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BRIEF REPORT

Reactions to Trauma Research Among Women Recently Exposed to a Campus Shooting

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*Subjective and objective reactions to writing and reading a narrative of their experiences after having been recently exposed to a campus shooting were examined in 58 women. Posttraumatic stress, depression, anxiety symptoms, and physical exposure to the shooting were considered in relation to laboratory indices. The latter used a multimethod approach to index distress; these included subjective (self-report) and objective (heart rate, skin conductance, and cortisol) components. Consistent with prior research, reports of symptoms were significantly positively correlated with subjective distress (*r *ranged from .35 to .45), but only posttraumatic stress symptoms uniquely predicted subjective distress in regression analyses (partial* r = *.33). Objective distress, however, was not significantly related to any participant measure. Finally, a clear majority (85%) of participants reported they would participate in the study again. Points of convergence and divergence with prior studies are discussed.*

Over the past decade researchers have examined reactions to participating in trauma-related research, with increased interest directed toward both understanding reactions to trauma as well as to participating in research in the short-term aftermath of a large-scale traumatic event (see Boscarino et al., 2004; Galea et al., 2005). Whereas Boscarino et al. and Galea et al. assessed reactions to survey studies, the present study examined reactions to laboratory tasks in the short-term aftermath of the trauma of a campus shooting in which there were multiple victims. Such an extension is important, as research suggests that experimental tasks of trauma-related research are associated with heightened distress (Griffin, Resick, Waldrop, & Mechanic, 2003). Finding relatively lower levels of positive reactions to a laboratory study than to survey studies might provide important information regarding the appropriateness of conducting laboratory studies in the short-term aftermath of traumatic events. Moreover, determining whether anxiety, depression, physical exposure to trauma, and posttraumatic stress (the characteristics associated with distress in response to survey-based studies in Boscarino et al., 2004, and Galea et al., 2005) are associated with distress from participating in a laboratory study might lead to improvements in research procedures, such as a fuller informed consent process. Finally, the relatively low correspondence between subjective and objective indices of distress (e.g., Watson & Pennebaker, 1989) suggests the use of a multimethod approach for assessing objective distress.

The fourth deadliest university shooting in United States history occurred on Northern Illinois University's (NIU) campus the afternoon of February 14, 2008, when a gunman entered a lecture hall and opened fire, killing 5 students, injuring 18 others, and then killing himself. This event was the traumatic exposure that was the focus in the present study.

METHOD

Participants

Participants were 58 women enrolled in a longitudinal study of sexual victimization among female undergraduates at NIU at the time of the shooting. Sexual victimization was not a recruitment criterion of either the longitudinal or the current study; participants were required only to be at least 18 years old and fluent in English. Of those invited to participate in the postshooting assessment (812 of the original 1,045 participants), 691 (85%) completed an online assessment (see Stephenson, Valentiner, Kumpula, & Orcutt, 2009, for a fuller description). The subset of 15 women who were

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actually in the classroom during the shooting was not approached to participate.

Participants' physical exposure to the shooting was coded initially from their response to the question, "Please describe how you learned about the mass shooting that took place on the NIU campus on February 14, 2008." Approximately 6 weeks following the shooting, those with the highest and lowest levels of exposure were recruited; these were followed by those with moderate exposure. Of the 173 women invited to participate in the present study, 77 scheduled an appointment; only 58 (33%) actually participated. The final sample had a mean age of 19.6 ($SD = 1.7$) years and was predominantly Caucasian (81%). The mean length between the campus shooting and the laboratory session was 8.8 ($SD = 2.0$; range = 6–13) weeks.

Measures

Posttraumatic stress symptoms related to the shooting were assessed using the Distressing Events Questionnaire (DEQ; Kubany, Leisen, Kaplan, & Kelly, 2000), a 17-item measure that uses a 5-point response option (0–4). Depression and anxiety symptoms were assessed using the depression and anxiety scales of the Depression Anxiety Stress Scales-21-Item Version (DASS-21; Lovibond & Lovibond, 1995), seven-item scales that use a 4-point response option (0–3). The measure of exposure to the shooting was adapted from a measure created by Littleton, Taquechel, and Axsom (2009) and comprised 12 dichotomously scored (0, 1) items.

