$), and a trend towards a main effect of condition ($F(1, 111) = 3.22$, $p = .08$, partial $\eta^2 = .03$). There was no main effect of box type ($F(1, 111) = .01$, $p = .94$, partial $\eta^2 < .001$. The interaction of time, box type, and condition was not significant, $F(1, 111) = 1.67$, $p = .20$, partial $\eta^2 = .02$.

[3] When state disgust was not included as a covariate, results showed a trend towards a significant difference between condition, $F(1, 114) = 3.79$, $p = .05$, partial $\eta^2 = .03$. Adjusted means were 1.09 (SD = 0.28) for the Threat condition, and 1.02 (SD = 0.28) for the No-Threat condition.

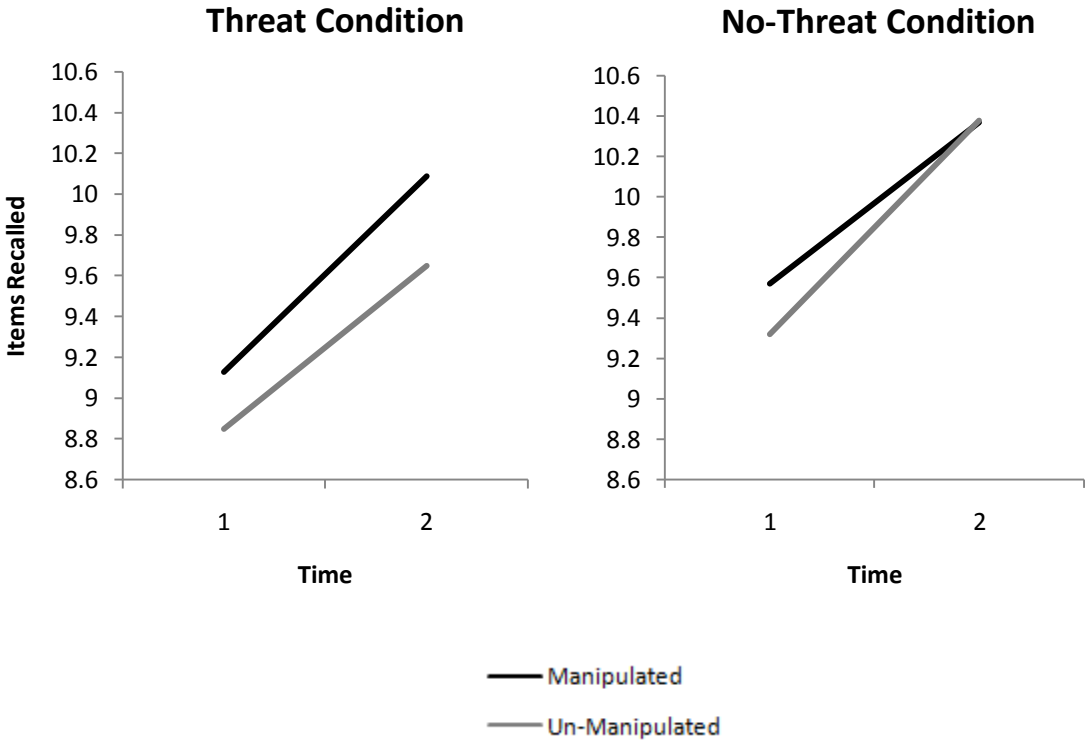

Figure 1. Mean recall memory scores by condition, time, and box.

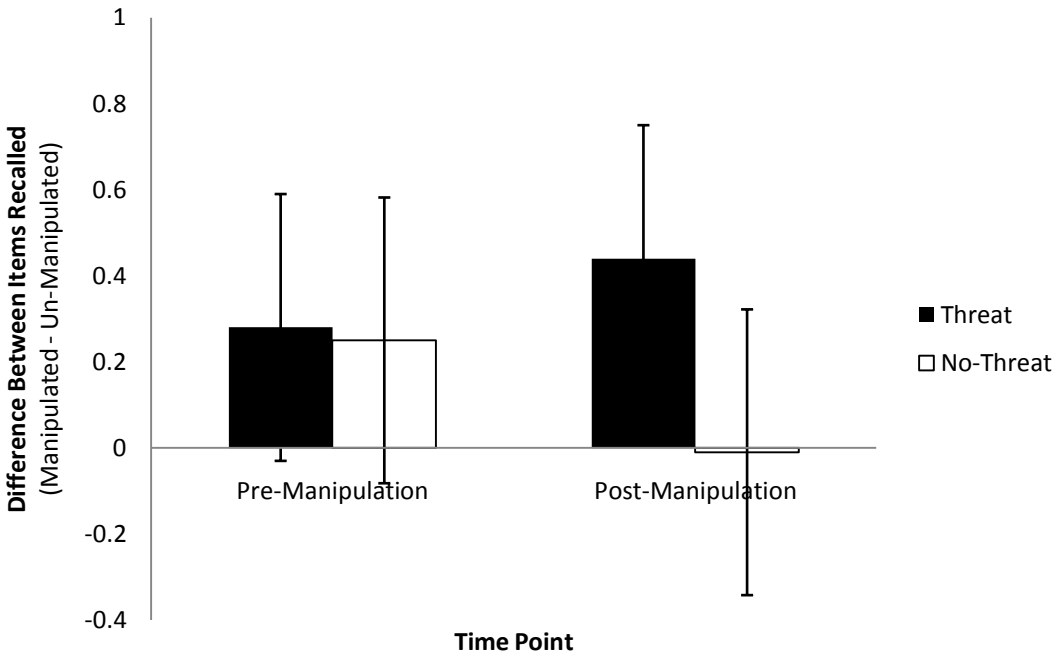

Figure 2. Mean recall memory change scores by box and condition.

of items remembered in the manipulated to the un-manipulated boxes than individuals in the No-Threat condition. The difference between conditions based on proportions of items remembered from each box was not present at time 1, $t(113) = -0.14$, $p = .90$, $d = -.02$.

