

FEAR RESPONSE TO DISSOCIATION CHALLENGE

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Participants ($N=101$) scoring high or low on a new scale for assessing fear of dissociative sensations (Dissociation Sensitivity Index) underwent an audio/visual sensory challenge using a device called the D.A.V.I.D. Participants' report of subjective fear and level of dissociation were measured before and after completing the audio/visual sensory challenge. Consistent with prediction, participants scoring high on the DSI responded to the challenge with significantly greater increases in subjective fear and dissociative symptoms relative to those scoring low on the DSI. Contrary to prediction, the DSI performed poorer than the Anxiety Sensitivity Index in predicting participants' response to the audio/visual sensory challenge. Theoretical and clinical implications of the findings are discussed.

Keywords: Dissociation; Anxiety sensitivity; Panic provocation; Non-clinical subjects; D.A.V.I.D.; Sensory stimulation challenge

DISSOCIATION INDUCTION AND THE FEAR RESPONSE

Dissociation has been defined as a temporary disruption in conscious awareness, memory, or sense of identity (American Psychiatric Association, 1994). Some evidence suggests that normal dissociative experiences such as daydreaming, "tuning out," and feeling detached from others are common in the general population (Ray and Faith, 1995; Ross *et al.*, 1990) and may at times be experienced as pleasant (Trueman, 1984). Marijuana and other hallucinogens as well as

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meditation are known to create altered states of awareness similar to depersonalization (Castillo, 1990; Kirmayer, 1994; pp. 94–97; Mathew *et al.*, 1993).

In contrast, pathological dissociation is often associated with psychological disorders, including anxiety (Bernstein and Putnam, 1986; Cassano *et al.*, 1989; Engel *et al.*, 1996; Goff *et al.*, 1992; Noyes *et al.*, 1992; Schneier *et al.*, 1991; Telch *et al.*, 1989a; Warshaw *et al.*, 1993). Despite the observed co-occurrence of dissociative and anxiety symptoms, the nature of the linkage is not well understood. One possibility is that dissociative symptoms and anxiety are simply two different states that develop concurrently from a common underlying mechanism. For example, states of increased autonomic arousal may cause both anxiety and dissociation (Fewtrell and O'Connor, 1989; Mathew *et al.*, 1993). A second possibility is that dissociation serves as a coping mechanism for anxiety (Linton and Estock, 1977). From this perspective, dissociation may function as an adaptive effort to psychically survive stress and trauma (Horowitz, 1993; Shilony and Grossman, 1993). Third, dissociation may trigger anxiety for those who perceive one or more features of dissociation as threatening (as is the case for some panic disorder patients who interpret feelings of derealization as a sign of impending insanity).

Preliminary support for this latter hypothesis comes from a clinical study in which dissociative symptoms were elicited through focused visual staring at a dot (Miller *et al.*, 1994). In this study, patients with panic disorder and symptoms of depersonalization or derealization were more likely to terminate their dot staring prematurely than both normal controls and panic patients without depersonalization or derealization. Despite this latter finding, the groups did not differ with respect to self-reported fear or panic. Watts and Wilkins (1989) found that compared to controls, agoraphobics reported more anxiety in response to epileptogenic visual stimuli (i.e., glare from sunlight reflected on water, striped provocative pattern).

Although these data suggest that a subgroup of anxiety patients experience significant anxiety in response to dissociation, investigations are needed which prospectively identify those individuals, either with or without anxiety disorders, who are likely to respond to dissociative symptoms with anxiety. Given that normal subjects high

in anxiety sensitivity have been shown to respond fearfully to carbon dioxide (CO₂) inhalation and hyperventilation (Holloway and McNally, 1987; McNally and Eke, 1996; Rapee and Medoro, 1994; Schmidt and Telch, 1994), we propose that some individuals possess a specific threat sensitivity to the experience of dissociation.

