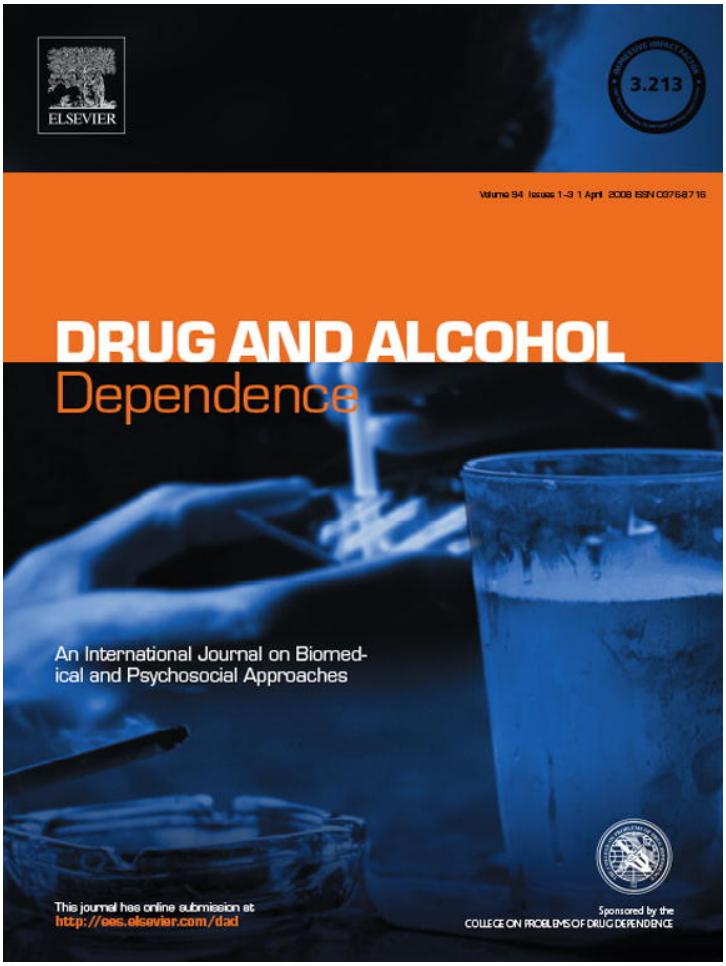

Available online at www.sciencedirect.com
ScienceDirect
Drug and Alcohol Dependence 94 (2008) 267–271
DRUG and ALCOHOL DEPENDENCE
www.elsevier.com/locate/drugalcdep

Short communication

Smoking predicts posttraumatic stress symptoms among rescue workers: A prospective study of ambulance personnel involved in the Enschede Fireworks Disaster

Peter G. van der Velden [a,*], Rolf J. Kleber [a,b], Karestan C. Koenen [c]

[a] *Institute for Psychotrauma (IvP), Zaltbommel, The Netherlands*
[b] *Department of Clinical & Health Psychology, Utrecht University, Utrecht, The Netherlands*
[c] *Harvard School of Public Health, Departments of Society, Human Development, and Health & Epidemiology, Boston, USA*

Received 1 May 2007; received in revised form 31 October 2007; accepted 1 November 2007

Abstract

Background: Examining whether smoking is a risk factor for posttraumatic stress disorder (PTSD) symptoms among rescue workers affected by a disaster.
Methods: Ambulance personnel ($N = 66$) participated in surveys 2–3 weeks (T1) and 18 months after a fireworks disaster (T2). Hierarchical multiple regression analyses were conducted with cigarette consumption at T1 as a predictor of PTSD symptoms at T2. Demographic characteristics, disaster experiences, peritraumatic dissociation, intrusions and avoidance, psychological distress and alcohol consumption assessed at T1 were included as covariates.
Results: Regression analyses showed that smoking at T1 independently predicted intrusions, avoidance, hostility, and depression symptoms at T2. Results were not affected by controlling for post-disaster critical incidents at work.
Conclusions: This is the first prospective study among rescue workers demonstrating that smoking soon after a disaster predicts PTSD symptoms in the intermediate term. Findings substantiate results of previous studies indicating that smoking is a relevant risk factor. Future research on how changes in cigarettes consumption post-trauma affect risk of PTSD is required.

