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Anxiety sensitivity moderates behavioral avoidance in anxious youth

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Abstract

Individuals who are high in anxiety sensitivity (AS) are motivated to avoid sensations of anxiety. Consequently, AS is hypothesized to contribute to overall avoidance of any feared stimuli. No studies have yet examined whether fear of a stimulus is a stronger predictor of behavioral avoidance in individuals who are high in AS compared to individuals who are low in AS. We examined whether AS moderates the association between fear of spiders and behavioral avoidance of spider stimuli in 50 clinically anxious youth. Fear of spiders significantly predicted avoidance of spider stimuli in youth high in AS but not in youth low in AS. These results provide support for the role of AS in avoidant behavior and help to explain the link between AS and the anxiety disorders. The results have implications for exposure-based anxiety treatments and highlight the importance of increasing anxious patients' ability to tolerate sensations of anxiety.

Keywords

Anxiety sensitivity; Fear; Anxiety; Avoidance; Cognitive behavior therapy; Exposure; Anxiety disorders

Anxiety sensitivity (AS) refers to individuals' beliefs that sensations related to anxiety pose a threat to their physical or psychological safety, and the consequent fear and avoidance of those sensations (Reiss, Peterson, Gursky, & McNally, 1986). AS can be measured reliably in children and adults and explains variance beyond that explained by trait anxiety (Leen-Feldner, Reardon, & Zvolensky, 2007; Silverman, Fleisig, Rabian, & Peterson, 1991; Zinbarg, Brown, Barlow, & Rapee, 2001). AS is linked to the presence of the various phobic and anxiety disorders in children and in adults (Olatunji & Wolitzky-Taylor, 2009; Silverman, Goedhart, Barrett, & Turner, 2003).

Reiss's expectancy model (Reiss, 1991; Reiss & McNally, 1985) provides a theoretical formulation for the role of AS in the development and maintenance of phobic and anxiety disorders, particularly with respect to avoidant behavior, which characterizes these disorders. The model proposes that during encounters with fear-and anxiety-provoking stimuli, individuals experience not only fear or anxiety toward the stimuli, but they also experience

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Conflict of Interest

None.

fear and anxiety about the physical sensations elicited by these encounters. As Reiss explained (1991, p. 142): "Avoidance motivation implies the presence of both fear-outcome expectations and fear-outcome sensitivities." As such, AS is thought to amplify the impact of any fearful or anxious experience on avoidant behavior, and to act as a risk factor for anxiety pathology (Schmidt, Lerew, & Joiner, 1998).

It follows from Reiss's (Reiss, 1991) formulation that fear of a stimulus would be a stronger predictor of avoidance in individuals who are high in AS compared to individuals who are low in AS. In other words, AS moderates the link between fear and avoidance. If avoidance is indeed moderated by AS than this would be in line with Reiss's expectancy model. If on the other hand avoidance is predicted by individuals' fear and anxiety of the stimulus only and not moderated by AS, than this would be less in line with the expectancy model.

Although the role of AS in avoidant behaviors is a cornerstone of expectancy theory (Reiss, 1991), we could not identify a single child or adult study that has examined the above moderation hypothesis. The closest study we could identify examined AS as a moderator of response to fear or anxiety-provoking situations, but of interest was whether AS would moderate subjective ratings of distress in the situations, not avoidant behavior. In that study, Orsillo, Lilienfeld, and Heimberg (1994) asked 62 clinic referred social phobic adults to participate in behavioral exposures (e.g., public speaking, one-on-one conversations). Findings indicated that AS moderated the relation between social anxiety and distress.

One kind of aversive sensation that can drive avoidant behavior of various stimuli is disgust. Woody, McLean, and Klassen (2005) for example, using a sample of 115 undergraduate students who rated themselves highly fearful of spiders found the students' behavioral avoidance of spiders related more strongly to their sensations of disgust than to their fear or anxiety about harm from the spider. Building on this research, Olatunji, Cisler, Meunier, Connolly, and Lohr (2008) examined harm- and disgust-related expectancies associated with spiders, in fifty undergraduate student participants who rated themselves either high or low in fear of spiders. Disgust-related expectancies were found to significantly predict avoidant behavior; harm-related expectancies did not.

In summary these findings support the idea that avoiding aversive sensations contributes to behavioral avoidance in anxiety. Whether a similar pattern of findings would emerge if the focus was not on disgust but on AS is unknown.