Preliminary investigations with nonclinical samples suggest that lower-order domain-specific sensitivities such as "suffocation sensitivity" may better predict response to anxiety/panic provocations such as CO₂ (McNally and Eke, 1996). In that study, suffocation sensitivity as measured by the Suffocation Fear Scale (Rachman and Taylor, 1994), outperformed both anxiety sensitivity and a behavioral measure of CO₂ sensitivity in predicting anxiety in response to rapid breathing into a paper bag.

In a previous study, we demonstrated that a pulsed audio and photic sensory stimulation challenge produced higher levels of reported dissociation in a nonclinical sample than either a dot staring task or a stimulus deprivation task (Leonard *et al.*, 1999). The aims of the present study were to answer three major questions regarding fearful responding to this dissociation challenge: (a) Do nonclinical participants scoring high on a newly developed dispositional measure of "dissociation sensitivity" display greater anxiety in response to dissociation challenge relative to those scoring low in dissociation sensitivity? (b) Does the experience of greater levels of dissociation in one's day-to-day life, as measured by the Dissociative Experiences Scale (DES), reduce fear in response to the dissociation challenge? and (c) Does a more domain-specific dispositional measure of threat sensitivity (i.e., dissociation sensitivity) outperform a less specific dispositional measure of threat sensitivity (i.e., anxiety sensitivity) in predicting anxious responding to dissociation challenge? We hypothesized that those scoring high in dissociation sensitivity would respond to the sensory challenge with heightened anxiety relative to those scoring low in dissociation sensitivity. We also reasoned that frequent day-to-day dissociation could result in desensitization to the experience, so that participants scoring high on the DES would respond to the challenge with less anxiety relative to those scoring low on the DES. Moreover, because of its specificity, we reasoned that dissociation sensitivity would better predict anxious responding to sensory challenge compared to a more global

sensitivity index such as the Anxiety Sensitivity Index (Peterson and Reiss, 1987).

METHODS

Participants

Students ($N = 101$) from the University of Texas at Austin participated in the study in partial fulfillment of their research requirement for an introductory psychology course. Participants ranged in age from 18 to 25, with a mean of 18.97 years ($SD = 1.16$). Sixty-five participants were female and 36 were male. Caucasians comprised 55% of the overall sample, Hispanics 21%, Asians 16%, African-Americans 6%, and those from other ethnic groups comprised 2%.

Design

Participants scoring high or low on the DSI (based on a median split) underwent a 12-min audio/visual sensory challenge previously shown to induce dissociation in a nonclinical sample (Leonard *et al.*, 1999). Subjective anxiety, dissociative symptoms and heart rate were assessed immediately before and after the audio/visual sensory challenge. This resulted in a 2×2 mixed-model design with DSI status (high/low) serving as the between-subjects factor, and assessment occasion (pre- and post-challenge) serving as the within-subjects factor.

Setting

The audio/visual sensory challenge was administered in a small sound-resistant room containing no windows and a comfortable reclining chair, with a Macintosh computer for administration of all study instruments.

Materials and Apparatus

Apparatus

The D.A.V.I.D. Paradise XL (Digital Audio-Video Integration Device) by Comptronic Devices, LTD. (9876-A 33rd Ave., Edmonton, Alberta T6N1C6) is used by health care professionals as a relaxation

device. The D.A.V.I.D. control board measures 7.6 × 12.7 cm and includes a numeric keypad. A stereo headset emits controllable ticking sounds, similar to those made by a metronome, while a plastic mask, resembling that worn by skiers, delivers pulsed white lights at controllable rates. The 12-min session was designed specifically for this experiment, in which the audio and video stimulus frequency ranged between 12 Hz (cycles per second) and 7 Hz. This was selected to match the brainwave alpha frequency, and is the suggested rate to maximally produce relaxation and meditative states. The final minute of the session consisted of a gradual slowing of the rate and intensity of the light and sound.

The Polar Accurex II by Polar CIC Inc. (99 Seaview Boulevard, Port Washington, NY 11050) was used to measure heart rate. This device includes a chest transmitter which, when fastened around the chest directly against the skin, transmits momentary heart rate to a wristwatch monitor. For this study, participants' heart rate was recorded immediately prior to starting the challenge. After the challenge, the average heart rate across the entire 12 min exercise was displayed on the monitor and recorded by the experimenter.

