

Disaster-Related Posttraumatic Stress Symptoms and Sustained Attention: Evaluation of Depressive Symptomatology and Sleep Disturbances as Mediators

Marie-Louise Meewisse,^{1,4} Mirjam J. Nijdam,¹ Giel-Jan de Vries,¹ Berthold P.R. Gersons,¹ Rolf J. Kleber,^{2,3} Peter G. van der Velden,² Albert-Jan Roskam,² Berdi Christiaanse,² Annelieke N. Drogendijk,² and Miranda Olf¹

Research about attentional functioning following trauma has almost exclusively been performed in patient populations with combat-related posttraumatic stress disorder (PTSD). In this study the relationship between sustained attention and PTSD symptoms was examined in a community sample of survivors of a major disaster using the Paced Auditory Serial Addition Task (PASAT) and the Self-Rating Scale for PTSD (SRS-PTSD) 2–3 years postdisaster. Analyses revealed low but significant partial correlations between PTSD symptoms and the least difficult subtests, ruling out the effects of age, education, depressive symptomatology, and sleep disturbances. These results demonstrate that PTSD symptoms link to attentional dysfunction 2–3 years postdisaster.

Studies investigating attention in survivors of traumatic events with posttraumatic stress disorder (PTSD) have almost exclusively focused on treatment-seeking patients with combat-related trauma. Although these studies have produced mixed results, many report attentional deficits in PTSD (e.g., Gilbertson, Gurvits, Lasko, Orr, & Pitman, 2001; Sachinvala et al., 2000; Vasterling et al., 2002). Deficits in sustained attention, which cause difficulties in executing a long-lasting task, were found most frequently.

Characteristics of the participants in the above mentioned studies include high symptom severity and co-existing psychopathology, especially substance abuse dis-

orders. Likely, these studies may represent populations that could differ from community samples in important ways. Therefore, the purpose of the present study was to investigate sustained attention in relation to PTSD symptom severity in a community sample of inhabitants of an area afflicted by a major disaster. To our knowledge, this is the first study of attention in such a unique population. After a traumatic event the most frequently developed disorders are major depressive disorder (MDD) and PTSD. Symptoms of these disorders overlap and high comorbidity up to 40% is reported. Knowing that both disorders are characterized by symptoms of impaired attention (*DSM-IV*; American Psychiatric Association, 1994), we raise the question whether this symptom is independent of depressive symptoms in PTSD. Therefore, we investigated whether attention in survivors is still related to PTSD symptom severity when we control for the influence of depressive symptoms. Furthermore, to assure that worsened attentional performance is not the consequence of sleep disturbances, we also examined the effect of sleep disturbances in the relationship between PTSD symptoms

¹Center for Psychological Trauma, Department of Psychiatry, Academic Medical Center/De Meren, Amsterdam, The Netherlands.

²Institute for Psychotrauma, Zaltbommel, The Netherlands.

³Department of Clinical Psychology, Utrecht University, Utrecht, The Netherlands.

⁴To whom correspondence should be addressed at Department of Psychiatry, Academic Medical Center/De Meren, Tafelbergweg 25, 1105 BC Amsterdam, The Netherlands; e-mail: m.l.meewisse@amc.uva.nl.

and attention. We expected to find negative relationships between PTSD symptom severity and attentional performance, even when controlling for the effects of depressive symptoms and sleep disturbances.

Method

Participants

Participants were survivors of the fireworks disaster in the city of Enschede, The Netherlands, on May 13, 2000. The explosion of a fireworks storage depot completely destroyed the surrounding residential district. Twenty-two people were killed outright and almost one thousand were injured. Over 10,000 local residents were evacuated for one or more days, while over 1,200 people lost their homes completely (Roorda, Van Stiphout, & Huijsman-Rubingh, 2004). Participants of the present study were Dutch-speaking adults, over 19 years of age, living in the affected area at the time of the disaster. They were a sample of participants in a large prospective study monitoring health ($n = 1,567$) after the disaster (Kamp & Van der Velden, 2001) and agreed to participate in neuropsychological testing as a two-year follow-up to their initial participation. For the main study, inhabitants of the disaster area were invited by a letter of the Dutch Ministry of Health Welfare and Sports to participate within 2 to 3 weeks postdisaster. In addition, announcements for the study were made in the media.

