A COMPARISON OF ALTERNATIVE TREATMENTS OF SPIDER PHOBIA: PLACEBO vs VERY BRIEF EXPOSURE

by

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Abstract

The universal treatment for treating phobias is exposure, the repeated and direct confrontation of feared stimuli or the feared situation. An alternative treatment based on this idea has been created, called very brief exposure (VBE). VBE is a technique that very briefly exposes images of the feared object so that phobic people can't see them. The purpose of this study was to directly compare the effects of alternative treatments of spider phobia: VBE and a placebo. The hypothesis was that the placebo would reduce avoidance of the spider as much as VBE. Participants were identified as spider-phobic with the Fear of Spider questionnaire (FSQ) and the Behavioral Avoidance Test (BAT) with a live tarantula. One week later, 59 participants returned for a follow-up BAT and were assigned to one of three conditions: VBE, Placebo with Deception and Placebo without Deception (i.e full knowledge of the placebo). The results showed that Placebo with deception reduced avoidance of the spider more than placebo without deception (the control). Placebo with deception and VBE did not significantly differ in terms of reduction of avoidance of the spider; they were similarly effective. The results indicate that fear can be reduced in two different ways, through a conscious process (placebo) or an unconscious habituation mechanism (VBE).

“A Comparison of Alternative Treatments of Spider Phobia: Placebo vs Very Brief Exposure”

Fear is an adaptive alarm reaction to danger. It protects us by activating a massive response from the autonomic nervous system called the flight or fight response. Its purpose is for mammals to immediately react to any dangerous situation. If there is an overreaction of this adaptive response to a stimulus, then an irrational fear can develop that is called a phobia. Phobias are defined as an unreasonable fear of a specific object or situation that interferes with daily life (Barlow, 2002). Phobias are highly prevalent with data indicating about 40% of the American population will have some form of a phobia at some point in their life (Barlow, 2002). The cause of phobias can be direct encounters with the feared stimuli, second-hand exposure through other people, and gradually developing that fear over time. As soon a phobia develops, it becomes chronic and can last a lifetime (Barlow, 2002).

The universal treatment for treating phobias is exposure, the repeated and direct confrontation of feared stimuli or the situation. The purpose of this technique is to help phobic patients overcome their fears through consistent habituation of the fear response by repeated exposure to the feared stimulus. All forms of exposure emphasize direct confrontation of the feared stimulus, as well as being fully aware of such confrontation throughout the process. Mounting evidence suggests, on the other hand, fear can be activated and learned outside of awareness (Ohman & Soares, 1994). An alternative treatment based on this idea has been created, called very brief exposure (VBE). It bypasses conscious processes by very briefly presenting the feared stimulus so that the phobic people can’t see the feared images. VBE presents the feared stimulus immediately after a brief “masking stimulus”. This results in spider

phobics unable to consciously perceive the first stimulus(spider images). This may be a useful alternative treatment because by bypassing conscious processes, it makes it easier and less stressful for phobic people to complete than traditional exposure therapy. Because they are so stressful, traditional exposure therapies can cause the patient to give up early, not wanting to attempt treatment again and thus end up only strengthening the phobia. The VBE treatment has been found to be effective as studies have shown the participants to be less fearful than they were before.

The purpose of this study is to directly compare the effects of alternative treatments of spider phobia: VBE and a placebo. A placebo is a substance that has no biological effect on a medical condition, but it may have a psychological effect on the patient and thus the medical condition. When testing treatments, placebos are usually used as a control treatment by deceiving the participants into thinking that it is an active medication. Placebos have been shown to have therapeutic effects on an extremely wide range of medical conditions from mental illnesses, common colds, to cancer (Arnstein, Broglio, Wuhrman, & Kean, 2011). Any change or improvement as a result of the placebo is a purely psychological effect on the medical condition called the placebo effect. A placebo may be another useful treatment for phobia and so can be used to compare two possible alternative treatments for phobia (Arnstein, Broglio, Wuhrman, & Kean, 2011). Whereas VBE is based on an unconscious process for reducing fear, the placebo effect is based on a conscious psychological process.

