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Dissociation in Acute Stress Disorder After a Hyperventilation Provocation Test

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Abstract. This study investigated the relationship of hyperarousal and dissociation in acute stress disorder (ASD). Civilian trauma survivors with ASD ($n = 17$) and without ASD ($n = 15$) and non-traumatized controls ($n = 14$) completed a hyperventilation provocation test and were administered the Beck Anxiety Inventory, the Anxiety Sensitivity Index, the Dissociative Experiences Scale, the Peritraumatic Dissociative Experiences Questionnaire, the Physical Reactions Scale, and the Agoraphobic Cognitions Questionnaire. Individuals with ASD demonstrated more panic, dissociation, and maladaptive interpretations about their arousal during the hyperventilation than non-ASD or control participants. Dissociation was associated with anxiety sensitivity and peritraumatic panic attacks. These findings suggest that hyperarousal and dissociation are highly associated in ASD and that catastrophic attributions may play a mediating role in this relationship.

Keywords: ASD, arousal, dissociation, hyperventilation, cognition.

Introduction

Although dissociation is a pivotal response in the diagnosis of acute stress disorder (ASD), the mechanisms mediating peritraumatic dissociation are poorly understood. Recent proposals suggest that peritraumatic dissociation is associated with hyperarousal, possibly as a parasympathetic response to increased activation of sympathetic nervous system (Friedman, 2000). Consistent with this hypothesis, panic attacks are common both during (Bryant and Panasetis, 2001) and subsequent to trauma exposure (Falsetti and Resnick, 1997). In addition, dissociation experienced during trauma exposure is better predicted by panic symptoms than reexperiencing, avoidance or anxiety reactions to the trauma (Bryant and Panasetis, in press).

Although reported associations between peritraumatic dissociation and panic provide indirect evidence, the proposal that hyperarousal is related to dissociative responses requires experimental investigation. Following evidence that hyperarousal can be achieved with a

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hyperventilation provocation test (HVPT; Hornsveld, Garssen and van Spiegel, 1995), we hypothesized that ASD participants would report more dissociative and panic reactions during hyperventilation than non-ASD and control participants. On the evidence that maladaptive appraisals of somatic experiences mediate panic attacks (McNally, 1994), we expected that ASD participants would make more maladaptive attributions about their arousal than non-ASD and control participants. We also expected that dissociation during hyperventilation would be predicted by the level of hyperarousal.

Method

Participants

The sample comprised 17 ASD patients (6 male, 11 female), 15 trauma-exposed non-ASD patients (8 male, 7 female) and 14 control participants (8 male, 6 female). Inclusion criteria for the traumatized patients were: (a) involvement in a non-sexual assault or motor vehicle accident in the previous 4 weeks; (b) proficiency in English; (c) aged between 16 and 65; (d) no narcotic analgesia within the previous 24 hours; (e) no diagnosis of organic mental disorder, psychosis or substance abuse. The ASD group consisted of patients who met all criteria for ASD. The non-ASD group comprised participants who did not satisfy the dissociative, reexperiencing, and avoidance clusters of the ASD criteria. The control group consisted of university psychology students who participated in the study for research credit. Control participants were screened for the presence of trauma exposure in the preceding 4 weeks.

Measures

Diagnosis of ASD was obtained by the Acute Stress Disorder Interview (ASDI; Bryant, Harvey, Dang and Sackville, 1998), which is a 19-item clinical interview that possesses sound test-retest reliability (.88), sensitivity (91%) and specificity (93%) relative to independent clinical diagnosis. The Panic Module of the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon and Williams, 1997) was used to assess premorbid, peritraumatic and posttraumatic panic attacks. Participants were administered the Beck Anxiety Inventory (BAI; Beck and Steer, 1990) to assess general anxiety, the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky and McNally, 1986) to index tendency to catastrophically misinterpret somatic sensations, and the Dissociative Experiences Scale-Comparative version (DES-C; Wright and Loftus, 1999) to assess trait dissociation. Modified versions of the Physical Reactions Scale (PRS; Falsetti and Resnick, 1992) and Agoraphobic Cognitions Questionnaire (ACQ; Chambless, Caputo, Bright and Gallagher, 1984) were administered after the HVPT to index panic symptoms and panic-related cognitions during the HVPT. A modified version of the Peritraumatic Experiences Questionnaire (PDEQ; Marmar, Weiss and Metzler, 1997) was used to measure dissociative reactions following hyperventilation.