Measures

Challenge-Induced Symptoms

Acute Dissociation Inventory (ADI)

The ADI is a 35-item self-report scale developed by the authors and used in our previous study (Leonard *et al.*, 1999). The first 26 items (ADI-D) assess dissociative sensations including amnesic experiences, gaps in awareness, depersonalization, derealization, absorption, and imaginative involvement. For example, item one asks, "How much of the past 10 min do you feel you can recall?" Participants choose from 11 options ranging from 0 (everything) to 100 (nothing). A total ADI-D score is obtained by calculating the average of these 26 items. Cronbach's alphas for this sample were 0.94 (pre-challenge) and 0.96 (post-challenge).

The ADI-A, another subscale of the ADI, consists of six items that measure subjective anxiety in response to dissociation provocation. Example items include "What was the maximum amount of fear you experienced during the last 10 min?" and "Did you experience any

'palpitations' or racing of your heart?" The subscale is scored by calculating the average of the six anxiety items, each of which is scored on an 11-point scale (0-100) Cronbach's alphas for this sample were 0.74 (pre-challenge) and 0.84 (post-challenge).

Threat Sensitivity Indices

Dissociation Sensitivity Index (DSI) The DSI is a 22-item self-report scale that was created for the purposes of this study to measure fear of dissociation. Respondents rate how much fear they would experience in response to specific dissociative experiences. Many of the suggested experiences are based on items from the DES (Bernstein and Putnam, 1986). Items include amnesic experiences (e.g., "Not being able to remember where you are."), absent-mindedness (e.g., "Losing your keys."), depersonalization (e.g., "Feeling disconnected from your body."), derealization (e.g., "Feeling like you are looking at things through a fog."), absorption (e.g., "Losing yourself in your thoughts so much that you are not aware of things going on around you."), and imaginative involvement (e.g., "Remembering a past event so vividly that it feels like it is really happening."). Participants record their level of fear in response to each item using a 5-point Likert scale ranging from 0 (no fear) to 4 (extreme fear). Although the DSI has not yet been subjected to rigorous validity testing, it showed excellent internal consistency in this sample ($\alpha = 0.93$, split-half reliability $r = 0.87$). Test-retest reliability of a slightly modified version (16 items) was 0.42 over a two-month period.

Anxiety Sensitivity Index (ASI) The ASI is a 16-item self-report scale that assesses fear of anxiety (Peterson and Reiss, 1987), e.g., "It scares me when I am nervous." Each item is rated on a five-point Likert scale ranging from 0 (very little) to 4 (very much). The ASI has adequate internal consistency ($r = 0.82$; Telch *et al.*, 1989b) and good split-half reliability ($r = 0.85$; Peterson and Heilbronner, 1987). Cronbach's alpha for this sample was 0.88.

Beck Anxiety Inventory (BAI) The BAI is a 21-item self-report scale for assessing anxiety symptoms during the past week (Beck *et al.*, 1988). Each symptom is rated on a four-point Likert scale ranging from 0 ("Not at all") to 3 ("I can barely stand it") and summed to produce a total score. The BAI has been shown to be internally consistent

($\alpha = 0.94$) and has adequate test-retest reliability (0.75 for one week) (Beck *et al.*, 1988). Cronbach's alpha for this sample was 0.94.

Dissociative Experiences Scale (DES) The DES was designed as a screening measure to help identify patients with dissociative disorders and as a research tool to assess frequency of dissociative experiences (Bernstein and Putnam, 1986). It includes 28 self-report items consisting of three factor-analytically-derived factors: amnesic dissociation, depersonalization/derealization, and absorption/imaginative involvement. Respondents are asked to rate how often they experience events such as "Finding themselves in a place and having no idea how they got there." Responses are scored on an 11-point Likert scale ranging from 0% to 100%. An overall score is derived by averaging all 28 items. The DES has shown favorable test-retest reliability (an average of 0.86 across several studies), and good validity (see Carlson and Putnam for a review, 1993). Cronbach's alpha for this sample was 0.97.

