AWARENESS BOUNDARIES OF VERY BRIEF EXPOSURE

by

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Abstract

Previous studies have suggested that very brief exposure (VBE) to feared stimuli can have positive effects on avoidance of that feared stimuli. The purpose of this study was to examine different dosages of Very Brief Exposure and to determine which amount of exposure to images of spiders would reduce fear behavior the most. A Behavioral Avoidance Test was completed one week before exposure and immediately after exposure. Phobic participants were randomly assigned to one of four conditions: VBE (33 ms stimulus duration), Briefer VBE (17 ms stimulus duration), Barely Visible VBE (50 ms stimulus duration), and VBF (33 ms stimulus duration). It was expected that VBE would reduce avoidance unconsciously in phobic participants. It was also expected that when a lower dose of exposure is given, at an SOA of 17 milliseconds (one refresh rate lower), there would be too little awareness for VBE to affect avoidance behavior. It was also expected that when a higher dose of exposure was given, at an SOA of 50 milliseconds (one refresh rate higher), there would be too much exposure. The results showed that the effect of VBE on reducing avoidance of the tarantula approached significance. The effects of Briefer VBE and Barely Visible VBE were not close to significant. If there were more participants, the effect of VBE on reducing phobic avoidance may have been significant, since the effect size was considerable. These results suggest that VBE is the optimal dose to reduce avoidance of feared stimuli, and that a future study with more participants is needed to test the hypotheses fully.

AWARENESS BOUNDRIES OF VERY BRIEF EXPOSURE

A phobia is considered an intense, irrational fear of specific objects or situations that cannot be voluntarily controlled or reasoned away (Ohman & Soares, 1994). It has long been believed that one must be directly exposed to and consciously confront a feared situation to diminish that fear. There is strong evidence that fear is mainly controlled by non-conscious processes, and that it can be activated outside of awareness. If fear is mostly an unconscious process, people will act or behave in a fearful way before they can consciously process what they are responding to.

Ohman and Soares (1994) conducted a seminal study in unconscious emotional processes, the first study to show that fear responses can be activated by masked stimuli. "Masked" stimuli refer to the technique of visual masking: a target stimulus is very briefly presented, and immediately followed by a second, masking stimulus in order to prevent recognition of the target stimulus. Using masking, Ohman and Soares (1994) showed that unconscious processing is just as strong if not stronger as conscious processing of feared stimuli.

Siegel and Weinberger (2009) then created a technique called very brief exposure (VBE) - the repeated presentation of a series of masked phobic stimuli - to answer the question of whether exposure without full awareness can reduce phobic behavior. The results of this study showed that spider phobic participants who received VBE to masked spider pictures were able to get closer to a live tarantula than a control group. That is, VBE had a positive effect on phobics approaching a live spider. Siegel, Anderson, and Han (2011) built on this study by including a baseline BAT, and a non-phobic comparison group to test if VBE affects everyone or is specific to phobic people. VBE reduced avoidance of the tarantula by phobic participants and had no effect on non-phobic participants. Siegel and Weinberger (2012) built on Siegel, Anderson, and Han (2011) by manipulating levels of awareness of the spider stimuli; a third clearly visible

exposure (CVE) group was included. They found a double dissociation between the effects of VBE and CVE on avoidance behavior verses conscious distress. CVE increased conscious distress while VBE did not. Further, VBE reduced avoidance of the live tarantula but CVE did not. This pattern of results strongly suggests that VBE is reducing phobic behavior unconsciously. Siegel and Warren (2013) showed that participants who received VBE maintained their reduced avoidance levels one year later (i.e., an immediate effect of reduced avoidance was maintained a year later).