Testing the hypothesis that AS moderates avoidant behavior requires accurate assessment of both AS and avoidant behavior. AS has been assessed reliably for decades using rating scales such as the Anxiety Sensitivity Index (Peterson & Heilbronner, 1987), and the Childhood Anxiety Sensitivity Index (Silverman et al., 1991), but assessing avoidant behavior presents methodological challenges. Traditional Behavioral Avoidance Tests (BAT) have faced challenges including generating few data points with low-resolution information, the risk of demand characteristics because participants are aware that their avoidance is the variable of interest, and limited ecological validity (Kazdin, 1979; Kirsch, 1982; Miller & Bernstein, 1972).

Technological advances are being used to overcome such limitations by employing accurate motion-tracking technology to facilitate the development of sophisticated BATs that provide high-resolution measurement of avoidant behavior in participants who are free to physically move around, and are not explicitly focused on the issue of avoidance thereby reducing demand characteristics. In the current study we used the Yale Interactive Kinect Environment Software (YIKES) platform (Lebowitz, Shic, Campbell, MacLeod, & Silverman, 2015) to measure behavioral avoidance of spider images in children and adolescents with clinical anxiety disorders. In a previous study with 86 adult women, self-rated fear of spiders was positively correlated with behavioral avoidance of spider images in YIKES, explaining approximately 25% of variance in the measured avoidant behavior (Lebowitz et al., 2015).

YIKES experiments can be used to measure avoidance of any visual stimulus but previous research has focused on spider images which have been among the most commonly studied stimuli in the avoidance literature. There are several advantages to using spider stimuli in studies of fear and avoidance, as well as AS. Fear of spiders is common in both general population and clinical populations, with a wide distribution of severity (Davey, 1992; Oosterink, de Jongh, & Hoogstraten, 2009). Because all spiders are predators and most are venomous, fear of spiders has long been considered and evolutionary adaptation contributing to its prevalence in the general population (Seligman, 1971). Research comparing spiders to other animals, including other potentially dangerous arthropods (e.g., wasps), supports this conclusion and the usefulness of spider images in studies of fear and avoidance (Gerdes, Uhl, & Alpers, 2009). Global measures of anxiety (e.g., trait anxiety), as well as fear of spiders, predict response to spider stimuli, and images of spiders are effective stimuli for triggering fear of spiders (Arntz, Rauner, & van den Hout, 1995; Lipp & Derakshan, 2005; Muris, Mayer, & Merckelbach, 1998; Renaud, Bouchard, & Proulx, 2002; Thorpe & Salkovskis, 1998). Finally, spiders elicit both fear of harm and aversive physical sensations, with individuals frequently reporting they avoid spiders because of a fear of panic-like symptoms, making them well suited to test the hypothesis that AS moderates the association between fear of spiders and behavioral avoidance of spider stimuli (McNally & Steketee, 1985).

In the current study we aimed to test this hypothesis in a sample of clinically anxious youth, with a range of anxiety disorders. We focused on a clinical sample, rather than a nonclinical sample of the general population, because understanding the factors that motivate or maintain avoidance in youth with anxiety disorders, in which avoidance is a key factor contributing to impairment, is of prime importance and potentially high impact. We chose not to limit the sample to youth with spider phobia, to ensure a broader range of fear of spiders. Because fear of spiders is highly prevalent in the population and is linked to overall trait anxiety, it provides an excellent model in which to conduct this first test of the role of AS in moderating avoidance (Arntz et al., 1995; Lipp & Derakshan, 2005; Muris et al., 1998; Renaud et al., 2002; Thorpe & Salkovskis, 1998).

Our objective was to test whether AS moderates the association between fear of spiders and behavioral avoidance of spider stimuli. We hypothesized, in line with Reiss and McNally (1985) expectancy model, that fear of spiders would predict behavioral avoidance of spider

stimuli more strongly in youth who were high in AS compared to youth who were low in AS.