Subjective distress was defined as emotional reactions to the study tasks (following Ferrier-Auerbach, Erbes, & Polusny, 2009) and was assessed using an abbreviated negative affect scale of the Positive and Negative Affect Schedule-Expanded Form (Watson & Clark, 1994). This scale (PANAS-A-NA) contains six negative affect items with a 7-point response option (1–7). State-like (i.e., moment) time instructions were used. All measures, except DASS-21-Anxiety (Cronbach's $\alpha = .69$), demonstrated adequate internal consistency (αs ranged from .77 to .90). Consistent with prior studies (e.g., Boscarino et al., 2004), positive reactions were assessed using the question, "Knowing what I know now, I would participate in this study if given the opportunity." Agreement was defined as endorsing this item with the response option *agree* or *strongly agree* on a scale ranging from *strongly disagree* to *strongly agree*.

Objective distress was assessed by measuring participants' heart rate (HR), skin conductance level (SC), and cortisol level. AcqKnowledge 3.8.1 (BioPac Systems, Inc., Goleta, CA) was used to gather HR and SC. Salivary samples were frozen and later analyzed with an assay to detect quantities of cortisol (Salimetrics, LLC, State College, PA). Objective distress in response to study tasks was calculated as participants' maximum HR (beats per minute), maximum SC (microsiemens), and maximum cortisol (microgram/deciliter) at two experimental time points (during writing and reading for HR and SC; postwriting and postreading and recovery for cortisol). Heart rate and SC were measured continuously and resampled in 1-minute and 30-second epochs for writing and reading analyses, respectively. Baseline HR and SC were defined as the last 1-minute epoch of a 5-minute resting baseline immediately preceding the start of the experiment. Baseline cortisol measures were from the first saliva sample provided just after signing the informed consent. Missing data ranged from zero to two participants across all variables and were handled following recommendations made by Enders (2010). Specifically, all of the reported analyses were performed five times using data sets obtained from Schafer's (1999) multiple imputation program titled NORM. The estimates were combined across data sets and standard errors incorporated both within- and between-imputation variance. As a result, the full sample ($N = 58$) was used in all reported analyses. Of note, an identical pattern of results emerged when using listwise deletion, suggesting the missing data procedure did not alter the results.

Procedure

For this institutional review board-approved study, all participants were fully informed of the study procedures and signed a consent form agreeing to participate. Participants were seated in a small sound-attenuated room that was equipped with silver-silver chloride electrodes for measuring HR and SC (electrodes were placed following standard procedures; Fowles et al., 1981). At baseline, participants provided a saliva sample and completed questionnaires, including symptom measures and PANAS-A-NA.

After a 5-minute resting period, participants were given the following instructions: "For the next 20 minutes, write about your deepest thoughts and feelings regarding the mass shooting...." After completing the expressive writing task, participants completed a second PANAS-A-NA and provided another saliva sample. After a 2-minute resting period, participants read aloud what they had written, which was immediately followed by a 10-minute resting recovery period, at the end of which participants completed yet another PANAS-A-NA and provided another saliva sample. At the conclusion of the study, participants completed a questionnaire assessing reactions to the present study and paperwork to process their compensation ($40). Participation lasted approximately 2 hours and participants were debriefed thoroughly.