Discussion

This study aimed to investigate whether the provision of threatening information related to previously-learned neutral stimuli could increase memory for those stimuli. It was predicted that providing threatening information about neutrally encoded stimuli would cause an increase in memory for the now threatening stimuli. Results were in partial support of this hypothesis, in that there was a trend towards an interaction between condition (provision of threatening versus non-threatening information), time (before or after the provision of new information), and box (whether the box was the one with added information, or the one that remained neutral). Individuals in the Threat condition showed a trend towards remembering more threat-related than neutral items at the second memory test compared to the first memory test, whereas individuals in the No-Threat condition did not show this same pattern of change.

Memory has a limit to its capacity (Miller, 1956); therefore, the degree to which overall memory could increase across time in the current study was limited. Accordingly, condition differences were also examined based on the proportion of items remembered that were manipulated versus un-manipulated, following the manipulation. Results showed a difference between the two conditions, with individuals in the Threat condition showing a higher proportion of manipulated to un-manipulated objects remembered, while there was no difference in memory for manipulated versus un-manipulated items in

the No-Threat condition. Furthermore, this difference between conditions was not observed prior to the provision of new information. This is evidence for a memory bias for threat. Support was provided for the hypothesis that individuals exposed to threatening information would show an increase in memory over time for threat-related stimuli compared to non-threat-related stimuli, whereas individuals exposed to additional neutral information would have an equal increase in memory for both the threat- and non-threat-related stimuli. Additionally, the construct of hypermnesia (increased memory over time without additional learning; Ballard, 1913; Erdelyi & Becker, 1974) was apparent, in that item recall increased (on average) from time one to time two.

Overall these results provide evidence that a change in memory for previously-learned objects can occur following the provision of threatening information. This provides support for the theory that subsequent events occurring after encoding of information may lead to threat reappraisal (Ehlers & Clark, 2000). The results of this study provide theoretical support for the notion that new information one receives about a specific past event can change their memory of that event. Prior research shows that memory is important to the development and maintenance of anxiety disorders (Radomsky & Rachman, 2004; Hagenaars, van Minnen, Hoogduin, & Verbraak, 2009; Amir, Leiner, & Bomyea, 2010; Cody & Teachman, 2010; Morgan, 2010; Robinaugh & McNally, 2010), which leads to one hypothesis about how disorders of delayed onset may develop. Specifically, if the onset of a disorder relates to the interpretation of life events as threatening (either immediately following their occurrence or at some future point in time), reinterpretation of once-neutral events as threatening could theoretically explain how disorders occasionally develop long after an event's occurrence.

Bower's (1981) theory of information processing predicts both attentional and memory biases for threat-related information. In the current study, all information was neutral at encoding; thus, the later increase in memory for threat-related information cannot be attributed to increased attention to these stimuli. The current results lend support to Bower's theory, and also to previous research demonstrating the existence of a memory bias for anxiety- or threat-related information (Nunn et al., 1984; Cloitre & Liebowitz, 1991; Cloitre et al., 1994; Radomsky & Rachman, 1999; Radomsky, Rachman, & Hammond, 2001; Coles, Turk, & Heimberg, 2007). It is proposed that the design of the current study facilitated detection of an effect due to ecological validity of the fear stimulus; therefore, future studies in this area should continue to use such methods in order to investigate the true nature of memory biases in anxiety.

When considering disorders of delayed onset, the mechanisms by which memory may be affected are unclear. Similar to questions that have been put forth in relation to the misinformation effect (Loftus & Palmer, 1974; Loftus, 1979; McCloskey & Zaragoza, 1985), it is not known whether there is in fact a change in memory, a change in access to memory resources, or integration of new information with old information as a new memory. Although the current study was not capable of elucidating such information, it provides evidence that a change in memory can occur when threatening information is provided about previously neutral information. Further studies should investigate the specific mechanisms involved in memory's effect on delayed onset disorders.

The current study is the first to investigate mechanisms of delayed onset in anxiety other than anxiety related to PTSD. Given that anecdotal evidence supports the possibility of other disorders developing with delayed onset, this important area of

research can further our understanding of the genesis of anxiety disorders. Additionally, it is the first known attempt at experimentally demonstrating the phenomenon of delayed onset. This provides further evidence for the mechanisms that may underlie this construct.

The results of this study have a number of clinical implications. Knowing that disorders can develop after time has passed since a triggering event will be useful in identifying individuals who are at risk of later developing a disorder, which may lead to the prevention of a vast number of anxiety disorders. Additionally, having an increased understanding of the mechanisms involved in the onset of a subset of disorders will provide opportunities to target specific therapeutic techniques that may work well for these individuals, such as the reappraisal of anxious memories. This may be an important focus in treatment for individuals with delayed onset disorders, given that the disorder will have come about at least partially due to threat re-appraisal. The current results provide an initial understanding of how disorders of delayed onset occur and how we may be able to reduce their occurrence and/or increase efficacy of treatment.

Although the results of the current study are promising, they are not without some limitations. First, the current study used a non-clinical sample, so generalization to individuals with clinical disorders is questionable. Effect sizes were not large and only a trend was evident, which may be in part due to low levels of anxiety or disgust reactions across participants in general. With the manipulation causing low levels (on average) of distress, elucidating a strong effect would be difficult. However, given that the focus of this study was on delayed onset, a lengthy longitudinal study would be necessary in order to study a clinical sample; therefore, this was an appropriate first step for investigating

this construct. An additional limitation is that the information provided to participants in the study (i.e., the manipulation) was not equally believable across conditions. Although this was an unexpected difference, the manipulations in both conditions were described as at least somewhat believable; therefore, this condition difference should not greatly impact our conceptualization of the current results. In fact, due to reduced believability in the Threat condition, it is possible that increasing believability in this condition would in fact amplify the results of the current study.

Generalization to real-world occurrences of delayed onset (in PTSD, for example) is also difficult, given that the change in memory that occurred in this study was for physical stimuli, whereas changes in memory associated with disorders of delayed onset are likely associated with other information. Although it could be argued that memory for objects parallels memory for information, and therefore would not be processed differently than one's memory for a situation, generalizability remains unknown.

This study was also limited by its short-term nature: participants completed both the pre- and post-manipulation memory tests within ten minutes. Given that when delayed onset is seen currently in PTSD it typically has an onset of months or years after the original event (Bryant & Harvey, 2002; Carty, O'Donnell, & Creamer, 2006), it would be useful to examine to what extent these effects would be evident given a greater length of time between the event, the time at which additional threatening information is provided, and when the memory tests take place.