Keywords: Disaster; Prediction; PTSD symptoms; Smoking; Ambulance personnel

1. Introduction

In a comprehensive review, Feldner et al. (2007) concluded that there is general consensus across empirical studies that exposure to traumatic events and posttraumatic stress disorder (PTSD) are associated with increased smoking. For example, in the U.S. approximately 45% of persons with current PTSD are current smokers, in contrast to 22% of the general population (Feldner et al., 2007).

However, emerging evidence also suggests that smoking may influence occurrence of PTSD symptoms. Joseph et al. (1993) showed that increased smoking after a shipping disaster was positively related to psychological distress and intrusions and avoidance 30 months post-disaster. Vlahov et al. (2002) found that increased smoking was positively associated with PTSD and depression 5–8 weeks after the 11th September terrorist attacks. Increased smoking since September 11 was associated with disaster-related PTSD assessed at 4 months (Nandi et al., 2005), and 6–9 months post-attack (Vlahov et al., 2004). Similarly, Koenen et al. (2005) found that nicotine dependence among male Vietnam veterans was independently associated with a twofold risk for developing PTSD. Van der Velden et al. (2007), using data from the Enschede Fireworks Disaster Study, found that smoking 18 months post-disaster was independently associated with a 2–3-fold increased risk for PTSD 4 years post-disaster among affected residents.

The current prospective study also uses data from the Enschede Fireworks Disaster Study (Cf. Van Kamp et al., 2005; Van der Velden et al., 2006) to examine whether smoking independently predicts posttraumatic stress symptoms among rescue

* Corresponding author.
E-mail address: peter.vdvelden@ivp.nl (P.G. van der Velden).

0376-8716/$ – see front matter © 2007 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.drugalcdep.2007.11.001

workers, i.e. ambulance personnel affected by this disaster. Previous studies suggest that rescue workers are at less risk of developing post-disaster mental health problems than affected citizens (Galea et al., 2005; Van der Velden et al., 2006). If smokers are at increased risk of developing PTSD symptoms, this information may help to identify affected rescue personnel who are most at risk for post-disaster mental health problems.

This longitudinal study started 2–3 weeks after the disaster (May, 2000, The Netherlands), causing the death of 23 people, injured approximately 1000 people, and destroyed 500 homes. The prospective study design enabled us to control for numerous pre- (age, gender, education), peri- (disaster exposure, peritraumatic dissociation) and post-disaster variables (intrusions, avoidance, psychological distress, and alcohol consumption 2–3 weeks post-disaster), which may confound the relationship between smoking and PTSD symptoms (Brewin et al., 2000; Ozer et al., 2003; Stewart, 1996). In addition, we controlled for work-related post-disaster critical incidents. Of course, we were unable to control for all plausible confounders. In particular, absence of data on pre-disaster smoking is a limitation of this study that makes it difficult to study reciprocal relationships between smoking and PTSD that may be of interest.

2. Methods

2.1. Procedure and participants

Details on the procedures and measures of the Enschede Fireworks Disaster Study have been published previously and are briefly described here (Van Kamp et al., 2005; Van der Velden et al., 2006, 2007). The Medical Ethical Testing Committee (TNO, the Netherlands) approved the study protocols.

The present study group consisted of affected ambulance personnel ($N = 66$), assessed 2–3 weeks (T1, estimated response between 31% and 49%) and 18 months post-disaster (T2; response = 83.5%). All participants gave their written informed consent. Data on affected ambulance personnel have not been published previously. Therefore, we present the characteristics of the participants in Table 1.

2.2. Measures

2.2.1. Predictors. Smoking questions from the Dutch Local and National Public Health Monitor (GGD, 2003) were used to assess daily cigarettes consumption (CC) at T1 (number of cigarettes smoked). The number of cigars smoked was added to the number of cigarettes smoked (1 cigar was counted as 3 cigarettes).

2.2.2. Outcomes and Covariates. Disaster exposure was assessed at T1 using a list of 31 items (Van der Velden et al., 2006) about what rescue workers had seen, felt, heard or smelt during or immediately after the disaster (0 = no, 1 = yes). Items are summed to give a total disaster exposure score (alpha = 0.95). Self-sustained injuries and death of a significant other were also assessed [1 = no (severe) self-sustained injuries/no loss significant other; 2 = severe injuries and/or loss significant other)].