Before presenting the study, I will provide evidence of the effects of alternative treatments, especially VBE. I will start with the established theory of the source of fear known as the “fear module”,- as it is the basis of research on the nonconscious activation of fear and

phobias. Research based on the "fear module" will then be used to review research on the nonconscious activation and learning of phobic behavior, followed by the non-conscious reduction of phobic behavior. I will discuss how fear is involved in unconscious versus conscious processes.

Öhman and Mineka's (2001) proposed the theory of a fear module, a neural circuit for automatically processing feared stimuli. The fear module is a specific network in the brain that is designed to detect threatening stimuli in the environment and automatically generate fear responses. Threat detection occurs unconsciously. The module is activated independently by other parts of the brain. It developed in the brain before the cerebral cortex, where conscious processes developed. If the fear module detects feared stimuli unconsciously then fear responses should occur unconsciously. Previous studies have shown that fear can be unconsciously activated and conditioned by fear-relevant stimuli (Esteves, Parra, Dimberg, & Öhman, 1994). On the basis of this research, Öhman and Mineka (2001) concluded that "fear" is an unconscious process.

Based on the fear module, Siegel, Han, Anderson, and Cohen (2013) tested the idea that threatening stimuli are unconsciously detected. The researchers hypothesized that phobic stimuli are detected unconsciously. 25 spider phobics and 22 non-phobics completed the Fear Questionnaire of Spiders (FSQ, Szymanksi & O'Donohue, 1995) and a Behavioral Avoidance Test (BAT). The BAT is a series of approach tasks, requiring more interaction with the feared object as it proceeds. The BAT was based on a ten point scale of willingness to approach a live tarantula, and for each task, a point was scored when completed.

Participants were presented with 24 masked images of spiders and flowers with an equal 48 images of control stimuli in a random sequence. The masked images were pictures of spiders covered by a sequence of capital letters that flash very briefly called the masking stimulus. After each masked stimulus was presented, the participants answered two questions. The response to the first question "Did you see something?" is a detection response and the response to the second question "was a spider or flower present?" is an identification response.
A signal detection analysis was used to test the detection of each target stimulus relative to the control stimuli.

The results supported the hypothesis that spider phobic group correctly identified both detected and undetected spiders better than chance. That is, the detection-paradigm revealed phobics identified spiders regardless of whether or not they saw it. The non-phobic group did not exhibit the same detection-identification dissociation for either spiders or flowers. They only identified spiders better than chance when they detected that something was here. Thus, the results showed a detection-identification dissociation was specific to phobic stimuli. This suggests that feared stimuli are perceived unconsciously and the possibility that fear responses can be unconsciously activated.

Ohman and Soares (1994) tested if fear can be activated outside of awareness because, in phobias, fears are not voluntarily controlled. When phobics are confronted with what they fear, they show an immediate, and autonomic response indicating that fear may be a nonconscious process. By using skin conductance responses (SCRs), the researchers tested if fear responses are initiated before conscious processes. A 30-ms mask interval for the exposures found complete and effective masking of the feared stimuli (Öhman & Soares, 1993). Researchers selected

participants phobic of spiders or snakes and exposed them to either masked or unmasked versions of those images. They predicted that phobics would show larger SCRs scores to feared stimuli than to the control stimuli. The main hypothesis of this study was that the phobic participants would still respond to the feared stimuli when they were masked as much as they would to the non-masked stimuli.

A total of 48 participants were selected using a set of fear questionnaires: 16 spider phobics,16 snake phobics,16 non-phobics. Participants were presented with 24 pictures of either masked and unmasked spiders, snakes, and mushrooms (control stimuli). SCRs electrodes were attached to the front side of their fingers while being exposed to randomized series of these stimuli. The presentation was broken into two different runs, masked stimuli being followed by unmasked stimuli. After each stimulus presentation, participants were given an identification task in which they were asked to write down what they thought they saw and how they felt on a 9 point emotional rating scale.