Another limit to this study was the inability to obtain both pre- and post-manipulation levels of anxiety. Due to the nature of the study, requesting pre-manipulation ratings would potentially expose the true nature of the study, thereby

affecting the results obtained. For this reason, it is difficult to determine whether or not there was in fact a difference between groups in terms of change in anxiety due to the manipulation. However, given that there were differences in self-reported disgust and disgust has been shown to be correlated with anxiety (Davey, MacDonald, & Brierly, 2008; Olatunji, Cisler, & Phillips, 2010; Olatunji et al., 2007), and especially in the context of spider-related fears (Olatunji, Huijding, de Jong, & Smits, 2011), disgust reactions are presumed to be an appropriate proxy for anxiety. It should be noted that controlling for disgust, given that it was not the outcome variable of interest, does not remove the threat of the stimulus.

As mentioned previously, there are many further directions that could enhance our knowledge in this area of research. Specifically, it would be useful to investigate these effects with a longer delay before the provision of new and threatening information (as this is more relevant to real-world examples of delayed onset), and also seeing how long the effects may last. It would also to be useful to examine these effects in participants with different types of threat-related manipulations, and with manipulations that will be able to elicit anxiety reactions rather than just disgust reactions.

Greater understanding of the mechanisms involved in disorders of delayed onset may be possible through the use of longitudinal studies that would provide information about the experiences and retroactive memories of individuals who go on to develop these disorders. This suggestion is particularly important because it would provide the opportunity to collect confirmatory evidence for the theories presented in the current study.

Summary

The present study demonstrated that individuals' memory for previously neutral stimuli can change when those stimuli later become threatening. The current results support findings of previous memory processing research and offer new support for the study of anxiety disorders with delayed onset, as well as potential mechanisms involved in their genesis. Although this study could not address many important questions related to the existence of disorders of delayed onset, it supports a combination of theories positing that delayed onset is not exclusively characteristic of PTSD. Further replication and investigation is necessary, but the current study provides results that further our understanding of the onset and maintenance of clinical anxiety, as well as creating potential for advances in the prevention and treatment of anxiety disorders.

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Appendix A

Questionnaires:

Disgust Scale

Fear of Spiders Questionnaire

Spider Phobia Beliefs Questionnaire

Vancouver Obsessional Compulsive Inventory

Beck Anxiety Inventory

Beck Depression Inventory II

Manipulation Believability Questionnaire (Paper)

Manipulation Believability Questionnaire (Spider)

DS

Please circle T (true) or F (false)

T F 1. It bothers me to see someone in a restaurant eating messy food with his fingers.

T F 2. Seeing a cockroach in someone else's house doesn't bother me.

T F 3. It bothers me to hear someone clear a throat full of mucous.

T F 4. I think it is immoral for people to seek sexual pleasure from animals.

T F 5. It would bother me to be in a science class and to see a human hand preserved in a jar.

T F 6. I would go out of my way to avoid walking through a graveyard.

T F 7. I never let any part of my body touch the toilet seat in public restrooms.

T F 8. Even if I were hungry, I would not drink a bowl of my favorite soup if it had been stirred by a used but thoroughly washed flyswatter.

T F 9. I might be willing to try eating monkey meat, under certain circumstances.

T F 10. It would bother me to see a rat run across my path in a park.

T F 11. If I see someone vomit, it makes me sick to my stomach.

T F 12. I think homosexual activities are immoral.

T F 13. It would not upset me at all to watch a person with a glass eye take the eye out of the socket.

T F 14. It would bother me tremendously to touch a dead body.

T F 15. I probably would not go to my favorite restaurant if I found out that the cook had a cold.

T F 16. It would bother me to sleep in a nice hotel room if I knew that a man had died of a heart attack in that room the night before.

Please rate (0, 1, 2) how disgusting you would find the following experiences.

0: not disgusting at all
1: slightly disgusting
2: very disgusting

If you think something is bad or unpleasant, but not disgusting, you should write "0".

_____ 17. You see someone put ketchup on vanilla ice cream, and eat it.

_____ 18. You see maggots on a piece of meat in an outdoor garbage pail.

_____ 19. While you are walking through a tunnel under a railroad track, you smell urine.

_____ 20. You hear about a 30 year old man who seeks sexual relationships with 80 year old women.

_____ 21. You see someone accidentally stick a fish hook through his finger.

_____ 22. Your friend's pet cat dies, and you have to pick up the dead body with your bare hands.

_____ 23. You take a sip of soda, and then realize that you drank from the glass that an acquaintance of yours had been drinking from.

_____ 24. A friend offers you a piece of chocolate shaped like dog-doo.

_____ 25. You are about to drink a glass of milk when you smell that it is spoiled.

_____ 26. You are walking barefoot on concrete, and you step on an earthworm.

_____ 27. You see a bowel movement left unflushed in a public toilet.

_____ 28. You hear about an adult woman who has sex with her father.

_____ 29. You see a man with his intestines exposed after an accident.

_____ 30. You accidentally touch the ashes of a person who has been cremated.

_____ 31. You discover that a friend of yours changes underwear only once a week.

_____ 32. As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth.

FSQ

For each item, please record a number to indicate how much you agree with the statement. Ratings can include any number between 0 (totally disagree) and 7 (totally agree).

Totally Disagree Totally Agree
0 ---------- 1 ---------- 2 ---------- 3 ---------- 4 ---------- 5 ---------- 6 ---------- 7

____ 1. If I came across a spider now, I would get help from someone else to remove it.

____ 2. Currently, I am sometimes on the look-out for spiders.

____ 3. If I saw a spider now, I would think it will harm me.

____ 4. I now think a lot about spiders.

____ 5. I would be somewhat afraid to enter a room now, where I have seen a spider before.

____ 6. I now would do anything to try to avoid a spider.

____ 7. Currently, I sometimes think about getting bit by a spider.

____ 8. If I encountered a spider now, I wouldn't be able to deal effectively with it.

____ 9. If I encountered a spider now, it would take a long time to get it out of my mind.

____ 10. If I came across a spider now, I would leave the room.

____ 11. If I saw a spider now, I would think it will try to jump on me.

____ 12. If I saw a spider now, I would ask someone else to kill it.

____ 13. If I encountered a spider now, I would have images of it trying to get me.

____ 14. If I saw a spider now, I would be afraid of it.

____ 15. If I saw a spider now, I would feel very panicky.

____ 16. Spiders are one of my worst fears.

____ 17. I would feel very nervous if I saw a spider now.

____ 18. If I saw a spider now, I would probably break out in a sweat and my heart would beat faster.

SBQ - Part I

This questionnaire is concerned with thoughts that might run through your mind at the moment that you encounter a spider. Beside each thought, fill in the extent to which you believe in the thought. Do not indicate the strength of your belief at this moment, but the strength of your belief at the moment that you encounter a spider and you are possibly anxious.