All prior VBE studies have used target stimulus duration of 33 milliseconds (ms). While most participants say they can't make out the stimuli, some say they could tell what some of the spider images were. Thus, it is possible that conscious processes influence the VBE effect. What are the awareness boundaries of VBE? If the stimuli are presented even faster, at a duration that entirely blocks any awareness of the stimuli, will the effect of reduced avoidance of a live tarantula still occur? If the stimuli are presented supraliminally or more slowly, so that the stimuli are barely visible, will the effect still occur? This study will be a fine-grained analysis of the relationship between awareness of exposure and the efficacy of exposure.

Unconscious Activation and Conditioning of Fear

Ohman and Soares (1994) was the first study to introduce the idea that fear can be activated unconsciously. They measured skin conductance responses (SCRs), a sensitive indicator of physiological arousal and thus of fear responses, while presenting masked and non-masked stimuli. They hypothesized that SCRs would be activated by masked phobic stimuli. There were a total of 48 participants: 16 snake phobics, 16 spider phobics, and 16 non-phobics. All participants saw both masked and unmasked spiders, snakes, flowers, and mushrooms. Thus, the spiders were phobic stimuli for the spider-phobics, the snakes were phobic stimuli for the

snake-phobics, and the flowers and mushrooms served as control stimuli. The study was a within subjects design; the participants received all of the stimuli masked, and then unmasked. Thus, their SCRs to the different stimuli were directly compared. Further, the masked stimuli were always presented first so the participants would not be primed. If they had presented any unmasked stimuli before the masked stimuli, the participants would have known what to expect when being presented with the masked stimuli, which would have confounded the experiment. The results showed that phobic participants had SCRs for masked phobic stimuli that were just as high or higher compared to the unmasked stimuli. That is, unconscious processing of phobic stimuli is just as strong if not stronger than conscious processing.

Ohman and Soares (1998) further investigated unconscious fear by testing if fear responses could be conditioned, or acquired, unconsciously. Their hypothesis was that unconscious fear conditioning is possible, but only with fear-relevant stimuli, which are stimuli like spiders, snakes, the dark, blood - those we are biologically prepared or "pre-wired" to fear, or stimuli that we all fear to a certain extent. Their participants were 40 non-phobic undergraduate students who scored low on both the Snake and Spider Fear Questionaires (Klorman, Weerts, Hastings, Melamed, & Lang, 1974). During the conditioning phase, participants were randomly assigned to two groups: fear-relevant conditioned stimuli, which consisted of spiders and snakes, and fear-irrelevant conditioned stimuli, which consisted of flowers and mushrooms. In both groups, when the masked images were presented the participants would also receive a mild shock. Next was the extinction phase, wherein the same stimuli were presented again, but this time they were unmasked and no shocks were given. SCRs were measured during both conditioning and extinction in order to see if the participants showed elevated SCRs to the unmasked fear-relevant stimuli during extinction. The results during the

extinction phase showed that those who received fear-relevant conditioned stimuli with shocks had elevated SCRs to the same unmasked stimuli. That is, when presented with the same unmasked, fear-relevant stimuli, they continued to show elevated SCRs. Participants who had received fear-irrelevant conditioned stimuli, by contrast, did not show elevated SCRs when the same stimuli were presented unmasked during extinction. Thus, conditioning effects were specific to the masked, fear-relevant stimuli. Fear conditioning can only occur unconsciously with fear-relevant stimuli.

Very Brief Exposure

If fear responses can be conditioned unconsciously, can they also be reduced unconsciously? Siegel and Weinberger (2009) created a technique called very brief exposure (VBE), the repeated presentation of a series of masked phobic stimuli, in order to answer the question of whether exposure without full awareness can reduce phobic behavior. They predicted that spider fearful or phobic participants who got VBE to masked spider images would approach a live, caged tarantula more than those who were exposed to masked, unreportable trees (control). The participants consisted of undergraduates who reported having the most fear on the Fear of Spiders Questionnaire (FSQ, Szymanski & Donohue, 1995). Participants were randomly assigned to one of three types of exposure: VBE to spiders, clearly visible exposure (CVE) to spiders, or unreportable masked trees (control). The participants were then asked to take the Behavioral Avoidance Test (BAT), in which they gradually approached a live tarantula in a series of steps. Spider phobic participants who got VBE were able to get closer to the tarantula than both of the other groups. Thus, VBE can have a positive effect on phobic participants approaching a live spider. A limitation of this study was there was no baseline

BAT. Thus, the group who got VBE to spiders might have been already less fearful than the other groups, which could have been why they were able to get closer to the live tarantula.