Procedure

Participant Screening

Participants were selected from a larger pool of 2243 students who completed the DES in large "Introductory to Psychology" classes over two consecutive semesters. Students ($N = 801$) qualified for study participation by scoring either a 5 or below (low) or a 20 and above (high). These high/low cutoffs have been used in prior research (Ross *et al.*, 1991). Students were contacted randomly by telephone to schedule appointments for study participation. Those reporting a history of seizures, migraine headaches, or photosensitivity were excluded from participation due to the possibility that photic stimulation might exacerbate these conditions (Simon, 1983; Striano, 1992). This resulted in the exclusion of six students, all due to a history of migraine headaches.

Dissociation Challenge

One directing graduate student and five undergraduate psychology students served as experimenters. Upon arrival, participants were informed that they would be participating in a brief sensation-generating

exercise which causes many people to feel relaxed, but may cause others to feel anxious or "spaced out." After completing informed consent procedures, participants were led into a private room and seated at a desk with a Macintosh computer. They were shown a brief computer demonstration to familiarize them with computer administration of the assessment instruments. Participants then completed the DSI, DES, and the ADI (pre-challenge). Upon completion of these measures, the heart rate monitor was fitted while the experimenter was absent. When the experimenter returned to the room, participants were informed that they would be asked to wear headphones and a mask that would emit flashing lights and sounds. Participants were told that during the 12-min exercise, they should try to relax in the chair and keep their eyes closed. Participants were also informed that after the exercise they would be asked to rate their sensations and thoughts during the exercise, just as they had done immediately prior. The experimenter checked the position of the headphones and mask for comfort and reminded participants to keep their eyes closed. The experimenter then recorded the baseline heart rate, started the D.A.V.I.D. device, the heart rate monitor and the stopwatch, and then left the room.

After 12 min, the experimenter returned and recorded the average heart rate and assisted the participant in removing the headphones and mask. Immediately thereafter, participants completed the post-challenge ADI, the BAI and the ASI. Participants were debriefed, given the opportunity to ask questions, and were left to remove the heart rate equipment in private.

RESULTS

Means and standard deviations for each of the measures at pre- and post-challenge are presented in Table I.

The single and interactive effects of DSI status and testing occasion (pre vs. post challenge) on participants' self-reported dissociation, subjective anxiety, heart rate, and state anxiety following recovery were examined using 2×2 repeated measures ANOVAs. Participants' DSI status served as the between-subjects variable, while testing occasion (pre vs. post challenge) served as the within-subjects variable.

TABLE I Mean scores for state anxiety, heart rate, and dissociation indices at pre- and post-challenge for high and low DSI groups

Measure	DSI status	
	High (N = 51)	Low (N = 50)
ADI-A		
Pre	8.43 (11.02)	5.13 (8.48)
Post	16.04 (17.35)	7.93 (8.99)
Heart rate		
Pre	78.43 (12.55)	79.51 (12.35)
Post	72.57 (10.87)	71.27 (12.64)
ADI-D		
Pre	15.70 (16.30)	12.14 (12.22)
Post	32.16 (25.42)	27.40 (20.44)

Note: ADI-A = Anxiety subscale of the Acute Dissociation Inventory; ADI-D = Dissociation subscale of the Acute Dissociation Inventory; DSI = Dissociation Sensitivity Index; Values in parentheses are standard deviations.

Effects of DSI on Dissociation

Consistent with findings from our previous study (Leonard *et al.*, 1999), the audio/visual sensory challenge was successful in producing a marked increase in dissociation [$F(1,99) = 133.27$, $p < 0.0001$]. High and low DSI participants did not differ in their level of challenge-induced dissociation.