Rate the strength of your belief in each thought by using the scale indicated below. You can write down any number from 0 to 100 as long as it expresses the strength of your belief in the thought at the moment you encounter a spider.

0 ---------- 100	
I do not believe it at all	I absolutely believe it

When there is a spider in my vicinity, I believe that the spider…

_____ 1. will come towards me.
_____ 2. will jump on me.
_____ 3. will crawl into my clothes.
_____ 4. will bite me.
_____ 5. will attack me.
_____ 6. will crawl towards my private parts.
_____ 7. senses that I'm anxious.
_____ 8. knows that I'm anxious and that I cannot stand it.
_____ 9. does things on purpose to tease me.
_____ 10. is mean.
_____ 11. is poisonous.
_____ 12. is deadly.
_____ 13. is dangerous.
_____ 14. is horrible.
_____ 15. is dirty.
_____ 16. is unpredictable.
_____ 17. is vicious.
_____ 18. is incalculable.
_____ 19. is very quick.
_____ 20. is uncontrollable.
_____ 21. runs in an elusive way.
_____ 22. usually travels in pairs.
_____ 23. will become larger.
_____ 24. hides itself.
_____ 25. runs very fast.
_____ 26. will chase me.
_____ 27. is staring at me.
_____ 28. will settle in spots I do not want, like my bed.
_____ 29. will pop up unexpectedly.
_____ 30. will control me.
_____ 31. will walk all over me during the night.
_____ 32. will hide itself and pop up unexpectedly 10 times as big, or with other spiders.
_____ 33. will drive me to the wall.
_____ 34. cannot be shaken off once it is on me.
_____ 35. especially selects me because of my fear.
_____ 36. hides itself in order to pop up unexpectedly.
_____ 37. wants to come upon me on parts of me that I cannot reach.
_____ 38. becomes (in my imagination) very large and holds me with its legs.
_____ 39. will settle on my face.
_____ 40. is never alone, there are always more of them.
_____ 41. will drop from the ceiling on me.
_____ 42. is spying on me.
_____ 43. other (please describe) _____
_____
_____ 44. other (please describe) _____
_____

SBQ – Part II

The following section presents thoughts that you might have about yourself at the moment that you encounter a spider and are possibly anxious.

You can write down <u>any number from 0 to 100</u> as long as it expresses the strength of your belief in the thought at the moment you encounter a spider.

0 ---------- 100	
I do not believe it at all	I absolutely believe it

If the spider does not go away, I will…

_____ 45. become crazy because of anxiety.

_____ 46. not be able to stand it.

_____ 47. panic completely and not know what I'm doing.

_____ 48. die of fear.

_____ 49. lose control.

_____ 50. have to be transported to a hospital or psychiatric ward.

_____ 51. become so anxious that other people will think I'm an idiot.

_____ 52. endanger myself or others.

_____ 53. lash out fiercely.

_____ 54. become sick with anxiety.

_____ 55. jump out of a window or out of a moving car.

_____ 56. get a heart attack.

_____ 57. scream or yell uncontrollably.

_____ 58. get creepy dreams.

_____ 59. think of myself as a hysterical or as an idiot.

_____ 60. become even more anxious about spiders.

_____ 61. faint.

_____ 62. come to see spiders everywhere.

_____ 63. cause an accident.

_____ 64. damage my heart.

_____ 65. vomit.

_____ 66. be unable to function normally anymore.

_____ 67. beat up someone.

_____ 68. dare nothing anymore and be overwhelmed with fear.

_____ 69. cry uncontrollably.

_____ 70. become paralyzed.

_____ 71. be unable to sleep for days.

_____ 72. become aggressive (beat, kick, throw).

_____ 73. become hysterical.

_____ 74. stiffen completely from anxiety.

_____ 75. be unable to get the animal out of my mind.

_____ 76. want to be dead.

_____ 77. run away blindly.

_____ 78. be unable to think rationally.

_____ 79. get nightmares of creepy spiders.

_____ 80. be unable to do anything.

_____ 81. other (please describe) _____

_____

_____ 82. other (please describe) _____

_____

VOCI

Please rate each statement by putting a circle around the number that best describes how much the statement is true of you. Please answer every item, without spending too much time on any particular item.

How much is each of the following statements true of you?		Not at all	A little	Some	Much	Very Much
1.	I feel compelled to check letters over and over before mailing them.	0	1	2	3	4
2.	I am often upset by my unwanted thoughts of using a sharp weapon.	0	1	2	3	4
3.	I feel very dirty after touching money.	0	1	2	3	4
4.	I find it very difficult to make even trivial decisions.	0	1	2	3	4
5.	I feel compelled to be absolutely perfect.	0	1	2	3	4
6.	I repeatedly experience the same unwanted thought or image about an accident.	0	1	2	3	4
7.	I repeatedly check and recheck things like taps and switches after turning them off.	0	1	2	3	4
8.	I use an excessive amount of disinfectants to keep my home or myself safe from germs.	0	1	2	3	4
9.	I often feel compelled to memorize trivial things (e.g., licence plate numbers, instructions on labels).	0	1	2	3	4
10.	I have trouble carrying out normal household activities because my home is so cluttered with things I have collected.	0	1	2	3	4
11.	After I have decided something, I usually worry about my decision for a long time.	0	1	2	3	4
12.	I find that almost every day I am upset by unpleasant thoughts that come into my mind against my will.	0	1	2	3	4
13.	I spend far too much time washing my hands.	0	1	2	3	4
14.	I often have trouble getting things done because I try to do everything exactly right.	0	1	2	3	4
15.	Touching the bottom of my shoes makes me very anxious.	0	1	2	3	4
16.	I am often upset by my unwanted thoughts or images of sexual acts.	0	1	2	3	4