Siegel, Anderson, and Han (2011) addressed the limitations of Siegel and Weinberger (2009) by including a baseline BAT. They also included a non-phobic group for comparison, to see if VBE affects everyone or is specific to phobic people. Another purpose of the study was to see if VBE affects not only avoidance behavior, but also subjective distress (how much fear they experience). They hypothesized that VBE would affect avoidance behavior, but would not affect distress. Participants included spider fearful and non-phobic undergraduates identified by the Fear of Spiders Questionnaire (FSQ) and the BAT with the live tarantula. The participants were randomly assigned to receive either VBE to spiders or control exposure to very brief flowers (VBF). Participants did the BAT one week before and immediately after these exposures. Participants were also asked to rate levels of distress on a 10-point, Subjective Units of Distress Scale (SUDS) right before and immediately after exposure. The results showed that VBE reduced avoidance of the tarantula by phobic participants and VBE had no effect on distress. VBE had an implicit effect on fear of phobic participants, affecting their behavior, but not their conscious distress. VBE had no effect on avoidance of the tarantula by non-phobic participants. A limitation of this study was that one couldn't conclude that the effect of VBE on avoidance occurred unconsciously because there was no manipulation of awareness; there was no group that received clearly visible exposure (CVE) to spiders. Thus, there is not enough evidence to say that VBE reduced phobic behavior unconsciously.

Siegel and Weinberger (2012) addressed this limitation of Siegel, Anderson, and Han (2011) by manipulating levels of awareness of the spider stimuli. That is, a third, clearly visible exposure (CVE) group was included. There were four hypotheses. The first was to replicate

results from previous studies and show that VBE to images of spiders reduces avoidance of a live tarantula (relative to control exposure). The second hypothesis was that VBE to images of spiders would reduce phobic avoidance more than CVE to the same stimuli. Thirdly, the first hypothesized effect of reduced avoidance of VBE would be maintained two weeks later. Lastly, CVE to images of spiders would increase subjective distress, whereas VBE would not. There were 99 spider-phobic participants identified by the Fear of Spiders Questionnaire (FSQ) and the BAT. Participants were randomly assigned to one of three types of exposure: VBE to spiders, CVE to spiders, or the control, very brief flowers (VBF). The BAT was given one week before exposure (baseline) and immediately after exposure. Participants rated levels of distress on a 10-point Subjective Units of Distress Scale (SUDS) right before exposure and immediately after exposure. The results showed that CVE increased SUDS relative to control, and VBE did not. VBE increased approach toward the live tarantula compared to control, but CVE did not. Thus, there was a double dissociation between the effects of VBE and CVE on avoidance behavior versus conscious distress. CVE affected conscious experience, while VBE did not. VBE reduced avoidance of the live tarantula, but CVE did not. These results strongly suggest that VBE reduces avoidance unconsciously in phobic participants.

The previous studies have shown that VBE can reduce avoidance unconsciously, but they have not tested if the effects on avoidance behavior can last over a long period of time. The purpose of Siegel and Warren (2013) was to measure the long-term effects of VBE. They hypothesized that the immediate effect of VBE on avoidance behavior would be maintained one year later. Their participants consisted of 53 spider-phobics who had been in Siegel and Weinberger (2012) and returned a year later to take the BAT again. The results showed that

participants who had VBE had maintained their avoidance levels after one year. In other words, the immediate effect of VBE on avoidance behavior was maintained a year later.