Effects of DSI on Challenge-Induced Anxiety

A significant pre- to post-challenge increase in subjective anxiety was observed [$F(1,99) = 16.13$, $p < 0.001$]. Moreover, compared to participants scoring low on the DSI, those scoring high reported significantly more anxiety at both pre- and post-challenge [$F(1,99) = 8.04$, $p < 0.01$]. These main effects were qualified by a time by DSI status interaction [$F(1,99) = 3.44$, $p = 0.07$] suggesting a trend for high DSI participants to respond to the challenge with a greater increase in subjective anxiety relative to low DSI participants. This finding is graphically depicted in Fig. 1.

In order to evaluate the possibility that the higher challenge-induced ADI-A scores reported by the high DSI participants were due to the effects of pre-challenge self-reports of day-to-day dissociative experiences, we repeated these analyses controlling for DES scores. The

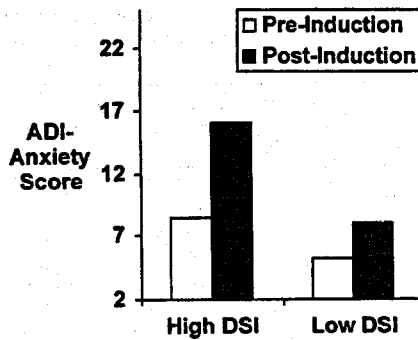


FIGURE 1 Reported anxiety to both pre- and post-induction among participants scoring high or low on the DSI. Note: DSI = Dissociation Sensitivity Index.

difference between the high and low DSI participants on the ADI-A continued to reach significance when DES scores were held constant [$F(1,98) = 5.67, p < 0.05$].

A significant reduction in heart rate was observed from the pre-challenge to post-challenge assessment time [$F(1,90) = 64.76, p < 0.001$]. However, neither the main effect of DSI status on heart rate nor the interaction of DSI status and time were significant.

Effects of DES Status on Challenge-Induced Anxiety

We conducted a one-way ANOVA to evaluate challenge-induced subjective anxiety as a function of DES status. We found that high DES participants showed a significantly larger increase in anxiety from pre- to post-challenge than low DES participants [$F(1,98) = 11.32, p < 0.01$].

Predictors of Anxiety in Response to Challenge

A hierarchical multiple regression analysis was performed to evaluate the relative contribution of anxiety sensitivity, dissociation sensitivity, state anxiety, and day-to-day dissociative experiences in predicting subjective fear in response to the audio-visual sensory challenge. Post-challenge ADI-A scores adjusted for pre-challenge scores served as the dependent variable, while ASI and DSI scores were entered sequentially as independent variables. Finally, BAI and DES scores were

TABLE II Intercorrelations between anxiety and dissociation measures

Measure	(n = 101)					
	1	2	3	4	5	6
1. Pre ADI-A	—	0.46	0.50	0.20	0.64	0.51
2. Post ADI-A		—	0.51	0.21	0.53	0.46
3. ASI			—	0.50	0.67	0.55
4. DSI				—	0.34	0.11
5. BAI					—	0.69
6. DES						—

Note: ADI-A = Anxiety subscale of the Acute Dissociation Inventory; ASI = Anxiety Sensitivity Index; DSI = Dissociation Sensitivity Index; BAI = Beck Anxiety Inventory; DES = Dissociation Sensitivity Index.

entered jointly to examine whether they explained variance not already accounted for by ASI or DSI scores.

ASI significantly predicted post-challenge ADI-A scores [$F(1,98) = 14.45, p < 0.001, \beta = 0.37$]. However, the remaining variables failed to account for significant variance above that already accounted for by the ASI [DSI: $F(1,97) = 0.18, p = 0.67$; BAI + DES: $F(2,95) = 2.22, p = 0.11$]. The inter-correlations for these variables are presented in Table II.

DISCUSSION

The present study sought to examine anxious responding to dissociation using a sensory challenge paradigm previously shown to induce dissociation in nonclinical participants (Leonard *et al.*, 1999). Consistent with our previous study, the presentation of audio/visual photic stimulation using a device called the D.A.V.I.D. produced a significant increase in the experience of "state" dissociation. Having established a reliable method for inducing dissociation in the laboratory enabled us to investigate further questions concerning fearful responding to dissociation.