How much is each of the following statements true of you?	Not at all	A little	Some	Much	Very Much
17. I become very anxious when I have to make even a minor decision.	0	1	2	3	4
18. I feel compelled to follow a very strict routine when doing ordinary things.	0	1	2	3	4
19. I feel upset if my furniture or other possessions are not always in exactly the same position.	0	1	2	3	4
20. I repeatedly check that my doors or windows are locked, even though I try to resist the urge to do so.	0	1	2	3	4
21. I find it very difficult to touch garbage or garbage bins.	0	1	2	3	4
22. I become very tense or upset when I think about throwing anything away.	0	1	2	3	4
23. I am excessively concerned about germs and disease.	0	1	2	3	4
24. I am often very late because I can't get through ordinary tasks on time.	0	1	2	3	4
25. I avoid using public telephones because of possible contamination.	0	1	2	3	4
26. I am embarrassed to invite people to my home because it is full of piles of worthless things I have saved.	0	1	2	3	4
27. I repeatedly experience the same upsetting thought or image about death.	0	1	2	3	4
28. I am often upset by unwanted thoughts or images of blurting out obscenities or insults in public.	0	1	2	3	4
29. I worry far too much that I might upset other people.	0	1	2	3	4
30. I am often frightened by unwanted urges to drive or run into oncoming traffic.	0	1	2	3	4
31. I almost always count when doing a routine task.	0	1	2	3	4
32. I feel very contaminated if I touch an animal.	0	1	2	3	4
33. One of my major problems is repeated checking.	0	1	2	3	4

How much is each of the following statements true of you?	Not at all	A little	Some	Much	Very Much
34. I often experience upsetting and unwanted thoughts about losing control.	0	1	2	3	4
35. I find it almost impossible to decide what to keep and what to throw away.	0	1	2	3	4
36. I am strongly compelled to count things.	0	1	2	3	4
37. I repeatedly check that my stove is turned off, even though I resist the urge to do so.	0	1	2	3	4
38. I get very upset if I can't complete my bedtime routine in exactly the same way every night.	0	1	2	3	4
39. I am very afraid of having even slight contact with bodily secretions (blood, urine, sweat, etc.).	0	1	2	3	4
40. I am often very upset by my unwanted impulses to harm other people.	0	1	2	3	4
41. I spend a lot of time every day checking things over and over again.	0	1	2	3	4
42. I have great trouble throwing anything away because I am very afraid of being wasteful.	0	1	2	3	4
43. I frequently have to check things like switches, faucets, appliances and doors several times.	0	1	2	3	4
44. One of my major problems is that I am excessively concerned about cleanliness.	0	1	2	3	4
45. I feel compelled to keep far too many things like old magazines, newspapers, and receipts because I am afraid I might need them in the future.	0	1	2	3	4
46. I repeatedly experience upsetting and unacceptable thoughts of a religious nature.	0	1	2	3	4
47. I tend to get behind in my work because I repeat the same thing over and over again.	0	1	2	3	4
48. I try to put off making decisions because I'm so afraid of making a mistake.	0	1	2	3	4
49. I often experience upsetting and unwanted thoughts about illness.	0	1	2	3	4
50. I am afraid to use even well-kept public toilets because I am so concerned about germs.	0	1	2	3	4
51. Although I try to resist, I feel compelled to collect a large quantity of things I never actually use.	0	1	2	3	4

How much is each of the following statements true of you?		Not at all	A little	Some	Much	Very Much
52.	I repeatedly experience upsetting and unwanted immoral thoughts.	0	1	2	3	4
53.	One of my major problems is that I pay far too much attention to detail.	0	1	2	3	4
54.	I am often upset by unwanted urges to harm myself.	0	1	2	3	4
55.	I spend far too long getting ready to leave home each day because I have to do everything exactly right.	0	1	2	3	4

Thordarson, D.S., Radomsky, A.S., Rachman, S., Shafran, R., Sawchuk, C.N., Hakstian, A.R. (2004). The Vancouver Obsessional Compulsive Inventory (VOCI). *Behaviour Research & Therapy, 42(11),* 1289-1314.

B.A.I.

Below is a list of common symptoms of anxiety. Please read each item in the list carefully. Indicate how much you have been bothered by each symptom during the PAST WEEK, INCLUDING TODAY by placing an X in the corresponding space in the column next to each symptom.

		Not at all	**Mildly. It did not bother me much**	**Moderately. It was very unpleasant but I could stand it**	**Severely I could barely stand it**
1	Numbness or tingling				
2	Feeling hot				
3	Wobbliness in legs				
4	Unable to relax				
5	Fear of worst happening				
6	Dizzy or lightheaded				
7	Heart pounding or racing				
8	Unsteady				
9	Terrified				
10	Nervous				
11	Feelings of choking				
12	Hands trembling				
13	Shaky				
14	Fear of losing control				
15	Difficulty breathing				
16	Fear of dying				
17	Scared				
18	Indigestion or discomfort in abdomen				
19	Faint				
20	Face flushed				
21	Sweating (not due to heat)				

BDI-II

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for each group.

1) Sadness

0 I do not feel sad.
1 I feel sad much of the time.
2 I am sad all the time.
3 I am so sad or unhappy that I can't stand it.

2) Pessimism

0 I am not discouraged about my future.
1 I feel more discouraged about my future than I used to be.
2 I do not expect things to work out for me.
3 I feel my future is hopeless and will only get worse.

3) Past Failure

0 I do not feel like a failure.
1 I have failed more than I should have.
2 As I look back, I see a lot of failures.
3 I feel I am a total failure as a person.

4) Loss of Pleasure

0 I get as much pleasure as I ever did from the things I enjoy.
1 I don't enjoy things as much as I used to.
2 I get very little pleasure from the things I used to enjoy.
3 I can't get any pleasure from the things I used to enjoy.

7) Self-Dislike

0 I feel the same about myself as ever.
1 I have lost confidence in myself.
2 I am disappointed in myself.
3 I dislike myself.