1. Method

1.1. Participants

Participants were 50 youth, aged 7–17 years (Mean = 11.86 years; SD = 3.19; 48% males), who presented consecutively for evaluation at a specialty anxiety clinic at a large medical center in the eastern United States, and were either self-referred or were referred to the clinic by primary care providers, other mental health providers, or school personnel. The clinic regularly distributes printed information on clinical services and research activities to local providers and school staff. Participating youth met DSM-5 (American Psychiatric Association, 2013) criteria for a primary anxiety disorder diagnosis of generalized anxiety disorder (35%), social phobia (32%), separation anxiety disorder (14%), specific phobia (15%), or panic disorder (4%). The average number of anxiety diagnoses was 2.3 (SD = 1.22), and ranged from 1 to 5. Secondary non anxiety disorder diagnoses included attention deficit hyper-activity disorder (20.6%), major depression (10.3%), oppositional defiant disorder (5.9%) and conduct disorder (1.5%). No participants met criteria for specific phobia of spiders. This is due, however, to our adherence to the DSM-5 criteria for specific phobia, which require significant interference with normal routine or functioning. Most previous research on spider phobia has waived this requirement for inclusion criteria or relied only elevated ratings of fear of spiders, which were well represented in our sample. All participants were enrolled in a regular educational setting and fluent English speakers. English was the primary language spoken in most (93.1%) of the homes with the remainder having Spanish as primary langauge. Youth were predominantly White (83.3%) and non-Hispanic (94.5%), with a minority being African American (6%), Asian (2%), or of mixed ethnic background.

1.2. Procedure

The study was approved by the University Institutional Review Board. Upon arrival, study procedures were explained and signed consents and assents were obtained from parents and youths respectively, before any additional study procedures. Participating youths first completed a diagnostic interview and rating scales. Youth were aided in the completion of study forms if necessary, by trained research personnel. Youth then participated in the motion tracking YIKES task (described below), which took approximately 10 min, including instructions and a 1-min practice.

1.3. Measures

Anxiety Disorders Interview Schedule – Children and Parent (ADIS C/P) (Silverman, Saavedra, & Pina, 2001)—The presence of a primary DSM-5 anxiety disorder diagnosis was established using the ADIS C/P, administered separately to the child and the mother. The ADIS C/P is a semi-structured interview with good to excellent reliability for establishing diagnoses, and strong correspondence with anxiety questionnaire ratings (Silverman et al., 2001; Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). The ADIS C/P was administered by graduate level clinicians or licensed psychologists,

trained in its use by one of the instrument's authors. Training included observing live and videotaped samples, supervised administration, discussion of initial discrepancies, and repeated practice until reliability was achieved. Once reliability (ICC > 0.85) was achieved, each assessment was discussed with a concensus team of expert clinicians (including an author of the ADIS C/P) to prevent rater drift. As in past research, in cases of discordance between parent and child reports the clinician considered both informants' views to derive a final diagnosis (Silverman et al., 1999; Silverman, Kurtines, Jaccard, & Pina, 2009).

Spider Phobia Questionnaire – Child Version (SPQ-C) (Kindt, Brosschot, & Muris, 1996)—The SPQ-C includes 29 statements to which participants respond either yes or no (e.g., 'Even a toy spider in my hand scares me a bit'). Scores are calculated as the sum of items to which the youth indicated a positive response (after reverse coding certain items) and can range from 0 to 29. The SPQ-C has good to excellent internal consistency (Kindt et al., 1996) (α coefficients from 0.86 to 0.90). Internal consistency in the current sample was excellent (α = 0.90).

Child Anxiety Sensitivity Index (CASI) (Silverman et al., 1991)—The CASI is an adaptation of the adult Anxiety Sensitivity Scale (ASI; Reiss et al., 1986) modified for use with youth ages 6–17. The CASI includes 18 items describing physical sensations and youth indicate the degree to which they believe those sensations pose a risk of negative consequences for them. Good internal consistency (α = 0.87) has been reported for the CASI (Silverman et al., 1991). Internal consistency in the current sample was excellent (α = 0.91).

Behavioral Measure: Yale Interactive Kinect Environment Software (YIKES) Task—YIKES pairs an accurate motion-sensing input device with experimentation software. The YIKES software component allows researchers to flexibly design experiments in which participants see themselves on a screen, and engage in tasks that involve actually walking around, while interacting with various on-screen elements (see Fig. 1 for illustration). Participant motion is captured and recorded with high spatial and temporal resolution.

The YIKES task was conducted in a rectangular windowless room, with the participant standing approximately 2 m away from the Kinect sensor and facing an LCD display. Participants were able to clearly see themselves on-screen, overlaid on the 'game' environment (see Fig. 1). Participants could move 1.5 m to either side of the midline creating a total experimental area 3 m wide. This YIKES task has been previously validated in another study with a non-clinical adult sample (Lebowitz et al., 2015) in which self-reported fear of spiders was found to positively and significantly predict behavioral avoidance of spider images.