The 10-item Peritraumatic Dissociative Experiences Questionnaire (Marmar et al., 1997) was administered at T1 to assess dissociation during or shortly after the disaster. Item response options ranged from 1 = not at all to 5 = often (alpha = 0.90). Peritraumatic dissociation (PD), i.e. experiencing changes or distortions in the perception of time, space and the self, during or immediately after a traumatic event, is considered a risk factor for PTSD symptomatology (Cf. Ozer et al., 2003).

The SCL-90-R (Derogatis, 1977; Arrindell and Ettema, 1986) was administered to assess psychological distress at T1 (sum score of all 90 items), and

Table 1
Characteristics affected ambulance personnel ($N = 66$) and summary results hierarchical multiple regression analyses predicting posttraumatic stress symptoms (step 2)

	M (S.D.) (%)	Posttraumatic Stress Symptoms 18 months post-disaster																			
		Intrusions				Avoidance reactions				Hostility symptoms				Depression symptoms							
		β	t	p	Zero-order[a]	Partial[a]	β	t	p	Zero-order[a]	Partial[a]	β	t	p	Zero-order[a]	Partial[a]	β	t	p	Zero-order[a]	Partial[a]
Age	38.2 (9.4)	0.07	0.72	0.47	0.22	0.10	0.03	0.29	0.78	0.19	0.04	0.03	0.11	0.78	0.13	0.04	0.00	0.00	1.00	0.19	0.00
Gender (females)	21.2	−0.20	−1.78	0.08	−0.08	−0.25	−0.14	−1.14	0.26	−0.09	−0.16	0.18	0.12	0.16	0.28	0.20	0.04	0.40	0.69	0.18	0.06
Educational level[b]	2.9 (0.8)	−0.16	−1.48	0.15	−0.12	−0.21	−0.13	−1.10	0.28	−0.15	−0.15	−0.17	0.12	0.15	−0.10	−0.20	−0.21	−2.15	0.04	−0.23	−0.29
Disaster exposure	10.4 (8.0)	0.25	2.02	0.05	0.32	0.28	0.20	1.44	0.16	0.20	0.20	0.17	0.14	0.21	0.08	0.18	−0.05	−0.46	0.65	−0.04	−0.06
Peritraumatic dissociation[c]	16.1 (7.1)	0.01	0.04	0.97	0.46	0.00	0.28	1.62	0.11	0.51	0.22	−0.45	0.17	0.01	0.20	−0.36	−0.02	−0.14	0.89	0.47	−0.02
Injuries/death due to disaster (yes)	7.7	0.13	1.24	0.22	0.21	0.17	0.02	0.13	0.90	0.05	0.02	0.02	0.12	0.84	0.20	0.03	0.21	2.12	0.04	0.29	0.29
Intrusions at T1[d]	11.8 (9.3)	0.06	0.39	0.70	0.45	0.05	−0.16	−0.89	0.38	0.27	−0.13	−0.17	0.18	0.34	0.31	−0.14	−.35	−2.33	0.02	0.29	−0.32
Avoidance reactions at T1[d]	6.3 (7.6)	0.36	2.37	0.02	0.54	0.32	0.36	2.12	0.04	0.45	0.29	0.13	0.17	0.46	0.30	0.11	0.41	2.97	>0.01	0.53	0.39
Psychological distress at T1[e]	106.2 (29.0)	0.14	0.78	0.44	0.49	0.12	0.01	0.03	0.97	0.38	>0.01	0.73	0.20	>0.01	0.49	0.46	0.52	3.12	>0.01	0.60	0.41
Alcohol consumption at T1[f]	3.8 (3.2)	−0.03	−0.27	0.79	−0.16	−0.04	−0.01	−0.11	0.91	−0.13	−0.02	0.11	0.11	0.32	−0.05	0.14	−.02	−0.18	0.86	−0.17	−0.03
Cigarette consumption at T1[g]	5.4 (8.7)	0.26	2.42	0.02	0.34	0.33	0.26	2.22	0.03	0.35	0.30	0.31	0.12	0.01	0.32	0.35	0.21	2.09	0.04	0.35	0.29

T1: assessed 2–3 weeks post-disaster.
a Correlations.
b Educational level: (1) Elementary school (1.5%); (2) Junior high/middle school (28.6%); (3) High school level (44.4%); (4) College degree/university (25.4%).
c Peritraumatic Dissociative Experiences Questionnaire.
d Impact of events scale.
e Symptom Checklist SCL-90-R.
f Dutch monitoring project on risk factors for chronic diseases.
g Dutch local and national public health monitor.

hostility (6 items) and depression symptoms (16 items) at T2. Item response options ranged from 1 = not at all to 5 = extremely (all alphas ≥ 0.81).