8) Self-Criticalness

0 I don't criticize or blame myself more than usual.
1 I am more critical of myself than I used to be.
2 I criticize myself for all the faults.
3 I blame myself for everything bad that happens.

9) Suicidal Thoughts or Wishes

0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10) Crying

0 I don't cry any more than I used to.
1 I cry more now than I used to.
2 I cry over every little thing.
3 I feel like crying but I can't.

5) Guilty Feelings

0 I don't feel particularly guilty.

1 I feel guilty over many things I have done or should have done.

2 I feel quite guilty most of the time.

3 I feel guilty all the time.

6) Punishment Feelings

0 I don't feel I am being punished.

1 I feel I may be punished.

2 I expect to be punished.

3 I feel I am being punished.

11) Agitation

0 I am no more restless or wound up than usual.

1 I feel more restless or wound up than usual.

2 I am so restless or agitated that it's hard to stay still.

3 I am so restless or agitated that I have to keep moving or doing something.

12) Loss of Interest

0 I have not lost interest in people or activities.

1 I am less interested in other people or things than before.

2 I have lost most of my interest in other people or things.

3 It's hard to get interested in anything.

13) Indecisiveness

0 I make decisions about as well as ever.

1 I find it more difficult to make decisions than usual.

2 I have much greater difficulty in making decisions than I used to.

3 I have trouble making any decision.

18) Changes in Appetite

0 I have not experienced any changes in my appetite.

1a My appetite is somewhat less than usual.

1b My appetite is somewhat greater than usual.

2a My appetite is much less than usual.

2b My appetite is much greater than usual.

3a I have no appetite at all.

3b I crave food all the time.

14) Worthlessness

0 I do not feel I am worthless.

1 I don't consider myself as worthwhile and useful as I used to.

2 I feel more worthless as compared to other people.

3 I feel utterly worthless.

19) Concentration Difficulty

0 I can concentrate as well as usual.

1 I can't concentrate as well as usual.

2 It's hard to keep my mind on anything for very long.

3 I find I can't concentrate on anything.

15) Loss of Energy

0 I have as much energy as ever.
1 I have less energy than I used to have.
2 I don't have enough energy to do very much.
3 I don't have enough energy to do anything.

16) Changes in Sleeping Pattern

0 I have not experienced any changes in my sleeping pattern.
1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.
2a I sleep a lot more than usual.
2b I sleep a lot less than usual.
3a I sleep most of the day.
3b I wake up 1-2 hours early and can't get back to sleep.

17) Irritability

0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

20) Tiredness or Fatigue

0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

21) Loss of Interest in Sex

0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

MBQ-P

1. Were you pleased with the experimenter today?

    a. Completely pleased
    b. Very pleased
    c. Moderately pleased
    d. Not very pleased
    e. Not pleased at all

2. Did the experimenter notify you of the regular use of the boxes in a way that was clear and understandable?

    a. Completely understandable
    b. Mostly understandable
    c. Somewhat understandable
    d. A little understandable
    e. Not at all understandable

3. Were you bothered by the actual use of the boxes?

    a. Completely bothered
    b. Very bothered
    c. Moderately bothered
    d. Not very bothered
    e. Not bothered at all

4. How upset were you about the paper having been in one of the boxes of objects you touched?

    a. Completely upset
    b. Very upset
    c. Moderately upset
    d. Not very upset
    e. Not upset at all

5. Was the experimenter professional while providing information about the use of the boxes?

    a. Completely professional
    b. Mostly professional
    c. Somewhat professional
    d. A little professional
    e. Not at all professional

6. Based on the information you were given, how convinced are you that the paper is usually kept in one of the boxes?

    a. Definitely convinced
    b. Mostly convinced
    c. Somewhat convinced
    d. A little convinced
    e. Not at all convinced

7. Would you recommend this experiment to others?

    a. Definitely recommend
    b. Most likely recommend
    c. Maybe recommend
    d. Likely not recommend
    e. Definitely not recommend

8. Would you choose this experimenter again in the future?

    a. Definitely
    b. Most likely
    c. Maybe
    d. Not likely
    e. Definitely not

MBQ-S

1. Were you pleased with the experimenter today?

    a. Completely pleased
    b. Very pleased
    c. Moderately pleased
    d. Not very pleased
    e. Not pleased at all

2. Did the experimenter notify you of the regular use of the boxes in a way that was clear and understandable?

    a. Completely understandable
    b. Mostly understandable
    c. Somewhat understandable
    d. A little understandable
    e. Not at all understandable

3. Were you bothered by the actual use of the boxes?

    a. Completely bothered
    b. Very bothered
    c. Moderately bothered
    d. Not very bothered
    e. Not bothered at all

4. How upset were you about the spider having been in one of the boxes of objects you touched?

    a. Completely upset
    b. Very upset
    c. Moderately upset
    d. Not very upset
    e. Not upset at all

5. Was the experimenter professional while providing information about the use of the boxes?

    a. Completely professional
    b. Mostly professional
    c. Somewhat professional
    d. A little professional
    e. Not at all professional

6. Based on the information you were given, how convinced are you that the spider spends time in one of the boxes?

    a. Definitely convinced
    b. Mostly convinced
    c. Somewhat convinced
    d. A little convinced
    e. Not at all convinced

7. Would you recommend this experiment to others?

    a. Definitely recommend
    b. Most likely recommend
    c. Maybe recommend
    d. Likely not recommend
    e. Definitely not recommend

8. Would you choose this experimenter again in the future?

    a. Definitely
    b. Most likely
    c. Maybe
    d. Not likely
    e. Definitely not

Appendix B

List of objects:

Complete object list

Randomized and separated into sets and versions

COMPLETE OBJECT LIST

1) Clothes pin
2) Frog
3) Glass jar
4) Tennis ball
5) Toothpaste
6) Eraser
7) Bird
8) Light bulb
9) Hippo
10) Car
11) Cactus
12) Tape
13) Nightlight
14) Padlock/Lock
15) Gum
16) Battery
17) Flower
18) Highlighter
19) Binoculars
20) Sunglasses
21) Comb
22) Mirror
23) Yo-yo
24) Pen
25) Bucket/Pail
26) Apple
27) Watermelon
28) Fish
29) Pineapple
30) Train