In previous VBE studies there has not been a measure of psychological arousal, which is important for understanding unconscious emotional responses during VBE. Siegel, Warren, Jacobson, and Merrit (2017) compared the effects of VBE on electrodermal activity and avoidance of a live tarantula. There were three hypotheses: (1) to replicate the findings of prior studies and show that VBE can reduce the avoidance of a live tarantula but does not affect distress; (2) thus, VBE will not raise skin conductance levels (SCLs) any more than control exposure; and (3) there would be a negative correlation between increased SCLs during VBE and its effect on avoidance behavior. There were 60 spider-phobic participants who were identified by the FSQ and the BAT. Participants were randomly assigned to VBE to spiders or VBF. A baseline BAT was given one week before exposure and a BAT was given immediately after exposure. SUDS were taken immediately before and immediately after exposure. The SCLs were measured continuously during VBE and VBF. The results showed that VBE reduced avoidance of the tarantula and did not increase SCLs anymore than VBF (control). VBE did not cause distress relative to VBF either. There was a negative correlation between SCLs during VBE and fear reduction, meaning that the more VBE induced SCLs, the less fear reduction that occurred. Together, these findings suggest that VBE reduces phobic avoidance without inducing SCLs. VBE reduces fear the most when participants have less arousal. A limitation of this experiment was that there was no clearly visible exposure (CVE), and thus no manipulation of awareness.

A second experiment was done to address this limitation. Siegel et al. (2017) hypothesized that the CVE would increase SUDS and SCLs more than both VBE and VBF,

which would not increase SUDS and SCLs. There were 16 spider phobic participants identified by the FSQ and BAT. It was a within-subjects experiment so each participant received each of the three types of exposure: VBE, CVE, and the VBF (control). It was within-subjects to compare each participant to themselves with respect to SCLs. SUDS were taken right before and after exposure. CVE was always presented last to avoid awareness of the stimuli during VBE and VBF, which would prevent biases about the masked conditions. VBE and VBF were counter-balanced and randomized. The results showed that CVE increases SCL and SUDS significantly more than both VBE and VBF. The SUDS and SCLs of VBE and VBF did not differ.

Previous studies have examined the attributes of VBE and its effect on unconscious fear reduction. These results suggest that VBE can reduce fear unconsciously, and that this effect can last over a long period of time. However, none of these studies tested if different durations of the masked phobic stimuli could have the same effect observed in past studies of phobic participants who received VBE. All prior studies have had a stimulus onset asynchrony (SOA) of 33 milliseconds for each target stimulus during VBE. This means that the stimuli were on the computer screen for two refresh periods before being followed by a masking stimulus. The purpose of this study is to test the awareness boundaries of VBE. Can the effects of VBE on avoidance behavior still occur when the stimuli are presented subliminally, at a duration that entirely blocks any awareness? Can the effects of VBE on avoidance behavior still occur when the stimuli are presented supraliminally, more slowly, making all of the spider stimuli barely visible? It is expected that VBE will reduce avoidance behavior of spider-phobics, replicating the results of previous studies. It is also expected that when a lower dose of exposure is given, at an SOA of 17 milliseconds (one refresh rate lower), there will be too little awareness for VBE to

affect avoidance behavior. Finally, it is expected that when a higher dose of exposure is given, at an SOA of 50 milliseconds (one refresh rate higher), there will be too much exposure. That is, participants will be too aware of the stimuli for VBE to produce similar effects on avoidance behavior. If the spider phobics are able to see the spiders, they will experience distress, which will prevent them from being less avoidant to the tarantula.

Methods

Participants

There were 48 spider-phobic participants from a public, northeastern college, 16 male and 32 female (Mean age = 19.24, SD = 2.17). Participants were identified by being in the top 15% of the distribution of scores of the Fear of Spiders Questionnaire (FSQ, Szymanski & Donohue, 1995, described below,). To confirm participants self-reported fear, they took a Behavioral Avoidance Test (BAT, described below) in which they approached a live tarantula. As compensation, the participants were given the option to receive either 2 research participant credits for a class or $15 cash.