The 15-item Impact of Event Scale (Horowitz et al., 1979; Van der Ploeg et al., 2004) was used at both waves to assess disaster-related intrusions and avoidance (0 = not at all, 5 = often; all alpha's ≥ 86). Intrusions (e.g. re-experiencing the trauma) and avoidance (e.g. avoiding reminders of the trauma) are typical after a traumatic event and, in addition to hyperarousal, symptoms of PTSD.

Standardized alcohol consumption questions from the Dutch Monitoring Project on Risk Factors for Chronic Diseases (MORGEN-project, Blokstra et al., 1998) were applied at T1 (five categories: beer, red wine, white wine, sherry, and brandy; 0 = not to 4 = daily consumption). For the present study the total score of the five categories was calculated.

Ten items of the Acute Stress List (Van der Velden et al., 2006) were administered at T2 to measure critical incidents at work in the prior 12 months, including items such as "how many times were you involved in an accident which severely injured a child". The total score was calculated by summing the 10 items. Response options ranged from 1 = not at all to 7 = daily (alpha = 0.72).

2.3. Data analysis

Hierarchical multiple regression analyses were conducted to assess the relationship between smoking at T1 and PTSD symptoms at T2. At step 1 all pre-, peri and post-disaster T1 variables were entered as predictors, except cigarettes consumption (CC) at T1. At step 2 CC at T1 was added. Dependent variables at T2 were PTSD symptoms and included intrusions, avoidance, hostility, and depression. Analyses were performed by SPSS (version 14.0).

3. Results

Table 1 presents the results of step 2 of the regression analyses[1], with standardized beta's (β), t and p-values, zero-order and partial correlations between predictors and PTSD symptoms. CC at T1 independently predicted intrusions at T2 (step 2 F^{change} (1, 49) = 5.9, $p = 0.019$, $\Delta R^{2\ \text{adjusted}} = 0.06$; total $R^{2\ \text{adjusted}} = 0.44$), avoidance at T2 (step 2: $F^{\text{change}}(1, 49) = 4.9$, $p = 0.031$, $\Delta R^{2\ \text{adjusted}} = 0.06$; total $R^{2\ \text{adjusted}} = 0.30$), hostility symptoms at T2 (step 2: $F^{\text{change}}(1, 49) = 6.8$, $p = .012$, $\Delta R^{2\ \text{adjusted}} = 0.08$; total $R^{2\ \text{adjusted}} = 0.31$), and depression symptoms at T2 (step 2: $F^{\text{change}}(1, 49) = 4.4$, $p = .032$, $\Delta R^{2\ \text{adjusted}} = 0.04$; total $R^{2\ \text{adjusted}} = 0.52$). Multicolinearity between CC and predictors was evaluated before performing step 2 (VIF = 1.22, tolerance = 0.82).

Respondents were often confronted with post-disaster critical incidents at work (Mean = 30.3, S.D. = 10.2). For example, on a monthly basis, 57.6% reported failed reanimations and 6.1% encountered dead children. Entering post-disaster critical incidents in the full models of Table 1, did not alter our findings (data not shown in a table)[1].

4. Discussion

Before discussing our findings, we re-direct attention to limitations mentioned in our introduction, as well as other limitations faced in post-trauma observational research of this type, including the low T1 participation level. Despite these limitations to our knowledge, this is the first prospective study assessing smoking as a risk factor for PTSD symptoms among rescue workers. Consistent with studies of veterans and civilians affected by disasters (Koenen et al., 2005; Nandi et al., 2005; Joseph et al., 1993; Van der Velden et al., 2007; Vlahov et al., 2002, 2004) results show that there is an independent relationship between cigarettes consumption 2–3 weeks post-disaster and PTSD symptoms 18 months later. Thus, assessment of smoking may help to identify people who are at risk for PTSD symptoms after a traumatic event.