The results showed a clear main effect of stimulus type, with higher SCRS to the phobic images than the neutral images. The phobic groups responded to what they were fearful of. Snake-phobic group had larger SCRs to the images of snakes, and the spider-phobic group had larger SCRs to the images of spiders. More importantly, the main hypothesis was supported as the phobic groups responded to their feared stimuli regardless of whether the images were masked or unmasked. This indicated that participants were aroused by phobic stimuli that they couldn't see at all. Öhman and Soares (1994) concluded masked images are just as effective as unmasked images at initiating autonomic responses in fearful participants.

In a similar study, Ohman and Soares (1998) next showed that SCRs to feared stimuli can be conditioned or acquired unconsciously. If fear can be initiated and learned outside of awareness, is it possible to bypass direct confrontation of a feared object in exposure? Will such an exposure method be able to help phobic patients approach the feared object without full conscious awareness (Siegel & Weinberger, 2009)?

The purpose of a study by Siegel and Weinberger (2009) was to see if VBE to images of spiders can help spider phobic participants approach a live tarantula. In the experiment, participants were exposed to masked images of spiders (30 ms each) with rows of capital letters acting as the masking stimulus. At this exposure duration, both phobics and non-phobics were unable to recognize the images. Two main hypotheses were tested in this study. The first was spider phobic participants that were exposed to masked images of spiders (VBE) would approach the live tarantula more than those that were exposed to neutral masked images of trees. The second hypothesis was that the spider phobic participants exposed to masked images of spiders would approach a live tarantula more than participants that were exposed to clearly visible images (CVE) of spiders, followed by those exposed to the neutral images. Researchers expected spider phobic participants exposed to clearly visible images of spiders would have conscious fear responses. Thus, the rate of habituation would be slower and would cause these participants to not approach as much as VBE participants.

To test the hypotheses, the researchers randomly selected 65 spider-fearful participants based on their FSQ scores. Participants were randomly assigned to one of three levels of exposure: unreportable (masked) images of spiders (or VBE, 25-ms stimulus duration), clearly visible images of spiders (500-ms), or unreportable images of trees (control, 25ms). To measure

the phobics avoidance behavior, a BAT was given immediately after the exposure treatment. The results showed that spider phobic participants who received exposure to masked images of spiders (VBE) approached the live tarantula more. They got closer to the live spider than both participants that were exposed to the visible images of spiders and the control group. That is, a shorter time period of exposure lead to more interaction with the spider than a longer period. A limitation of the study was a baseline BAT was not taken before the exposure tasks. Thus, with no baseline BAT, it's possible that the VBE group got closer simply because they were less fearful.

This limitation was addressed by Siegel, Anderson, and Han (2011) whose purpose was to compare the effects of VBE to spider stimuli on spider phobic and non-phobic individuals. This time a baseline BAT test was implemented one week before exposure in order to establish the participants level of avoidance. Furthermore, the researchers tested the effects of exposure on subjective distress when the feared stimuli were presented. The hypothesis was that VBE to images of spiders would reduce avoidance in the spider-phobic group, and not in the non-phobic group. There were 36 spider-phobic and 35 non-phobic participants who completed a baseline BAT and the FSQ. Participants were exposed to 24 masked images of either spiders or flowers (25-ms each) and Subjective Units of Distress Scores (SUDS) were taken just before and immediately after the exposure task. SUDS are a self-reported a rating of how much conscious distress a person is experiencing. Then the participants did the BAT again after exposure so that the researchers could see if there was a change in phobic behavior from their baseline BAT.

The results showed that exposure to masked images of spiders (VBE) reduced avoidance of a live spider in phobics. The researcher's main hypothesis was supported as VBE promoted an

approach towards a feared object. However, VBE didn't affect the conscious experience of fear in phobic participants as shown by not affecting SUDS. A limitation of this study was that it did not include a group who were exposed to clearly visible images of spiders well within their conscious awareness. Thus, the researchers couldn't conclude that the effect of VBE on phobic avoidance of the tarantula was unconscious.