Design

Participants were randomly assigned to one of three conditions: VBE (33 ms), Briefer VBE (17 ms), or Barely Visible VBE (50 ms). Each of the conditions were identified by code numbers so experimenters were blind to the conditions. Participants were blind to the first two conditions, but they couldn't be blind to the barely visible condition because they could see them. This was done intentionally. A control group who were exposed to masked flowers (SOA duration 33 ms) was taken from a previous study. Each condition contained 24 images of masked spiders or flowers. Participants approached a live tarantula one week prior to the manipulation

(baseline BAT), and immediately after exposure to the stimuli in order to measure changes in avoidance of the tarantula.

Materials and Equipment

The target stimuli were 24 color images of spiders and flowers, which were downloaded from entomology and botany sites. When presented on the screen, the images were 450 x 350 pixels in size. The mean number of pixels, brightness, and contrast of brightness of the two types of images did not differ, and thus those features couldn't confound the result. Like the spiders, the flowers had a central body with multiple radiations (petals), which controlled for the visual shape of the spider images (Siegel et al, 2017). The masking stimulus consisted of an array of repeating letters ABCD, which were 500 X 500 pixels in size. The masking stimulus entirely covered the area of the target images.

The stimuli were presented by EPRIME 2.0 on a 2014 Dell desktop computer and 19" monitor. The monitor resolution was 1024 X 768 pixels and the refresh rate was 60Hz (i.e., the screen regenerated every 1/60 or .0166 sec; images were presented for two refresh rates or .033 sec, 33 ms each; Siegel et al, 2017).

Behavioral Measures

The *Fear of Spiders Questionnaire (FSQ)* had the participants self-report through various yes/no questions on how fearful of spiders they believed they were. The questionnaire also consisted of many filler questions in order to disguise the intent of the questionnaire. The filler items consisted of fear of heights, snakes, and needles, and sensation -seeking behaviors. Filler questions were not scored (Siegel & Weinberger, 2009).

To confirm the participants' self-reported fear of spiders, and to measure the level of behavioral fear, they took a *Behavioral Avoidance Test (BAT)*, in which the participants slowly

approached a live caged tarantula. The BAT consisted of ten tasks, wherein each task was progressively more fear-inducing while getting closer to the tarantula. The list of tasks that participants were asked to complete can be found in the Appendix.

Procedure

The study consisted of two sessions, one week apart. During the 1st session, the participant first provided informed consent and filled out a demographics form. The experimenter explained the BAT by having the participant read a task sheet, and the participant was permitted to ask questions afterward. The participant was told to answer yes or no to each approach task before being told to proceed with the task. Participants were told that they could stop at any time throughout the BAT. The BAT was discontinued if the participant reported they weren't willing to do a task ("No" response) or were unable to complete a task. The number of tasks completed by the participant was recorded.

When the participant returned for the second week, they first engaged in a computer task which had them view one of the three conditions: Briefer VBE, VBE, or Longer VBE. In each of these conditions, a large X appeared on the screen as a fixation point, which lasted for about a second. The X was followed by a flash, which was the target image. The target image was on the screen for various times depending on which condition the participant was in. Immediately after the target image, there was a masking stimulus represented by a series of capital letters ABCD, which stayed on the screen for 120-ms. This sequence of the X, followed by a flash, and then the masking stimulus was repeated 24 times and lasted for about two minutes (Siegel & Weinberger, 2009).

Once the computer task was completed, the participant was asked to engage in the BAT again. The BAT was administered by the experimenter just as it was the prior week in the first

session. Once the participant chose to end the BAT, the participant was asked to complete a quick questionnaire about the computer task which assessed if the participant was able to decipher the stimuli. Lastly, the experimenter debriefed the participant about the study.