Procedure

Following informed consent, participants were instructed to sit quietly with their eyes closed and to breathe normally for 3 minutes. A 3-minute audiorecording was then played that prompted participants to breathe every 2 seconds and, when necessary, the researcher

Table 1. Participant characteristics and mean level of responses after the HVPT

	ASD		Non-ASD		Controls			
	M	*SD*	*M*	*SD*	*M*	*SD*	*F* (2, 43)	*p*
Age	27.59	6.98	28.80	11.67	25.57	7.20	.49	ns
ASI	22.06[a]	12.21	10.60[b]	7.87	14.92[a]	8.96	5.25	< .01
BAI	21.38[a]	14.01	6.47[b]	7.20	7.92[b]	8.57	9.35	< .001
DES	609.38	432.70	683.33	454.54	868.46	457.95	1.25	ns
PDEQ	19.35[a]	6.77	13.87[b]	4.22	13.07[b]	3.10	7.25	< .01
ACQ	1.33[a]	0.28	1.10[b]	0.18	1.10[b]	0.13	6.04	< .01
PRS	19.94[a]	9.87	10.40[b]	9.77	10.43[b]	9.14	5.25	< .01
HVPT Compliance	1.38[a]	0.28	1.33[a]	0.36	1.68[b]	0.32	4.94	< .05

Note: ASI = Anxiety Sensitivity Index; BAI = Beck Anxiety Inventory; DES = Dissociative Experiences Scale; PDEQ = Peritraumatic Dissociative Experiences Questionnaire; ACQ = Agoraphobic Cognitions Questionnaire; PRS = Physical Reactions Scale. Values within a row that have different superscripted letters indicate significant differences from each other.

encouraged the participant to keep pace with the tape. Participants were given the following instructions. "In a moment I am going to ask you to breathe quickly for 3 minutes, and will play a tape to help you with this. *You will need to breathe in and out as deeply and as quickly as you can*. The voice on the tape will tell you when to breathe, and I will also coach you as we go along to breathe at that rate. Is that clear? Do you have any questions? I will show you how I would like you to breathe." The researcher then played the HVPT tape for approximately 20 seconds and modelled hyperventilation for the participant, before rewinding the tape to begin the task.

At the end of the HVPT, participants were informed they should resume normal breathing for a further 3 minutes. In addition to coaching during the HVPT, participants' compliance was assessed by asking them about their ability to sustain the pace of breathing on a 3-point scale (0 = not able, 1 = somewhat able, 2 = able to sustain breathing rate). Participants then completed the PDEQ, ACQ and PRS. Modified instructions for these questionnaires asked participants to complete their responses in relation to the 3-minute period of their hyperventilation and immediately afterwards.

Results

Participant characteristics

Table 1 presents the mean values of age, BAI, ASI and DES. Oneway analyses of variance (ANOVA) with a Bonferroni adjustment (alpha = $p < .01$) indicated that ASD patients had higher scores on the BAI than non-ASD and control participants ($t[41] = 3.94$, $p < .001$, and $t[41] = 3.42$, $p < .01$, respectively), and higher scores on the ASI than non-ASD patients ($t[41] = 3.20$, $p < .01$).

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Hyperventilation reactions

Table 1 also presents the mean levels of panic symptoms (PRS), dissociative experiences (PDEQ), and cognitions (ACQ) after the HVPT, with one-way ANOVAs indicating group differences on all three measures. Planned comparisons (with a Bonferroni adjustment $p < .01$) indicated that the ASD group was significantly different from the non-ASD and control groups, with no differences observed between the non-ASD and control groups. That is, ASD participants reported more panic symptoms and more dissociative reactions after the HVPT than non-ASD ($t[43] = 2.80$, $p < .05$, and ($t[43] = 2.74$, $p < .05$, respectively) and control participants ($t[43] = 3.05, p < .05$, and ($t[43] = 3.43, p < .01$, respectively). In addition, ASD participants reported more distorted cognitions about their physical symptoms after the HVPT than non-ASD and control participants ($t[43] = 2.94, p < .05$, and ($t[43] = 2.99, p < .05$, respectively). Participants were generally compliant with the HVPT task (see Table 1). Both the ASD and non-ASD group reported being less able to keep up with the breathing rate compared with control participants ($t[43] = 2.73$, $p < .05$, and ($t[43] = 2.74$, $p < .05$, respectively). However the ASD and non-ASD group did not differ ($t[43] = 0.42$, ns), indicating that the differences in arousal, dissociation and cognitions between the groups was not a function of HVPT effort.

To predict dissociative reactions during the HVPT, we entered the ASI, DES, BAI and number of peritraumatic panic symptoms (SCID) into a multiple regression analysis, with the PDEQ as the dependent variable. The ASI accounted for 12% of the variance (Adjusted $R^2 = .12$, $\beta = .20$, $SE = .08$, $t = 2.64$, $p < .05$), and peritraumatic panic contributed a further 18% of the variance of PDEQ scores (Adjusted $R^2 = .30$, $\beta = .80$, $SE = .23$, $t = 3.46$, $p < .01$). The PDEQ was correlated with both the ACQ ($r = .39$, $p < .01$) and PRS ($r = .65$, $p < .001$) after the HVPT.

Finally, because the measure used to index arousal following the HVPT, the PRS, contained an item that indexes dissociative experiences of derealization and depersonalization (which are also symptoms of a panic attack), all analyses were repeated without this item. The same pattern of findings was observed, indicating that the relationship between arousal and dissociation was not an artefact of overlapping shared symptoms. Table 2 presents the proportion of individuals who experienced arousal and dissociative reactions from the HVPT.