These limitations were addressed by Siegel and Weinberger (2012). The purpose of this study was to compare the effects of VBE and clearly visible exposure (CVE) to phobic stimuli on reducing phobic behavior. The researchers also assessed delayed the effects of VBE and CVE by having the phobic participants do the BAT again two weeks after exposure, as previous studies only assessed the immediate effects of VBE on phobic behavior. There were four hypotheses in this study: (1).- VBE to images of spiders would reduce avoidance of a live tarantula;-(2)-. VBE to images of spiders would reduce phobic avoidance more than CVE to the same stimuli; -(3)-. Effects of VBE would still be maintained 2 weeks later; and (4)-. CVE to images of spiders would increase subjective distress, whereas VBE would not. 101 spider phobic participants were selected after completing the FSQ and a baseline BAT with the tarantula

To test for delayed effects, 57 participants came back two weeks later for a follow-up BAT. The participants randomly assigned to one of three levels of exposure: very brief images of spiders (VBE, 25ms each), clearly visible images of spiders (CVE, 120ms), and very brief flowers (control, 25ms). Subjective distress scores were taken just before and immediately after the exposure task. Participants did the BAT one week before, immediately after, and 2 weeks after exposure.

The results supported Hypothesis 1, as exposure to very brief spiders reduced avoidance more than control exposure. Hypothesis 2 was supported, as exposure to very brief spiders reduced avoidance more than the clearly visible spider exposure. Clearly visible exposure to spiders increased distress more than that to very brief spiders and that to flowers. Hypothesis 3 was supported, as the effect of VBE on reducing avoidance was still maintained 2 weeks later. Hypothesis 4 was also supported, as SUDS increased for participants exposed to CVE, VBE while participants didn't experience distress. Overall, the data shows that phobics participants avoidance was affected by VBE, which didn't affect experienced fear, while phobic participants avoidance wasn't affected by CVE, which affected experienced fear. These results showed a double dissociation between the effects of VBE and CVE on avoidance versus conscious distress. The double dissociation means that VBE and CVE had exactly the opposite effects on the two dependent variables: approaching the tarantula, and subjective distress. VBE, is unconsciously affecting the participant's phobic behavior as distress scores were not affected, and they approached the live spider more. CVE, however, is consciously affecting fear in phobic participants as their distress scores were affected, but did not make their approach towards the live spider any closer.

Siegel and Warren (2013) next tested if the immediate effect of exposure to masked phobic stimuli on avoidance would still be maintained one year later. Researchers wanted to see if this effect of VBE to masked phobic stimuli would last a year as no studies of masked stimuli have done so. 53 spider phobics participants that completed the FSQ and a baseline BAT returned one year later. Participants were presented with 24 pictures of either masked (very brief) spiders or unmasked (clearly visible) (VBE or CVE), and masked (very brief) flowers (control).

Behavior avoidance of the spider was measured one week before, immediately after, and one year after the exposure manipulation.

The results indicated that the immediate effect of VBE on reducing phobic behavior was still maintained one year later. VBE reduced avoidance more than very brief flowers, and CVE, and this effect was still maintained a year later.

Siegel and Gallagher (2014) next tested the delayed effects of VBE to phobic stimuli on avoidance of the tarantula, 24 hours later. The purpose was to see VBE would still reduce phobic avoidance behavior of a spider 24 hours later. Thus, the post-exposure BAT was given 24 hours after exposure. The hypothesis was that VBE would reduce avoidance of the spider when the phobics participants confronted it 24 hours later. Researchers selected 86 spider phobics that completed the FSQ, and a baseline BAT, post-exposure BAT before and after 24 hrs later. Spider phobic participants were randomly assigned to presentations of 25 pictures of masked images of either spiders (VBE) or flowers (control). These participants approached the live spider on the BAT either immediately after exposure or 24 hours later.