Measures

Symptom Severity Measures

To determine the severity of PTSD and MDD symptoms, participants completed two self-report measures. The Self-Rating Scale for PTSD (SRS-PTSD; Carlier, Lamberts, Van Uchelen, & Gersons, 1998) was administered to obtain a severity score for PTSD symptoms based on *DSM-IV* criteria. Participants were asked specifically to consider the fireworks disaster when completing this measure. The internal consistency and interjudge reliability of this self-report are found to be satisfactory. The Dutch version of the Symptom Check List-90 (SCL-90; Arrindell & Ettema, 1986) was administered to measure the severity of depressive symptoms (16 items) and sleep disturbances (3 items). These items are scored on a 5-point Likert scale. The internal consistency of the test is good, and both the construct and the predictive validity are adequate.

Measure of Attention

To assess impairments in divided and sustained attention and speed of processing, the Dutch version of the Paced Auditory Serial Addition Task (PASAT; Aarnoudse, Van den Burg, & Saan, 1995; Gronwall, 1977) was used. The objective of this test is to add 60 pairs of randomized digits in the range of 1 to 6, which are presented at 5 rates of speed with 3.2, 2.8, 2.4, 2.0, and 1.6 seconds between successive digits on an audiotape. The PASAT has shown high convergent validity and modest discriminant validity, because of its relationship to general intelligence (Deary, Langan, Hepburn, & Frier, 1991). Furthermore, PASAT performance is significantly correlated with age and education (Brittain, La Marche, Reeder, Roth, & Boll, 1991). Aarnoudse et al. (1995) found high reliabilities for the Dutch version.

Procedure

Self-report measures for the main study were completed at 2 to 3 weeks postdisaster. Between 23 and 38 months ($M = 2.1$ years, $SD = 0.2$) postdisaster, self-report measures were repeated and the attention test was administered for the present study. Prior to this participation, brochures with extensive information were sent to participants of the main study and upon agreement an appointment was set for the PASAT to be administered by trained research employees. The study protocol was approved by the Medical Ethics Committee of the Academic Medical Center, Amsterdam, The Netherlands, and participants gave written informed consent.

Statistical Analyses

Chi-square tests and independent t tests were used to examine whether survivor groups in this follow-up differed in terms of socio-demographic features and symptom severity from survivors of the main study at 2 to 3 weeks postdisaster.

Relationships between PTSD symptom severity and PASAT performance were analyzed using partial correlations, successively controlling for age, years of education, depressive symptoms, and sleep disturbances. All statistical tests were two-tailed, and p values of less than .05 were considered statistically significant.

Results

Attentional testing and symptom severity measures were completed by 124 participants with an average age

of 45.6 years ($SD = 14.1$), 64.5% were of the female gender, the mean number of years of education was 13.3 ($SD = 3.9$), and 66.1% were employed. The mean SRS-PTSD was 5.7 ($SD = 4.2$) and the mean scores for SCL-90 depressive symptoms and sleep disturbances were 25.7 ($SD = 11.0$) and 5.9 ($SD = 3.2$).

When we compared the subgroup of survivors included in the present study to other participants in the main study on measures collected 2 to 3 weeks post-disaster, no differences in terms of age, employment, or sickness-leave from work were apparent. However, we did find a between-group difference for gender: $\chi^2(1, N = 1566) = 6.91, p < .05$, and for years of education $t(153.74) = 2.67, p < .05$. A higher proportion of women and higher-educated persons participated in this part of the study. No differences in PTSD symptoms, depressive symptoms, or sleep disturbances were found between the groups.

The nature of the participants' exposure consisted in part of being severely frightened (66.7%), running away from home (44.1%) or into their homes (18.0%), seeing slightly (72.1%) and severely (27.9%) wounded victims, helping the wounded (9.0%), searching for loved ones (56.7%), having seen explosions (80.2%) or fire (58.6%), and having heavy damage or total destruction of one's house (23.1%).