OBJECT LISTS

Randomized and separated into sets and versions

	List 1	**List 2**
SET 1	Mirror Gum Hippopotamus Tennis ball Watermelon Toothpaste Eraser Car Clothes pin Tape Battery Flower Highlighter Apple Lock/padlock	Frog Glass jar Yo-yo Comb Pineapple Cactus Bird Light bulb Nightlight Binoculars Sunglasses Pen Bucket/pail Fish Train
SET 2	Clothes pin Car Tape Battery Flower Mirror Highlighter Gum Apple Tennis ball Lock/padlock Toothpaste Watermelon Eraser Hippopotamus	Sunglasses Glass jar Comb Binoculars Fish Yo-yo Cactus Light bulb Bird Pen Frog Pineapple Nightlight Train Bucket/pail

Appendix C

Informed Consent Forms:

First Consent Form

Second Consent Form

CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Dr. Adam S. Radomsky in the Psychology Department of Concordia University.

A. PURPOSE

I have been informed that the purpose of this study is to expand on existing work on free associations and see how people describe different objects. All results will be compared to those of clinical samples to see if there are any connections between responses and specific traits or clinical presentations.

B. PROCEDURES

If you agree to participate in this study, you will first be asked to take part in an object description task. You will be asked to rate your current mood and thoughts, and to fill out a paper-based questionnaire package. Once you have completed the study, we will fully explain the hypotheses of the study and answer any questions you may have about the experiment. The study should take approximately 60 minutes to complete, and will take place in SP-215. For your participation, you will be entered in draw for a chance to win a cash prize ranging from 50$ to 300$, OR course credit if you are part of the Psychology Department Participant Pool.

C. CONDITIONS OF PARTICIPATION

I understand that I am free to withdraw my consent and discontinue my participation in this study at any time, without any negative consequences whatsoever. I understand that all information obtained will be kept strictly confidential and will be stored under lock and key for a period of seven years after which they will be shredded. Access to this information will be made available only to restricted members of Dr. Radomsky's research team. I understand that to ensure my confidentiality all data will be coded by number only and will be kept separate from my name. I understand that data from this study may be published, but that no identifying information will be released.

If you have any questions concerning the study, please feel free to ask the experimenter now. If other questions or concerns come up following the study, please feel free to contact our laboratory at (514) 848-2424, ext. 2199.

Adam S. Radomsky, Ph.D., Associate Professor
Jessica M. Senn, B.A., Graduate Student

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print) _____ AGE _____

SIGNATURE _____ GENDER M / F

WITNESS SIGNATURE _____

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Office, Concordia University, at 514-848-2424, ext. 7481 or by e-mail at Adela.Reid@concordia.ca

CONSENT FORM TO PARTICIPATE IN RESEARCH

As you have just been informed, the use of deceptive information was essential in this study in order to determine if a memory bias could be observed after neutral information had already been learned.

By signing below you indicate that you have been informed of this minor deception and allow us to include your results in our analyses. Given the nature of this deception, we ask that you refrain from talking about the specific details of this study with your friends and/or classmates.

Signature _____

Witness _____

Date _____

If you have any questions concerning this study, please feel free to ask the researcher or call the lab at 848-2424, ext. 5965.

A. Radomsky, Ph.D., Associate Professor.
Jessica Senn, B.A., Graduate Student

Appendix D

Scripts:

Initial instructions

Object association task

Manipulation – Experimental and control

Debriefing

Initial Instructions

The study you are about to take part in is an expansion of previous work on free associations (free association is a task in which someone is normally presented with a word or object, and is asked to say the first thing that comes to mind). Today, we will have you complete free association tasks and also answer some questions about your mood and your thoughts. We are asking these questions so that we can compare the types of responses given by a university student sample to those given by people who have been diagnosed with different mood and anxiety disorders (such as depression, panic disorder, posttraumatic stress disorder, etc.). So, we have two groups in this study, the student group and the clinical group. The clinical group is made up of individuals who have disorders like the ones I just mentioned. You are in the student group.

Object Association Task

Each of these boxes contains a number of everyday objects. After I take the lids off the boxes, I am going to ask you to pick up the objects in the two boxes one at a time, alternating between the boxes. I will tell you which object to pick up. When I tell you to pick up a particular object, please use the hand that corresponds to the box location in which you find the object. For example, when I say an object from the box on your left, please pick it up with your left hand. When I say an object from the box on your right, please pick it up with your right hand. For each object you pick up, please say a sentence or statement to describe it, using the name of the object in your sentence. Because this is a study about free association, I will ask you to say the first thing that comes to mind, as long as it describes the object you are holding. Please try not to use the same sentence structure for every object – try to vary the types of sentences you provide. When you are finished creating your sentence, place the object back into the box you picked it up from and wait for me to tell you what object to pick up next.

So for example, if I were to ask you to pick up the balloon from the box on your right, you would use your right hand to pick up the balloon, and state the first sentence that comes to mind using the name of the object in the sentence. So you may say something like "This ballon is deflated, so it isn't ready to be used as a party decoration yet." Then you would put the balloon back into the box on your right and wait for me to inform you of the next object to pick up. Do you have any questions? (**Open boxes**) Please take a quick second to look into the boxes, and then I will ask you not to look in the boxes unless you are picking up an object. Okay, let's get started. From the box on your ___(left/right) __, please pick up the ___(object name)__. (*Repeat for each object*)

Manipulation

Both Conditions:

Just give me a second – I need to go and take care of something.

Experimental Condition:

Note: the following script was delivered while carrying in the tarantula, setting it on the testing table, and fiddling with paperwork. This was done in order to make it seem more like random information than an obvious experimental manipulation.

Sorry about that. I just needed to bring in our tarantula because I have to clean his tank after this. It's such a pain. We have to clean it like every week and I always get stuck doing it. I guess it's probably because we figured out that he loves being in *this box* (**point to MANIPULATED box**) while we clean his tank. When he's in there, he crawls all over the objects that we keep in there and is so much more active than usual. So since the objects are used for my study, I get stuck doing it.