The results found that VBE reduced avoidance of the live spider 24 hours after exposure, as much as it did immediately thereafter. Delayed exposure had the same effect on phobic behavior as immediate exposure, suggesting that VBE does not have to be immediately followed by confronting the tarantula. In other words, the delay showed that direct exposure to the feared situation doesn't have to happen immediately after VBE. Direct exposure can be distressing. With the delayed treatment, the participants can do VBE first to reduce fear, and then confront their fears later.

Previous eye-tracking studies have revealed that spider phobic patients show a typical anxious avoidance pattern to images of spiders. However, only one prior study has tested the effect of a placebo on spider phobia. The purpose of this study is to compare eye-tracking patterns to images of spiders in a placebo and nonplacebo conditions. The researchers Gremsl, Schwab, Höfler, and Schienle (2017) tested if a placebo can reduce fear of spiders. The researchers compared a placebo to a control condition where no treatment was received. 37 spider phobic participants completed the FSQ and the placebo was introduced as a fear reducing drug called Propranolol, a beta-blocker that has been used to treat spider phobia. The participants were presented with 48 picture pairs, while their eye movements were recorded. Sixteen pairs consisted of two neutral images, while the remaining 32 pairs contained one neutral image and one image of a spider. This study was split into two sessions, one week without the placebo and the second week with the placebo. Participants were told to rate the intensity of experienced fear on a 9-point Likert scale after the eye-tracking experiment. Following the second week, the same group received propranolol (placebo) to test for a longer focusing and fixation on the images of spiders.

The results showed that the placebo worked, the participants focused longer on the spider images in the second week than they did in the first week. The participants reported lower rates of experienced fear on a 9-point Likert Scales, and that's only after the placebo condition. The results showed that the placebo was able to change the visual avoidance of spiders. However, a major limitation of this study is the exposure exercise itself. Participants simply could've focused longer because they saw the images for the second time.

Prior VBE studies have not compared VBE to another alternative treatment of phobia. The purpose of my study is to directly compare the effects of alternative treatments of spider phobia: VBE and a placebo. Prior studies haven't compared VBE to other alternative treatments and placebo is a natural choice because like VBE it doesn't cause distress. Furthermore, placebos work by inducing conscious processes, beliefs that the drug will help the person whereas VBE works by unconscious processes. Comparing VBE and Placebo allows us to compare unconscious and conscious processes of fear reduction. I have two hypotheses in this study: (1) VBE will reduce avoidance of the tarantula, (2) Placebo will also reduce avoidance of tarantula. Which, however, will work better?. That is, which will reduce avoidance more- VBE or the placebo?. This research question is exploratory; I did not make a prediction. No prior research has been done that allows me to anticipate which will be more effective at reducing fear.

Methods

Participants

The Fear of Spiders Questionnaire (FSQ;(FSQ; Szymanski & O'Donohue, 1995)) was administered to 510 college students enrolled in natural and social science courses at a public, northeastern college. The students who scored in the top 15% of the distribution of scores were contacted to participate. To confirm their self-reported fear of spiders, potential participants engaged in a Behavioral Avoidance Test (BAT) with a live tarantula. (described below) Those who scored above the 15% cutoff on the FSQ and avoided the tarantula were invited to participate. Those who did not avoid the tarantula or discontinued the BAT because the tarantula

moved unexpectedly were excluded from the experiment. A total of 59 participants qualified for the study: 40 females, 15 males and 4 non-binary.