As predicted, participants scoring high on dissociation sensitivity reported more anxiety in response to the audio/visual sensory challenge than did participants scoring low in dissociation sensitivity. Consistent with the numerous studies demonstrating that those high in anxiety sensitivity respond to provocation of *somatic* stimuli with

heightened fear (e.g., Holloway and McNally, 1987; Rapee and Medoro, 1994; Schmidt and Telch, 1994), these findings provide preliminary evidence in support of the hypothesis that those who show a predisposition to perceive dissociation as threatening are at greater risk for responding to certain classes of *sensory* stimuli with heightened fear.

How does the experience of dissociation in one's day-to-day life affect response to a laboratory dissociation challenge? One possibility is that those who routinely experience greater dissociation might learn to habituate to it. If so, the prediction would be that compared to low DES scorers, high DES scorers should display less fear in response to the sensory challenge. Alternatively, those who display an emotional hypersensitivity to dissociation may be more hypervigilant to dissociation cues thus leading to an increase in trait dissociation. If this were the case, one would predict that those scoring high on the DES should display greater fear in response to a dissociation challenge. Contrary to our prediction, our findings are more in line with the latter – namely that those reporting greater trait dissociation respond to laboratory dissociation provocation with greater subjective fear.

Examination of the incremental validity of the DSI in predicting anxious responding to the audio/visual sensory challenge was not in line with prediction. Previous work found that a domain-specific suffocation sensitivity measure outperformed the ASI in predicting anxious responding to a CO₂ challenge (McNally and Eke, 1996). Consequently, we hypothesized that a more domain-specific measure of threat sensitivity to dissociation would outperform anxiety sensitivity in predicting anxious responding to laboratory provocation of dissociation. Contrary to prediction, our measure of *dissociation sensitivity* no longer predicted challenge-induced anxiety after controlling for the effects of anxiety sensitivity. We examined the possibility that the DSI may not reflect the types of sensations induced by the sensory challenge. For example, at least 13 of the 22 DSI items assess fear in response to specific situations, such as forgetting what was said during a recent conversation. While the audio/visual sensory challenge increases dissociative experiences such as depersonalization, derealization, and imaginative involvement, it may not produce others included in the DSI, such as amnesic experiences. To test this possibility, we repeated the regression analyses using a nine-item subset from the DSI that included only those items that reflected the kinds of experiences

induced by the D.A.V.I.D. The results of this analysis mirrored the previous findings – namely the ASI continued to be the only significant predictor of post-challenge anxiety.

Another possibility for why the ASI outperformed the DSI in predicting challenge-induced anxiety is that the domain-specific hypothesis hinges on the assumption that the sensory challenge itself is domain-specific. To the extent that the sensory challenge induces both unusual sensory experiences *and* bodily sensations, one might expect better prediction from a broader threat sensitivity measure such as the ASI.

The clinical implications of our findings deserve comment. In addition to its value in identifying individuals who fear internal sensations generated by dissociation induction, domain-specific assessment of dissociation fear may also serve to assist clinicians in identifying appropriate interoceptive exposure targets. For instance, those panic disorder patients who score high on the DSI may particularly profit from interoceptive exposure tasks (i.e., voluntary hyperventilation) that induce feelings of derealization. Of course, additional research is needed to establish the utility of the DSI for this purpose.

Findings from both the current and previous study suggest that pulsed audio/visual sensory stimulation is a safe, effective, and convenient alternative to pharmacologic challenge and thus may have a place in the treatment of panic disorder and PTSD. Preliminary data from our laboratory suggests that those panic disorder patients displaying a strong fear of dissociation and mental illness concerns respond to the sensory challenge with marked fear. Of the six panic disorder patients who have undergone repeated exposure to the sensory challenge, each displayed marked reductions in subjective fear over three 12-min sessions.

Further validation of the DSI is certainly required. With further development, the construct of dissociation sensitivity promises to be an interesting basis for future research not only in the dissociation domain, but also for other domain-specific sensitivities and their individual ability to predict fear.

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