Participants engaged in a ball-catching task using YIKES that required them to move from side to side to correctly position themselves to catch objects (small images of Earth) that dropped from the top of the screen (see Fig. 1). The locations for the 360 falling 'Earths' was a random uniform distribution, laterally counterbalanced such that every 30-Earth sequence was repeated as a mirror image of itself, to ensure that the locations of the falling Earths would not bias participant movement in either direction. Spider images and non-

spider (neutral) images were presented on the sides of the screen such that at any given time a participant would either be moving toward a spider image or be moving toward a neutral image (or standing still). The two images in each pair (one neutral, one spider) appeared simultaneously, with the first pair appearing after a 1-min baseline play during which no images were displayed (the 60 Earths that fell during that first minute are not included in the 360 count mentioned above). Each pair was displayed on-screen for 1 min, and then was immediately replaced with another pair, in which the neutral image would appear in place of the spider image and vice versa, to ensure counterbalancing in the location of the spider and neutral images. Overall, six sets of spider images and neutral images were displayed over 6 min, with each set displayed for 1 min. Pilot studies using a standardized system of picture rating (Ito, Cacioppo, & Lang, 1998) and two independent raters per image indicated the neutral images did not evoke significant affect. Spider images were likewise piloted before the experiment and were selected (from the many possible spider images) on the basis of the following criteria: being easily recognized as a spider, and eliciting high arousal and negative valence compared to other spider images. Neutral and spider images also had to be able to be paired with each other - meaning they had to be similar to each other in terms of overall shape, color, and outline. Participant movement throughout the experiment was recorded as a series of time and horizontal location pairs, with spatial resolution of > 1 cm and temporal resolution of 20 data points per second.

1.4. Calculating behavioral avoidance

To calculate avoidance of the spider stimuli we identified the average location at which participants who were moving toward an image turned back away from the image and toward the middle. We calculated two average ‘turning away points’ for each participant. One was the average from all the times they were moving toward a spider image, and the other was the average from all the times they were moving toward a neutral image. We operationalized avoidance of the spider image as turning back away sooner (at a greater distance from the image, which always appeared at the edges of the screen) when moving toward spider images compared to when moving toward neutral images. Turning back away sooner when moving toward spider images, compared to when moving toward neutral images, would mean maintaining less proximity to the spider images and thus would constitute the behavioral avoidance.

Following earlier research (Lebowitz et al., 2015), we identified the average location at which participants turned back while moving toward an image by estimating extreme points of the location–time curve. We estimated these by fitting the position-time points by a set of 3rd B-spline basis functions, plus an intercept, slope, and quadratic term, to yield an accurate representation of the position-time points by a smooth continuous function, and identifying the locations where the derivative of the estimated curve is equal to zero (Fig. 2). We then focused on the average of the points where the participant is changing direction back away from the image and toward the center, calculated separately for spider and neutral image-sides.

As a manipulation check, to validate that avoidance on the YIKES task was related to anxiety experienced during the task, we also administered the State Anxiety Inventory of the

State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) before and after the YIKES task. We examined whether avoidance on the YIKES task was significantly related to an increase in anxiety as measures on the scale. As expected, behavioral avoidance was significantly related to an increase in state anxiety as rated after the task compared to before ($r = 0.3$, $p < 0.05$).

1.5. Data analytic plan

Less than 3% of data was missing and preliminary analysis indicated that the missing data was randomly distributed and not associated with any identified variables. We used bivariate Pearson r correlations to examine the association between fear of spiders, AS, and behavioral avoidance of the spider images.

To test the hypothesis that AS moderates the association between fear of spiders and avoidance of spider stimuli we first conducted a hierarchical multiple linear regression, with avoidance as the predicted variable. In the first step we included fear of spiders and AS. In the second step we added the interaction term equal to the product of fear of spiders and AS. Variables were centered to decrease collinearity (Aiken & West, 1991). Significant change in explained variance in avoidance of the spiders when the interaction term is included in the analysis provides evidence of moderation. We then used the Process macro for SPSS (Hayes, 2013) to calculate simple slopes for the association between youths' fear of spiders and avoidance of spiders for low (1 SD below the mean), moderate (mean) and high (1 SD above the mean) levels of AS, and calculated 95% confidence intervals for the effect sizes based on bootstrapping procedures with 1000 samples.