Results of the partial correlations between the number of correct responses on each presentation rate of the PASAT and the SRS-PTSD, controlling successively for age, education, depressive symptoms, and sleep disturbances can be seen in Table 1.

Results indicate that PASAT performance decreases with increasing PTSD symptom severity. When we inserted the controlling variables the correlations lowered; the statistical significance disappears when the task gets more difficult.

Discussion

To our knowledge, this is the first study to investigate attention in disaster survivors in relation to PTSD symptomatology at 2 to 3 years postdisaster. Participants stem from a community population and are survivors of the Enschede fireworks disaster. As expected, age and education accounted for a great deal of attentional dysfunction in disaster survivors, and although depressive symptoms and sleep disturbances contributed as well, these concomitant symptoms to PTSD explained only a very small part of the difficulties. Nevertheless, the current findings suggest that even when we controlled for the influence of age, education, depressive symptoms, and sleep disturbances, attentional dysfunction is still related to PTSD symptoms.

Our results are consistent with the study of Jenkins, Langlais, Delis, and Cohen (2000) who found that depressive symptomatology plays only a minor role in mediating deficits in sustained attention in PTSD sufferers. In studies in which no attentional disturbances in PTSD were found (e.g., Sullivan, Kregel, Proctor, Devine, Heeren et al., 2003; Zalewski, Thompson, & Gottesman, 1994), it is conceivable that these contrasting results can be attributed to partial or subclinical PTSD in the traumatized controls who were used as a comparison group. In this way, small differences in PTSD symptom severity could be the cause of not detecting any attentional deficits.

We recognize the limitations of our study. Our sample may not be representative for survivors of other disasters. Therefore, generalizing the results to different populations should be done with caution. Second, because our interpretations are based on only one measure of attention, replication is necessary, preferably with several neuropsychological tests.

Attention lies at the basis of all adequate information processing. As such, attention is an important prerequisite

Table 1. Partial Correlation Coefficients of PTSD Symptom Severity (SRS-PTSD) and PASAT Scores Controlling Successively for Age, Education, Depressive Symptoms (SCL-90), and Sleep Disturbances (SCL-90)

Controlling variables	PASAT				
	3.2-sec (<i>n</i> = 124)	2.8-sec (<i>n</i> = 123)	2.4-sec (<i>n</i> = 120)	2.0-sec (<i>n</i> = 118)	1.6-sec (<i>n</i> = 115)
None ^a	-.30**	-.28**	-.25**	-.21*	-.08
Age, education	-.19*	-.21*	-.19*	-.09	-.02
Age, education, depression	-.20*	-.25*	-.16	-.13	-.08
Age, education, depression, sleep disturbances	-.20*	-.23*	-.13	-.15	-.06

Note. PTSD = posttraumatic stress disorder; SRS-PTSD = Self-Rating Scale for PTSD; PASAT = Paced Auditory Serial Addition Task; SCL-90 = Symptom Checklist. Because of missing data, sample sizes for the correlations vary.

^aUsing Pearson correlation.

* $p < .05$. ** $p < .01$.

for adequate functioning in work and daily life. Stein, Kennedy, and Twamley (2002) stated that even mild or subtle impairments on neuropsychological tests in the laboratory can translate into clinically significant difficulties in the real world, because real world situations involve more complex processing demands in the context of increased distraction in the environment. Moreover, small individual attentional impairments may have an important negative impact on the total population.

In conclusion, this study provides further evidence that PTSD symptoms are genuinely related to deficits in attention. Early screening and subsequent adequate treatment of PTSD symptoms in the community are needed to prevent these attentional constraints from causing populations to fall behind in the aftermath of trauma.

Acknowledgments

This research was supported by a grant from the Ministry of Health, Welfare and Sports (VWS), The Netherlands. We acknowledge the contribution of the Regional Health Authority of Twente. In particular, we acknowledge the remarkable contributions of Jan Roorda and our research employees who made the data collection possible.

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