That other box of objects (**point to UN-MANIPULATED box**) is great because we only use it for the study. The spider has never even seen the objects in that box. I don't know why they can't just order an extra box for me... I've already asked a couple times, but they keep forgetting. An extra box would make my life much easier. Anyways sorry for talking your ear off, I just didn't want to forget about this. You can just sit quietly for the rest of the break.

Control Condition:

Note: the following script was delivered while carrying in the paper, setting it on the testing table, and fiddling with paperwork. This was done in order to make it seem more like random information than an obvious experimental manipulation.

Sorry about that. I just needed to bring in this paper so I won't forget to put it back after we're finished. Our lab keeps it in *this box* (**point to MANIPULATED box**) so I constantly have to unload it and reload it when I am testing people for this study. It seems so silly that I have to put it back in the box instead of somewhere else, but I guess when people get used to something being somewhere they don't want it to change. That other box (**point to UN-MANIPULATED box**) is great because we only use it for the study. I don't know why they can't just order an extra box for me... I've already asked a couple times, but they keep forgetting. An extra box would make my life much easier. Anyways sorry for talking your ear off, I just didn't want to forget about this. You can just sit quietly for the rest of the break.

Debriefing

Both Conditions:

Okay, that concludes the experiment. We just have a few things to go through before you leave. First, let's discuss this debriefing form. This study was not actually about free associations. We are actually trying to test memory for information, and more specifically, whether or not your memory for items can change if you are given new information after original learning of information.

Experimental Condition:

You were in the experimental group of this study, and there was also a control group. All individuals in the experimental group were told that one box was neutral and one box was used for our tarantula, which it in fact is not. All individuals in the control group were told that one box is neutral and that the other box typically holds paper, which again, it does not. In other words, the tarantula has never actually touched the objects that you touched. We want to know if adding threatening information to something that was encoded neutrally can increase memory for the originally learned stimuli. In order to properly test our hypotheses, we need participants to be unaware of the memory tests or of the spider, so please keep this information to yourself, and do not share it with any of your peers. Do you have any questions about the purpose of the study?

Control Condition:

You were in the control group of this study, and there was also an experimental group. All individuals in the control group were told that one box is neutral and that the other box typically holds paper, which it in fact does not. All individuals in the

experimental group were told that one box was neutral and one box held something threatening, which again it did not. We want to know if adding threatening information to something that was encoded neutrally can increase memory for the originally learned stimuli. In order to properly test our hypotheses, we need participants to be unaware of the memory tests or of the potential of being in the threatening condition, so please keep this information to yourself, and do not share it with any of your peers. Do you have any questions about the purpose of the study?

Both Conditions:

We needed to use some deception in this study in order to ensure that participants would not know that their memory was going to be tested. We also had to falsely inform you about the use of the box so that we could change what you thought about those objects. Because these are forms of deception, we are required to ask you to fill out this form indicating that you understand why deception was used, and that you agree to let us use your data. Please read through the form and sign if you agree to the terms.

Any final questions?

Appendix E

Experimenter record form for oral responses to objects

OBJECT DESCRIPTION TASK:

EXPERIMENTER: *(Please dictate to the participant the order in which they should pick up the objects from each box using the two lists provided.)*

Shaded = participant's left; White = participant's right

Object	Side	Sentence Provided
Sunglasses	R	
Clothes pin	L	
Glass jar	R	
Car	L	
Comb	R	
Tape	L	
Binoculars	R	
Battery	L	
Fish	R	
Flower	L	
Yo-yo	R	
Mirror	L	
Cactus	R	
Highlighter	L	
Light bulb	R	
Gum	L	

Bird	R	
Apple	L	
Pen	R	
Tennis ball	L	
Frog	R	
Lock/padlock	L	
Pineapple	R	
Toothpaste	L	
Nightlight	R	
Watermelon	L	
Train	R	
Eraser	L	
Bucket/pail	R	
Hippopotamus	L	

Appendix F

Experimenter record form for oral responses to mood state questions

MOOD STATE QUESTIONS

Now I am going to ask you some questions about your current mood.

HAPPINESS

On a scale of 0-100, where 0 means "not at all happy" and 100 means "extreme happiness, the most you have ever felt in your life", how happy do you feel right now?

_____

GIVE MONEY

On a scale of 0-100, where 0 means "not at all likely" and 100 means "extremely likely, the most you have ever felt in your life", how likely are you to give money to a homeless person later today?

_____

TIREDNESS

On a scale of 0-100, where 0 means "not at all tired" and 100 means "extremely tired, the most you have ever felt in your life", how tired do you feel right now?

_____

NAP

On a scale of 0-100, where 0 means "not at all likely" and 100 means "extremely likely, the most you have ever felt in your life", how likely are you to take a nap when you get home today?

_____

BOXES I

On a scale of 0-100, where 0 means "not at all similar" and 100 means "extremely similar, the most you have ever felt in your life", how similar are these boxes to the types of boxes you use at home?

_____

BOXES II

On a scale of 0-100, where 0 means "not at all likely" and 100 means "extremely likely, the most you have ever felt in your life", how likely would you be to use boxes like this at home?

_____

SUDS

On a scale of 0-100, where 0 means "not at all anxious" and 100 means "extreme anxiety, the most you have ever felt in your life", how anxious are you feeling right now?

_____

DISGUST

On a scale of 0-100, where 0 means "not at all disgusted" and 100 means "extremely disgusted, the most you have ever felt in your life", how disgusted do you feel right now?

_____

RELAXED

On a scale of 0-100, where 0 means "not at all relaxed" and 100 means "extremely relaxed, the most you have ever felt in your life", how relaxed do you feel right now?

_____

URGES TO WASH

On a scale of 0-100, where 0 means "no urge to wash your hands" and 100 means "extreme urge to wash your hands, the most you have ever felt in your life", what is your urge to wash your hands right now?

_____

HUNGRY

On a scale of 0-100, where 0 means "not at all hungry" and 100 means "extremely hungry, the most you have ever felt in your life", how hungry do you feel right now?

_____

BOXES III

On a scale of 1-100, where 0 means "not at all willing" and 100 means "completely willing", how willing would you be to eat your lunch out of the box we use for the _____ (insert paper or spider)?

_____

BOXES IV

On a scale of 1-100, where 0 means "not at all willing" and 100 means "completely willing", how willing would you be to eat your lunch out of the box that is only used for this study?

_____