2. Results

Spider phobia (SPQ-C) scores ranged from 2 to 25 with an average SPQ-C score of 9.91 (SD = 5.86) which is higher than has been reported for most nonclinical samples, but lower than most specifically spider phobia samples (Kindt & Brosschot, 1999; Kindt et al., 1996). CASI scores ranged from 20 to 53 with an average CASI score of 32.28 (SD = 8.84) which is similar to what has been reported in other clinical samples and higher than what has been reported in nonclinical samples (Silverman et al., 1991). Males and females did not differ significantly on any of the study variables and age was not significantly associated with any study variables. Likewise, the presence or absence of any particular anxiety disorder (i.e. generalized anxiety, social phobia, separation anxiety, panic disorder, or specific phobia) or non anxiety disorder was not significantly associated with the study variables of behavioral avoidance and AS.

2.1. Bivariate correlations

As expected fear of spiders in youth significantly predicted behavioral avoidance of the spider images ($r_{49} = 0.45$, 95%CI 0.20–0.65, $p = 0.002$). Youth who scored higher on the SPQ-C turned back away sooner, on average, when moving toward spider images compared to when moving toward neutral images. Examining youths' approach to spider and neutral images separately revealed that only youths' approach to spider images was associated with fear of spiders ($r_{49} = 0.46$, 95%CI 0.20–0.65, $p = 0.001$), not youths' approach to neutral

images (r_{49} = −0.12, 95%CI −0.16 – 0.38, p = 0.41). This demonstrated that fear of spiders was associated specifically with avoidance of the spider images, not merely with moving less overall.

AS was weakly associated with avoidance of the spider images (r_{49} = 0.30, 95%CI 0.02–0.53, p = 0.04), and was not significantly associated with fear of spiders as measured with SPQ-C.

2.2. Moderation analysis

Results of the hierarchical multiple regression predicting the youths' avoidance of spider stimuli from their fear of spiders and from their AS showed significant change in explained variance when the interaction term between fear of spiders and AS was included in the analysis, providing evidence of moderation. The first step, including fear of spiders and AS, resulted in explained variance of R^2 = 0.64 (adjusted R^2 = 0.41) which was significantly different from zero (F = 10.06, p < 0.001). The second step, with the addition of the interaction term equal to the product of fear of spiders and AS, increased the R^2 by 16.98%, which was significantly different from step 1 (F_{change} = 12.43, p = 0.001).

We next examined the slope of the association between fear of spiders and avoidance of the spiders at different levels of AS and found that the effect size grew as AS increased, and that only the high AS slope revealed significant associations between fear of spiders and avoidance of the spider images (β= 0.77, 95% CI: 0.43 to 1.11, p < 0.001). The association in youth with moderate AS approached significance (β= 0.31, 95% CI: −0.01 to 0.64, p = 0.06) and the association in youth with low AS was insignificant (β= −0.14, 95% CI: −0.62 to 0.34, p = 0.55). Fig. 3 plots the simple slopes for the interaction and illustrates that fear of spiders significantly predicted behavioral avoidance only in youth high in AS.

3. Discussion

As far as we know, this is the first study to demonstrate the role of AS in amplifying the impact of fear and anxiety on avoidant behavior. Self-rated fear of spiders was significantly associated with behavioral avoidance of spider images in clinically anxious youth only when the youth also reported elevated AS. Self-rated fear of spiders in anxious youth who were low in AS was not significantly associated with behavioral avoidance of spider images. These results are in line with Reiss' expectancy model that proposes that avoidance of a phobic stimulus is best understood not only in relation to the degree of fear and anxiety about the stimulus, but also in relation to the individual's fear of experiencing anxiety and the sensations that accompany it (Reiss, 1991; Reiss & McNally, 1985; Reiss et al., 1986).

The results also are in line with earlier research showing that aversive body sensations of disgust and negative expectancies related to disgust were better predictors of behavioral avoidance of spiders than negative expectancies related to possible harm from the spider (Olatunji et al., 2008; Woody et al., 2005). Those studies however did not directly measure AS, did not focus on samples of clinically anxious individuals, and focused on adult rather than youth populations. Likewise, the results complement earlier findings that when

contending with a situation that provokes fear or anxiety, AS moderates participants' distress (Orsillo et al., 1994).