Design

The spider-phobic participants were randomly assigned to one of three different conditions: VBE to masked images of spiders, Placebo with deception and Placebo without deception (control). A control group for VBE was not necessary because prior studies have already established that VBE reduces fear, and because my specific hypothesis compares VBE to Placebo directly. The masked exposure conditions (VBE) consisted of 25 trials of masked spider images. Each trial consisted of a large "X" fixation point was displayed for 2 seconds, followed by the target image for "17 milliseconds(ms)", followed by the masking stimulus. Which was a series of capital letters for 100 ms. The placebo with deception condition involved giving the participant a placebo and telling them it was a real drug, the beta-blocker "Propranolol" which has been shown to reduce fear. In placebo without deception, the participant was given the same exact pill but they were told it was an inactive sugar pill. To measure the effectiveness of the conditions on phobic behavior, participants did the BAT in which they approached the live tarantula one week before and immediately after treatment.

Measures, Materials, and Equipment

The FSQ is widely used to identify individuals who are relatively high or low in fear of spiders. Filler questions designed to disguise the intent of the questionnaire concerned fear of

heights, snakes, and needles were added; these items were not scored. (Siegel and Weinberger 2012)

The Behavioral Assessment Test (BAT) was used to measure the avoidance of a feared object, in this measure a live tarantula. BATs are commonly used to measure improvements in spider phobia. Participants are asked to complete a series of tasks that involve approaching a live tarantula. The early tasks require little involvement; later tasks require more proximity and involvement with it. A participant is asked to complete one task at a time, and a point is only scored after each task they complete. The BAT was a 10-point scale of approaching a live tarantula in a cage (Siegel and Weinberger 2012).

A Subjective Units of Distress Scale (SUDS) was used to measure subjective distress caused by approaching the spider. The participant rated her own fear on a scale of 0 to 10. "0" meant that she was experiencing "no fear whatsoever", "10 "an extremely high, unbearable amount of fear", and 5 "a tolerable amount of fear." (Siegel and Weinberger 2012)

Procedure

In the first week of the study, the BAT was administered. The researcher gave the participant a list of approach tasks that described what they would be asked to do. The participants were told that they could discontinue at any time and did not have to do any of the tasks. Next, the participants were led to the room containing the caged tarantula. Each step of the task was presented in this manner: the researcher asked first if the participant was willing to complete the task. If the participants were willing then they were instructed to complete the task. A point was scored if the participant completed the task. At the end of each task, the participants

were asked to rate their fear of 0-10 according to the SUDS scale. The BAT was discontinued if the participant was unwilling or unable to complete a task. If the participant was willing to complete the final task (touching the spider) they were told not to do so.

When the participants returned for the second week of the study, they were randomized to one of the three conditions: VBE, Placebo with deception, or Placebo without deception. The VBE condition began by telling the participant that a series of stimuli would be presented that they may or may not be able to see. Their task was to focus on the "X" that appeared in the center of the screen for 2 seconds. This was followed by the flash, which was the target stimulus an image of a spider for 30 ms, followed by the masking stimulus, which was a series of capital letters for 100 ms. The participants were exposed to 25 trails of spiders. Immediately after the task was finished, the BAT was administered once again in order to measure improvement. Then a stimulus questionnaire was given that asked the participant about the stimuli they viewed during VBE, in order to see if they saw the spider images.

In the Placebo with deception condition, an inert sugar pill was disguised as a fear-reducing drug called Propranolol. The researchers, while wearing white lab coats, explained to the participants that they would be given a beta-blocker called "Propranolol" that is commonly used by performers to reduce levels of fear and anxiety. The researchers also reassured the participants the pill does not have any side-effects and that the effect would last for 15 minutes. A white pill bottle with a "Propranolol" label was shown to the participants and the researcher asked for their consent to take the pill. The participants who did not take the pill were dismissed from the study and their data excluded. After consenting, they were given one pill with a glass of water and were told it would take 5-10 minutes for the pill to take effect. While the participants

were waiting, the researcher gave the participant two articles to read about the fear reducing effects of Propranolol. After ten minutes, the participant proceeded to do the BAT. The final task was an intervention interview asking the participant about their knowledge of the pill. In the Placebo without Deception condition, participants were informed that by chance, they had been assigned to the "placebo" control group. The researchers told the participants that an inactive sugar pill would be given to them that does not have any negative effects. (Consent was asked to give the pill). If the participant consented, one pill was given with a glass of water. Immediately after, participants proceeded to do the BAT, followed by the intervention Interview. All participants were then debriefed as to what the experiment was about and were instructed to keep what they did for the study confidential.