Discussion

The finding that dissociative reactions are elicited by hyperarousal accords with evidence of dissociative responses in panic populations (Segui, Marquez, Canet, Salvador-Carulla and Oritz, 2000) and with the proposal that dissociation occurs in response to hyperarousal (Friedman, 2000). Peritraumatic panic and the belief that somatic sensations can be harmful were the important mechanisms that mediated dissociation during hyperventilation. It is possible that panic reactions at the time of trauma are conditioned to internal somatic cues that later become triggers for panic attacks (Falsetti, Resnick, Dansky, Lydiard and Kilpatrick, 1995). The tendency to interpret somatic reactions as harmful may contribute to arousal-induced dissociation because individuals may make attributions about their somatic experiences that lead to altered perceptions of awareness. This role of cognitive style is further indicated by evidence that persistent panic attacks after trauma are associated with maladaptive interpretations of physical sensations (Nixon and Bryant, 2003) and by the tendency for people

Table 2. Percentage of individuals within groups reporting arousal and dissociation symptoms after the HVPT

	ASD	Non-ASD	Controls
PDEQ[a]			
1. I "blanked out" or "spaced out"	18	7	0
2. I found that I was on "automatic pilot"	6	0	0
3. My sense of time changed	24	7	14
4. What was happening seemed unreal to me, like I was in a dream or watching a movie or play	24	7	0
5. It was though I were a spectator watching what was happening to me	29	7	0
6. My sense of my own body seemed distorted or changed	18	7	0
7. I felt as though things that were actually happening to others were happening to me	6	0	0
8. I was surprised to find out afterwards that a lot of things had happened at the time that I was not aware of, especially things I ordinarily would have noticed	6	7	0
9. I felt confused; that is, there were moments when I had difficulty making sense of what was happening	12	7	0
10. I felt disoriented: that is, there were moments when I felt uncertain about where I was or what time it was	6	0	0
PRS[b]			
1. Shortness of breath or smothering sensations	53	20	21
2. Choking	12	7	14
3. Rapid heart rate or palpitations	41	33	36
4. Chest pain or discomfort	12	0	7
5. Sweating	12	7	14
6. Dizziness, unsteady feelings or faintness	41	27	29
7. Nausea or abdominal distress	12	0	0
8. Unreality or depersonalization	12	13	7
9. Numbness or tingling sensations	41	33	21
10. Hot flashes or chills	35	7	14
11. Trembling or shaking	18	7	0
12. Fearful of dying	18	0	0
13. Crazy or doing something out of control	6	0	0
14. Worry if your heart was beating fast that you might have a heart attack	6	0	0
15. Unusual bodily sensations scare you	18	13	7
16. Other people might notice when you felt shaky	12	13	0

Note: PDEQ = Peritraumatic Dissociative Experiences Questionnaire; PRS = Physical Reactions Scale.
[a]Scores of 4 or 5 on the PDEQ (i.e. very true, extremely true) were considered to reflect the occurrence of a dissociative symptom.
[b]Scores of 3, 4 or 5 on the PRS (i.e. moderately, a lot, or extremely) were considered to indicate the presence of an arousal symptom.

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with ASD tend to catastrophize about somatic sensations more than people without ASD (Smith and Bryant, 2000).

The lack of physiological measures in this study precludes inferences about the role of physiological activation and dissociation. There is evidence that rape victims in the acute posttrauma phase who are highly dissociative are less physiologically reactive to trauma reminders than those who are not dissociative (Griffin, Resick and Mechanic, 1997). This finding raises the possibility that participants with ASD may suppress physiological reaction during arousal-inducing exercises. Further, even though prior history of panic did not influence the outcomes, we do not know the extent to which premorbid factors contributed to the observed patterns of dissociation and arousal. We recognize the difficulties in standardizing the hyperventilation procedure without using sophisticated equipment (e.g. the measurement of end-tidal CO2 concentration) and acknowledge the possibility of group differences in the degree of hyperventilation experienced. It is important to note, however, that to some degree the compliance ratings of the ASD group worked against our hypotheses. Despite being less compliant than controls and possibly less hyperventilated than the other two groups, ASD participants still reported significantly more arousal and dissociative reactions. These limitations notwithstanding, the findings suggest that hyperarousal plays an important role in posttraumatic dissociation. In terms of clinical application, the results of the present study underscore the importance of addressing hyperarousal and maladaptive interpretation of such arousal in the treatment of posttraumatic stress. This is particularly important given that extreme arousal and dissociation can impede the effectiveness of exposure-based techniques that are recommended in the treatment of posttraumatic stress disorders. In conclusion, further research is necessary to increase our understanding of the complex interactions of dissociation, hyperarousal and appraisal of responses, with such research having the potential to elucidate the mechanisms that mediate negative adaptation to a traumatic experience.

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