The biological mechanism underlying the smoking-PTSD association is not understood but may operate via the effects of smoking on the central nervous system. There is significant evidence that chronic smoking can produces dysregulation of the hypothalamic-pituitary-adrenal (HPA) system. Evidence from animal models suggests that drug abuse and stress trigger similar changes in midbrain dopaminergic function (Saal et al., 2003). Significant evidence suggests chronic smoking produces a dysregulation of neural stress systems (e.g., hypersecretion of cortisol). Constituents of tobacco smoke inhibit the enzymes involved in the breakdown of monoamines, including dopamine, serotonin and norepineprhine (Fowler et al., 2003), an effect that appears to normalize following successful smoking cessation (Rose et al., 2001). Indeed, chronic smoking may act to sensitize neurobiological stress response systems (Kassel et al., 2003). These neurobiological alternations might enhance vulnerability to developing PTSD symptoms following trauma exposure.

The strengths of the study include its prospective design and ability to control for relevant potential confounders of the smoking-PTSD association. However, the response level at T1 was not high (between 31% and 49%); participation at T2 was much improved (84%). We have no information on non-responders at T1. Furthermore, no information was available about smoking behavior before the disaster or the use of other drugs such as cannabis. We assessed self-reported PTSD symptoms and did not conduct clinical interviews to obtain diagnostic data. We controlled for relevant pre-, peri- and post-disaster factors (Brewin et al., 2000; Ozer et al., 2003), such as peritraumatic dissociation, disaster exposure, psychological distress, and alcohol consumption at T1. However, our findings might be confounded by other unmeasured "third factors" such as pre-existing mental health problems (Dirkzwager et al., 2006) and coping self-efficacy (Benight and Bandura, 2004). On the other hand, it is also possible that cigarette consumption was one of the unmeasured "third factors" in other trauma studies. Further research is warranted to examine whether our results will generalize to other groups of rescue workers.

Findings suggest that smoking might function as an independent causal determinant for post-disaster PTSD symptoms. Like prior studies, results raise the question whether the risk for PTSD symptoms can be attenuated by quitting or reducing cigarette consumption after the event (Koenen et al., 2005; Van der Velden et al., 2007). The relatively small number of respondents in our study prevented us from conducting additional analyses, such as assessing PTSD symptoms among respondents who reduced or increased cigarette consumption in the period between the T1 and T2 assessments. Therefore, future research on how changes in cigarette consumption post-trauma affect risk of PTSD is required. Since rescue workers are frequently exposed to trau-

[1] Models not presented here are available from the primary author on request.

matic events, there is opportunity for prospective studies that include measures of pre-event functioning. These studies are feasible and warranted.

Conflicts of interest

None.

Acknowledgements

We thank Linda Grievink (RIVM, The Netherlands) and Berthold Gersons (AMC, The Netherlands) for their valuable contributions to the surveys.

Role of funding source: The Enschede Fireworks Disaster Study was conducted on behalf of the Dutch Ministry of Health, Welfare and Sports. The ministry had no role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

Contributors: PV and RK contributed to the design and data-collection of the Enschede Fireworks Disaster Study. PV, RK and KK designed the present study. PV undertook the statistical analyses and wrote the first draft. PV, RK and KK revised the manuscript critically for important intellectual content. PV, RK and KK have approved the final manuscript and gave final approval of the version to be published.

Appendix A

See Table A.1.

Table A.1
Course of health problems and cigarettes consumption

	2–3 weeks post-disaster		18 months post-disaster		*t*	d.f.	*p*
	M	S.D.	M	S.D.			
Intrusions[a]	11.8	9.3	4.0	5.8	7.5	63	0.000
Avoidance reactions[a]	6.3	7.6	3.1	5.3	3.6	63	0.001
Psychological distress[b]	106.2	29.0	102.6	20.0	1.3	63	ns
Depression symptoms[b]	19.4	6.2	18.4	4.4	1.5	63	ns
Hostility symptoms[b]	6.9	1.7	6.6	1.4	1.2	64	ns
Cigarette consumption[c]	5.4	8.7	4.5	7.6	1.3	65	ns

At 2–3 weeks and 18 months post-disaster, 79 and 66 ambulance personnel respectively participated. In total, 66 participated at both waves.