These results contribute to understanding of the role of AS in the development and maintenance of anxiety disorders in youth. Substantial research has established that high AS is associated with the presence of the various anxiety disorders (Olatunji & Wolitzky-Taylor, 2009; Silverman et al., 1991, 2003), despite AS being a distinct characteristic from trait anxiety (Leen-Feldner et al., 2007; Weems, Hammond-Laurence, Silverman, & Ginsburg, 1998; Zinbarg et al., 2001). Our results point to two possible explanations for the increased likelihood of anxiety disorders in youth with high AS. One possibility is that because avoidance and impairment are germane to the diagnosis of most anxiety disorders, by increasing the likelihood of avoidance AS also leads to increased likelihood of meeting diagnostic criteria for anxiety disorders. A second possibility is that the increased avoidance resulting from AS leads to overall worsening of the anxiety or to more severe reporting of the anxiety, resulting in greater likelihood of clinical anxiety disorders. Future research building on the current results could help to distinguish between these related possibilities.

The current results also underscore the importance of AS for anxiety disorders such as specific phobia, that have not been the focus of most AS related work. Smits, Berry, Tart, and Powers (2008) conducted a meta-analysis of clinical trials that assessed AS before and after treatment and reported that out of sixteen clinical trials with treatment seeking participants twelve (75%) focused on panic disorder as the target disorder. The focus on panic disorder in AS research is natural as patients with panic disorder inherently have a fear of experiencing anxiety related sensations. The current study suggests that the role of AS is not limited to panic disorder but rather that AS can play an important part in the formation or maintenance of other anxiety disorders as well, including specific phobias.

The finding that AS moderates the link between anxiety and avoidance has potentially important implications for treatment like cognitive-behavioral therapy that emphasize exposure to anxiety provoking situations. Engaging in active exposures may be more challenging for youth with high AS because of the anxious sensations they elicit. Some researchers have emphasized patients' aversion to the experience of fear itself in the treatment of anxiety and have suggested that sometimes what a patient needs to learn through exposures is that they actually can tolerate fear (Craske, 2010; Craske et al., 2008). The current results seem to be in line with this approach as they suggest that a patient who is better able to tolerate fear may be less likely to engage in avoidant behavior.

The current results must be interpreted in light of certain limitations. The sample was relatively homogenous in terms of race and ethnicity. Further research is necessary to establish whether the pattern of results reported here are generalizable to other diverse samples. Relatedly, the current sample was not comprised of individuals with spider phobia. This allowed for a broad range and distribution in fear of spiders, but may have also limited the relevance of the images for some participants. Research shows that fear of spiders is common in the population and is related to trait anxiety as well as fear of spiders (Arntz et al., 1995; Lipp & Derakshan, 2005; Muris et al., 1998; Renaud et al., 2002; Thorpe & Salkovskis, 1998), but future research should also examine the study hypothesis using a

more varied set of stimuli beyond spider images. To date, YIKES has been useful in studying behavioral avoidance of images (e.g., spiders) and a question that requires further research is the ability to effectively measure avoidance of stimuli that will be fear-provoking in cases of generalized worry (e.g, failure). Several intriguing possibilities exist and are being explored in our lab. One such possibility is the use of words instead of images as the anxiety provoking stimulus, and a second possibility is the use of faces and facial expressions. Experimental paradigms have been successful at demonstrating both avoidance and attentional bias of words and faces (Marsh, Ambady, & Kleck, 2005), and even colors (Elliot, Maier, Binser, Friedman, & Pekrun, 2009). It remains to be determined whether these will be effective stimuli for YIKES experiments. These limitations notwithstanding the current study presents novel and important evidence for the role of AS in phobic avoidance of individuals with anxiety disorders.

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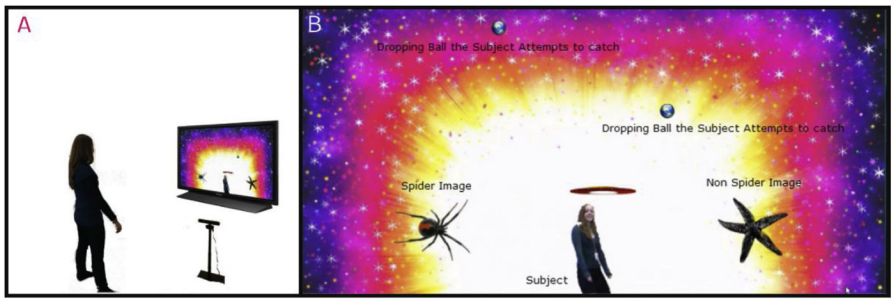

Fig. 1.