Results

A series of mixed model ANOVAs were used to test the hypotheses. The first factor in each ANOVA was type of exposure: Very Brief Exposure (VBE; 33 ms stimulus duration), Barely Visible VBE (50 ms), Briefer VBE (17 ms), or Very Brief Flowers (33 ms, control exposure). The second factor in each ANOVA was the time of measurement of the dependent variable. The dependent variable was the Behavioral Avoidance Task (BAT) with the live tarantula, which was done one week before exposure and immediately after exposure. It was measured by the number of approach steps the participants completed. If fearful avoidance was reduced, participants would be able to get closer to the tarantula by completing more steps.

Table 1 shows the mean BAT scores of the groups at each time of measurement. A 4 x 2, Exposure x Time, ANOVA was used to test the effect of exposure on BAT scores at the two times of measurement (one week before and immediately after exposure). The main effect of time was significant: $F(1,42) = 21.4$, $p = .0001$, showing that the participants got closer to the tarantula on the post-exposure BAT, regardless of type of exposure (or across type of exposure). The main effect of exposure was not significant: $F(3,42) = .708$, $p = .552$. Relevant to my hypothesis because it concerns changes in avoidance caused by exposure, the interaction effect of Exposure x Time was not significant: $F(3,42) = 1.72$, $p = .179$.

Even though the overall 4 x 2 ANOVA was not significant, my specific prediction was about the effect of VBE relative to control exposure. In the specific test of my hypothesis that VBE would reduce avoidance of a live tarantula, a 2 x 2, Exposure (comparing VBE and VBF) x

Time, ANOVA was conducted. The interaction effect of Exposure x Time was nearly significant: $F(1,21) = 3.753$, $p = .066$. The main effect of time was significant: $F(1,21) = 10.5$, $p = .004$. The main effect of condition was not significant: $F(1,21) = .456$, $p = .507$.

There were no ANOVAs conducted for Briefer VBE or Barely Visible VBE because as shown by the means in Table 1, they did not have an effect. As there were no significant differences of the means between the Briefer VBE or Barely Visible VBE compared to the control.

Discussion

The focus of this study was to examine the optimal dosage of very brief exposure (VBE) to images of spiders in order to reduce fear avoidance behavior in phobic participants. It was expected that this study would duplicate results from previous studies. Thus, VBE would reduce fearful avoidance of a live tarantula. Secondly, it was expected that Briefer VBE (17 ms stimulus duration) would be too fast to produce similar effects as VBE (33 ms). Thirdly, Barely Visible VBE (50 ms) would be too long a duration of exposure, and therefore would not produce similar effects as VBE (33ms). To test the level of fear, participants were asked to complete a Behavioral Avoidance Task, which had them gradually approach a live tarantula. A week after the baseline BAT, participants then were randomly assigned to one of four conditions: VBE (33ms), Briefer VBE (17ms), Barely Visible VBE (50ms), or VBF (control). Then they completed the BAT again immediately after exposure.

Regardless of exposure condition, participants were able to get closer to the live tarantula during the second week of the study. This result means that fear behavior was reduced due to exposure to the live tarantula. This was a garden-variety exposure effect of the spider, which represents a mundane finding. However, it appeared that the type of exposure that the

participant received did make a difference in reducing their fearful behavior. The effect of VBE on fearful behavior approached significance, meaning that participants in this condition almost got closer to the tarantula than those in the control group. The effect size of Eta=.44 suggests that if there were more participants, the effect of VBE would have been significant; VBE would have reduced avoidance of the tarantula. This finding was consistent with multiple prior VBE studies (Siegel & Weinberger, 2009, Siegel, Anderson, & Han, 2012, Siegel & Weinberger, 2012, Siegel & Warren, 2013, Siegel, Warren, Jacobson, & Merrit, 2017)