Results

Behavioral Avoidance Test (BAT): *Avoidance of the Tarantula*

Table 2 shows the BAT means of the three groups. A 3 x 2, Treatment (Placebo with deception, Placebo without deception, or VBE, between-subjects) x Time (pre- and post-exposure, within-subjects), mixed-model ANOVA was used to test the hypothesis. The main effect of Time was significant, $F\ (1, 55) = 17.8, p = .0001$, showing that BAT scores increased from pre- to post-exposure, i.e., avoidance of the tarantula was reduced, regardless of treatment. The main effect of Treatment was not significant ($F<1$). The interaction effect of Treatment and Time was significant, $F\ (1, 55) = 3.36, p = .042$. The size of this interaction effect was $Eta = .33$, which is considered a moderate effect. To determine which treatments significantly differed in terms of effects on avoidance, further ANOVAs were done.

To test whether the placebo reduced avoidance of the spider, a 2 x 2, Placebo condition (masked spiders or flowers, between-subjects) x Time (pre- and post-exposure, within-subjects), mixed-model ANOVA was used to test the hypothesis. The main effect of Time was significant, *F (1, 35) = 9.88, p =.003*, showing that BAT scores increased from pre- to post-exposure, i.e., avoidance of the tarantula was reduced, regardless of treatment. The main effect of Treatment was not significant (*F<1*). The interaction effect of Treatment and Time was significant, *F (1, 35) = 6.69, p =.014*. As shown by the means in Table 1, this interaction effects show that Placebo with deception reduced avoidance more than Placebo without deception (control). The size of this interaction effect was *Eta =.40*, which is considered between a moderate and a large effect.

To directly compare the effects of VBE and placebo, 2 x 2, Treatment (masked spiders or Placebo with deception, between-subjects) x Time (pre- and post-exposure, within-subjects), mixed-model ANOVA was used to test the hypothesis. The main effect of Time was significant, *F (1, 35) = 23.9, p =.0001*, showing that BAT scores increased from pre- to post-exposure, i.e., avoidance of the tarantula was reduced, regardless of treatment. The main effect of Treatment was not significant (*F<1*). The interaction effect of Treatment and Time was not significant, *F*<1. That is, Placebo with deception and VBE did not significantly differ in terms of effects on reducing avoidance of the tarantula.

Discussion

The purpose of my study was to directly compare the effects of alternative treatments of spider phobia: VBE and a placebo. Prior studies haven't compared VBE to other alternative

treatments and placebo is a natural choice because like VBE it doesn't cause distress. Siegel and Weinberger (2009) tested if VBE to images of spiders can help spider phobic participants approach a live tarantula but didn't compare them to non-phobics. These limitations were addressed later by other studies such as Siegel, Anderson, and Han (2011) that established the unconscious effect of VBE on spider phobia. The effect of placebos on reducing fear was established by Gremsl, Schwab, Höfler, and Schienle (2017). Furthermore, placebos work by inducing conscious processes, beliefs that the drug will help the person whereas VBE works by unconscious processes. Thus, comparing VBE and placebo allows us to compare the unconscious and conscious process of fear reduction. I had two hypotheses in this study: (1) VBE would reduce avoidance of the tarantula; (2) Placebo would also reduce avoidance of tarantula. However, which would work better? That is, which would reduce avoidance more - VBE or the placebo? That question was exploratory; I did not make a hypothesis about it.