Illustrates a participant engaging in the YIKES behavioral avoidance task (A); and what the participant sees on the screen (B).

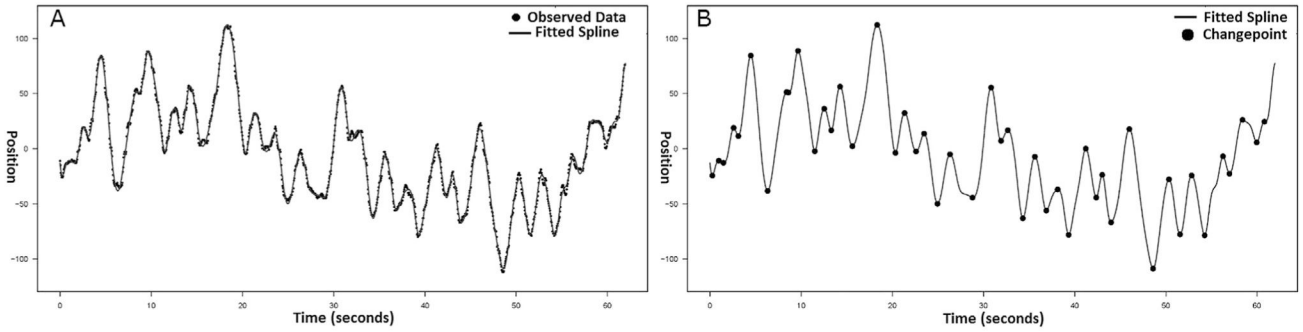

Fig. 2.

Participant time × Location data is first smoothed to a spline curve (A); and then extrema are identified as points at which the participant changed direction (B). This Figure is a sample of a single participant's data from 1 min of observed behavior.

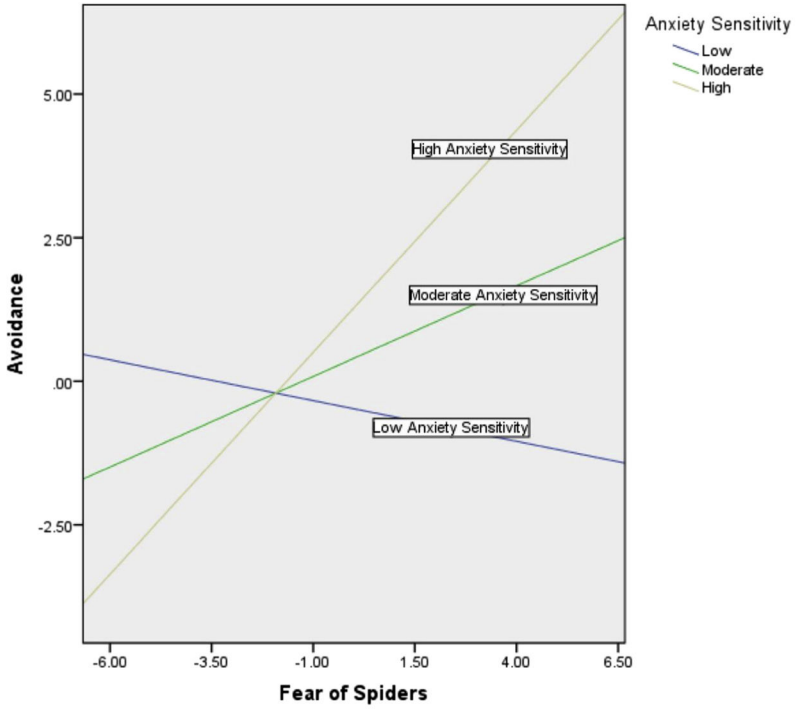

Fig. 3.

Separate regression slopes for the relation between fear of spiders and avoidance of spider images, at high (β= 0.77, 95% CI: 0.43 to 1.11, $p < 0.001$), moderate (β= 0.31, 95% CI: −0.01 to 0.64, $p = 0.06$), and low (β= −0.14, 95% CI: −0.62 to 0.34, $p = 0.55$) levels of anxiety sensitivity.