The other two types of exposure, briefer VBE and barely visible VBE, had no effect on avoidance of the tarantula relative to control. It is obvious from the means in Table 1 that they increased approach towards the tarantula about the same as control exposure. Overall, the results suggest that only VBE appears to be having an effect. If the current findings occur with a larger sample, they will suggest that VBE is the optimal dose of exposure. Briefer VBE was probably too fast to provide adequate exposure to the images of spiders, the feared stimuli. Barely visible VBE, on the other hand, may have been too much exposure to the feared stimuli. That is, barely visible VBE may have caused the phobic participants too much fear or distress, which could have interfered with approaching the tarantula. This interpretation suggests that VBE is just the right amount of exposure to reduce avoidance of the tarantula. Unlike Barely Visible VBE, participants who received VBE cannot make out the spider images so, there is no distress while processing the stimuli that would interfere with fear reduction. Briefer VBE does not allow for participants to have sufficient exposure to process the images, and thus does not have an effect on their fear. VBE provides sufficient exposure for phobic participants to process the images, without causing them to experience fear. Habituation occurs when someone is exposed repeatedly to what they fear; it eventually reduces their fear. If the presentation of the stimuli is

too brief, there cannot be enough of a response to create habituation. By having too much exposure in Barely Visible VBE, it can cause distress instead of habituating the participant and allowing them to get closer to the tarantula. The amount of exposure produced during VBE may allow for only some habituation to be created, which leads to better understanding of the mechanisms that allow VBE to work.

A limitation of this study was that some people reported they believed they saw images of spiders in VBE (33ms) and Briefer VBE (17ms) because these conditions were supposed to be unconscious. However, these participants did not actually report that they actually saw spiders in the Briefer VBE (17ms) condition. The participants were primed to expect spiders during computer exposure by confronting the tarantula the prior week of the study. If some of the images were in fact visible, we could not determine if VBE helped because the spider images were unconscious. Another limitation of this study was the lack of participants. There was a struggle in finding sufficiently phobic participants at a liberal arts college. Without enough participants, I was not able to collect enough data. The ratio of females to males was also a limitation because it means the results are less generalizable - to males specifically, who were underrepresented in the sample.

A future study should collect more data based on more participants in order to be able to see the effects of all four conditions more clearly and to continue to show the effect of VBE compared to control. Another possible study would be to use fMRI to see how VBE works in the brain – how it operates to reduce fear in the brain. Using fMRI would shed light on the neural mechanisms of VBE. This study would have to be based on a theory of why VBE works, to be able to understand how VBE causes changes in the brain functioning to reduce fear.

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Table 1

Behavioral Avoidance Test: Interaction of Type of Exposure and Time

	Type of Exposure			
Time	Very Brief Exposure	Barely Visible VBE	Briefer VBE	Very Brief Flowers
1 Week Before Exposure	5.0 (.78)	4.5(.82)	5.5(.78)	6.2(.82)
Immediately After Exposure	6.1(.81)	4.9(.84)	6.2(.81)	6.5(.84)

Note. Values outside of the parentheses represents mean scores on the Behavioral Avoidance. A higher number indicates greater approach towards the tarantula, and thus less avoidance of it. Values within parentheses represent standard error of measurement.

Appendix

Behavioral Avoidance Test

1. Are you willing to enter the room with the caged spider…yes or no?

2. Are you willing to stand directly next to the tank with the spider…yes or no?

3. Are you willing to slowly remove the blanket covering the tank…yes or no?

4. Are you willing to touch the sides of the tank near the spider…yes or no?

5. Are you willing to open the top of the tank for ten seconds, and then close the tank…yes or no?

6. Are you willing to open the top of the tank, place your face at the opening, and then close the tank…yes or no?

7. Are you willing to open the tank, and put your hand fully inside the tank – horizontally, like this - without touching the spider…yes or no?

8. Are you willing to open the tank, place your face at the opening, describe the spider in detail, and then close the tank…yes or no?

9. Are you willing to place your face at the opening as I make the spider move…yes or no

10. Are you willing to put your hand in and touch the spider…yes or no?