The results showed that placebo with deception reduced avoidance of the spider more than placebo without deception (the control). That is, participants got closer to the spider when they didn't know they were receiving a placebo - an inert sugar pill, rather than when they were told that they were receiving a placebo. This result is consistent with a large body of research on the Placebo effect. We know that placebos reduce the symptoms of a very wide variety of medical conditions. However, the current findings extend the placebo effect to spider phobia, as the results show that placebos may also be helpful in reducing spider fear. The placebo effect doesn't just concern medical conditions such as migraines, but also extends to common fears like spider phobia, which is a psychological condition. Thus, the results show that a purely

psychological effect of a placebo can be used to treat a psychological condition, as has been shown previously for other psychological conditions.

The results also showed that the placebo with deception and VBE did not significantly differ in terms of reduction of avoidance of the spider, they were similarly effective (Table 1). The multiple VBE studies that were presented in the literature review all showed that VBE reduced avoidance relative to control exposure (VBE) (Siegel and Weinberger 2009; Siegel and Warren 2013; Siegel and Gallagher 2015). That is, the effect of VBE on reducing avoidance has been established. The current findings showed that placebo reduced avoidance at least as much as VBE did. While one didn't have more of an effect than the other, the mean scores showed that the placebo had at least as much of an effect as VBE. Furthermore, prior studies have already established that VBE is having an unconscious effect on fear, while the current findings of the placebo attest to a conscious effect, an effect of a conscious belief - that participants believed they were getting a real drug that reduced fear. Thus, the study showed that fear can be reduced in two different ways, through a conscious process (placebo) or an unconscious habituation mechanism (VBE).

I think the placebo reduced fear because of the deception, the participants were told about the beta-blocker. Reading about the effects of the beta-blocker made the participants consciously believe that their fear would be reduced causing them to get closer to the spider. It is also possible that the placebo gave the participants the confidence to get closer to the spider and reduce their fear. That is, the placebo may have given the participants self-efficacy. However, that theory must be held tentatively because I did not measure the effects of the placebo on self-efficacy in this study.

The main limitation of this study was that it was not logistically possible to have a control group for VBE because there were not enough spider-phobic participants to include a fourth group. Another limitation was that this clinical research study had a relatively small sample, with 16-20 participants per group. However, this limitation`can be addressed by running more participants in future studies. Another limitation of this study was the phobic participants were neither diagnosed with Spider phobia nor seeking treatment for it. This could mean that the results may not be clinically valuable. To address this limitation in future studies, the participants should be either diagnosed or seeking treatment prior.

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Table 1

Behavioral Avoidance Test: *Avoidance of the Tarantula*

	Type of Exposure		
Time	Very Brief Exposure	Placebo with Deception	Placebo Control
1 Week Before Exposure	5.62 (.53)	6.00 (.53)	7.06 (.60)
Immediately After Exposure	6.48 (.53)	7.19 (.61)	7.29 (.53)

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

Appendix

Funneled Interview

1. *When you were watching the computer screen, what do you remember happening?* If this question didn't elicit information about the stimuli, the participant was asked:
2. *In between the X and the capital letters presented on the screen, did you see something?* If the participant indicated that he saw something but didn't say what it was, he was asked: *What did you see?* If the participant said that he saw "a flash" (i.e., the masked target stimulus), he was asked:
3. *If you had to guess what the flash was, what would you say it was?* If the participant denied that he saw anything between the X and the capital letters, he was told:
4. *Something was flashed on the screen between the X and the capital letters. If you had to guess what the flash was, what would you say it was?* If a participant said that he saw a spider(s)/flower(s) in response to any of the above questions, he was next asked:
5. *How many times did you see a spider/flower?*

Behavioral Avoidance Test

0. Will not enter the room
1. Enters the room but approaches no further
2. Comes within five feet of the tank but no further
3. Stands next to the tank
4. Removes blanket covering the tank
5. Places hands on two sides of tank closest to spider
6. Removes top cover of tank, and puts it back
7. Removes top cover of tank, puts face over open tank, and replaces cover
8. Removes top cover of tank, puts face over open tank and describes spider in detail
9. Removes top cover of tank, and places entire hand inside of tank horizontally
10. Reports willingness to touch spider (asked but never allowed, as explained below.)