RESULTS

Descriptive statistics are presented in Table 1. Physical exposure was significantly correlated with the DEQ ($r = .37$, $p = .004$), but not with DASS-21-Depression ($r = .05$, *ns*) or DASS-21-Anxiety ($r = .24$, *ns*). Most writing and reading distress scores (i.e., PANAS-A-NA, HR, and SC) significantly increased from baseline, ts(57) ranged from 2.99–22.81, ps $< .004$, indicating the experimental tasks engendered distress (average Cohen's

Table 1. Descriptive Statistics for Three Phases

	Baseline				Writing				Reading			
	Range				Range				Range			
Variable	Low	High	*M*	*SD*	Low	High	*M*	*SD*	Low	High	*M*	*SD*
DEQ	0	38	12.43	9.71	–		–	–	–		–	–
DASS-21-Depression	0	14	3.36	3.40	–		–	–	–		–	–
DASS-21-Anxiety	0	12	2.55	2.68	–		–	–	–		–	–
Physical exposure	0	6	2.79	2.17	–		–	–	–		–	–
PANAS-A-NA	6	25	10.57	4.92	6	33	14.53	7.04	6	28	12.43	6.12
Heart rate (BPM)	50.55	106.09	76.06	10.87	83.10	119.05	102.45	8.54	77.92	119.52	101.99	10.11
Skin conductance (μS)	0.28	13.45	3.78	3.46	0.42	15.90	8.31	4.27	0.42	19.04	10.82	4.74
Cortisol (μg/dL)	0.04	1.46	0.30	0.29	0.20	0.56	0.16	0.11	0.10	0.66	0.12	0.10

Note. $N = 58$. DEQ = Distressing Events Questionnaire; DASS-21 = Depression, Anxiety, and Stress Scale-21-item version; PANAS-A-NA = Positive and Negative Affect Schedule-Abbreviated-Negative Affect; BPM = beats per minute; μS = microsiemens; μg/dl = micrograms/deciliter.

$d = 1.52$, range = 0.34–2.72). Cortisol levels (controlling for time of day) were significantly lower, however, at postwriting and postreading relative to baseline, $Fs(1,54) = 39.21$ and 44.26, respectively, $ps < .001$.

Correlations between participant characteristics and distress are presented in Table 2. The increased possibility of a Type I error associated with these tests was addressed using the False Discovery Rate procedure (Benjamini & Hochberg, 1995). As shown, psychological symptoms, but not physical exposure, tended to correlate significantly with subjective distress at postwriting and postreading. None of the participant characteristics, however, were significantly correlated with any index of objective distress.

Hierarchical multiple regression analyses were used to further examine significant correlations. The variables were entered using an a priori order of entry to elucidate whether significant relations between participant characteristics and subjective distress would hold after partialling out baseline levels of subjective distress and the other significant psychological symptom predictor(s). Specifically, baseline PANAS-A-NA was entered into Step 1 of both regression models, but because only the DEQ and DASS-21-Anxiety correlated significantly with postwriting PANAS-A-NA, only these two psychological symptom measures were included in Step 2 of the regression model predicting postwriting subjective distress. Because all three psychological symptom measures (DEQ, DASS-21-Depression, DASS-21-Anxiety) correlated significantly with postreading PANAS-A-NA, all were included in Step 2 of the regression model predicting postreading subjective distress.

Within postwriting subjective distress analyses, the baseline and postwriting PANAS-A-NA scores yield a statistically significant correlation of .66, $p < .001$. The DEQ (partial $r = .33$, $p = .012$), but not DASS-21-Anxiety (partial $r = -.16$, *ns*),

Table 2. Correlations Between Participant Characteristics and Distress

Variable	DEQ	DASS-D	DASS-A	Physical exposure
Maximum PANAS-A-NA – Writing	**.45**	.31	**.35**	.17
Maximum heart rate (BPM)	.25	.17	.16	.14
Maximum skin conductance (μS)	.07	−.27	−.16	−.03
Maximum cortisol (μg/dL)[a]	−.09	−.14	−.13	.22
Maximum PANAS-A-NA – Reading	**.39**	**.38**	**.36**	.04
Maximum heart rate (BPM)	.30	.10	.13	−.02
Maximum skin conductance (μS)	.23	−.20	−.06	.02
Maximum cortisol (μg/dL)[a]	−.19	−.19	−.09	.16

Note. $N = 58$. Bolded coefficients significant at $p < .008$ (two-tailed; experimentwise alpha correction). PANAS-A-NA = Positive and Negative Affect Schedule-Abbreviated-Negative Affect; BPM = beats per minute; μS = microsiemens; μg/dL = micrograms/deciliter; DEQ = Distressing Events Questionnaire; DASS = Depression, Anxiety, and Stress Scale-21 item version (D = Depression; A = Anxiety).
[a]Partial correlations controlling for time of day.

incrementally contributed to the prediction of postwriting PANAS-A-NA scores ($\Delta R^2 = .06$, $p = .038$). Within postreading subjective distress analyses, baseline was correlated with postreading PANAS-A-NA at $r = .65$, $p < .001$. No further significant variance was accounted for by adding the DEQ (partial $r = .25$, *ns*), DASS-21-Depression (partial $r = .07$, *ns*), and DASS-21-Anxiety (partial $r = -.13$, *ns*; $\Delta R^2 = .04$, *ns*). The majority ($n = 49$; 85%) of participants indicated they would participate in the study again, but this preference was unrelated to any participant characteristic; rs ranged from $-.07$ to .15.

DISCUSSION

The experimental tasks of this study produced at least moderate distress and extended prior trauma-related studies using survey-based designs (Boscarino et al., 2004; Galea et al., 2005). Posttraumatic stress symptoms emerged as the most robust predictor of distress. Thus, individuals who are experiencing heightened levels of posttraumatic stress symptoms in the aftermath of traumatic events may well find experimental studies involving reminders of the events distressing. Nonetheless, a clear majority of participants (85%) reported that they would again participate, a percentage consistent with those seen in response to similar nonexperimental designs (e.g., 76%; Boscarino et al., 2004). Researchers might consider communicating such potential risks and benefits to participants during informed consent processes of experimental-based trauma studies.

None of the participant characteristics correlated significantly with HR, SC, or cortisol, which were used as indices of objective distress. However, it should be noted that the magnitude of relations between posttraumatic stress and both HR and SC was consistent with Pole (2007), who investigated relations between posttraumatic stress disorder (PTSD) and psychophysiological variables. Specifically, Pole identified a weighted mean effect size of $r = .22$ for the PTSD-HR relationship and $r = .19$ for the PTSD-SC relationship following idiographic trauma cues. As such, our small sample size might have resulted in insufficient power to detect relatively small relationships between participant characteristics and objective distress. Moreover, our indices of objective distress were used in somewhat nontraditional ways, which may have limited their utility for identifying potentially valid relationships between our study variables. Thus, additional work in this line of research is clearly warranted before firm conclusions are drawn.

Additional caveats surrounding the present study should be noted. First, only a subset of individuals who were involved in the campus shooting participated in the study. Consequently, differences in participants who did and did not participate may have influenced results. Further, our sample excluded from recruitment participants (15 of 691; 2.2% of those eligible for the study) who were physically present in the classroom at the time of the campus shooting. The decision to not recruit these women was based in part on their experiences being qualitatively different from the other eligible participants, thus making group comparisons tenuous. Nonetheless, reactions from these women would have been informative for further understanding reactions to the present research. Second, with the exception of HR and SC, postreading distress was assessed after a 10-minute recovery period. Thus, some indices of distress in response to reading aloud one's thoughts and feelings related to the shooting might have been minimized by our assessment point. Finally, participants endorsed relatively low levels of symptomatology and consisted of primarily Caucasian female undergraduate students. The present results may thus have limited generalizability to other groups of interest (e.g., treatment-seeking trauma victims). Limitations notwithstanding, these data add to the growing body of literature supporting the appropriateness of conducting experimental studies in the short-term aftermath of a large scale traumatic event. Such research could help to inform policy or interventions to prevent long-term adjustment problems.

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