[a] Impact of Events Scale.

[b] Symptom Checklist SCL-90-R.

[c] Dutch Local and National Public Health Monitor.

References

Arrindell, W.A., Ettema, J.H.M., 1986. SCL-90: Handleiding bij een multidimensionele psychopathologie indicator. In: Manual for a Multidimensional Psychopathology Indicator. Swets and Zeitlinger/Swets Test Publishers, Lisse.

Benight, C.C., Bandura, A., 2004. Social cognitive theory of posttraumatic recovery: the role of perceived self-efficacy. Behav. Res. Ther. 42, 1129–1148.

Blokstra, A., Seidell, J.C., Smit, H.A., Bueno de Mesquita, H.B., Verschuren, W.M.M., 1998. Het project Monitoring Risicofactoren en Gezondheid Nederland (MORGEN project) Jaarverslag 1997 [The Monitoring Project on Risk Factors for Chronic Diseases (MORGEN project) Annual Report 1997]. National Institute for Public Health and the Environment, Bilthoven.

Brewin, C.R., Andrews, A., Valentine, J.D., 2000. Meta-analysis or riks factors for posttraumatic stress disorder in trauma-exposed adults. J. Clin. Consult. Psychol. 68, 748–766.

Derogatis, L.R., 1977. SCL-90-R: Administration Scoring and Procedures Manual-I for the R(evised) Version. Johns Hopkins University School of Medicine, Clinical Psychometrics Research Unit, Baltimore.

Dirkzwager, A., Grievink, L., Van der Velden, P.G., Yzermans, C.J., 2006. A prospective study of risk factors for psychological and physical health problems after a man-made disaster. Br. J. Psychiatry 189, 144–149.

Feldner, M.T., Babson, K.A., Zvolensky, M.J., 2007. Smoking, traumatic event exposure, and post-traumatic stress: a critical review of the empirical literature. Clin. Psychol. Rev. 27, 4–45.

Fowler, J.S., Logan, J., Wang, G.J., Volkow, N.D., 2003. Monoamine oxidase and cigarette smoking. Neurotoxicology 24, 75–82.

Galea, S., Nandi, A., Vlahov, D., 2005. The epidemiology of posttraumatic stress disorder after disasters. Epidemiol. Rev. 27, 78–91.

GGD Nederland (Health Authority Netherlands), 2003. Standaard vraagstelling roken (standardized questions for smoking). Utrecht, The Netherlands, GGD Nederland.

Horowitz, M.J., Wilner, N., Alvarez, W., 1979. Impact of Event Scale: a measure of subjective stress. Psychosom. Med. 41, 209–218.

Joseph, S., Yule, W., Williams, R., Hodgekinson, P., 1993. Increased substance use in survivors of the Herald of Free Enterprise Disaster. Br. J. Med. Psychol. 66, 185–191.

Kassel, J.D., Stroud, L.R., Paronis, C.A., 2003. Smoking, stress, and negative affect: Correlation, causation, and context across stages of smoking. Psychol. Bull. 129, 270–304.

Koenen, K.C., Hitsman, B., Lyons, M.J., Niaura, R., McCaffery, J., Glodberg, J., Eisen, S.A., True, W., Tsuang, M., 2005. A twin registry study of the relationship between posttraumatic stress disorder and nicotine dependence in men. Archiv. Gen. Psychiatry 62, 1258–1265.

Marmar, C.R., Weiss, D.S., Metzler, T.J., 1997. The peritraumatic dissociation experiences questionnaire. In: Wilson, J.P., Keane, T.M. (Eds.), Assessing psychological trauma and severity. Guilford Press, New York.

Nandi, A., Galea, S., Ahern, J., Vlahov, D., 2005. D.Probable cigarette dependence, PTSD, and depression after an urban disaster: results from a population survey of New York City residents 4 months after September 11, 2001. Psychiatry 68, 299–310.

Ozer, E.J., Best, S.R., Lipsey, T.L., Weiss, D.S., 2003. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. Psychol. Bull. 129, 52–73.

Rose, J.E., Behm, F.M., Ramsey, C., Ritchie, J.C.J., 2001. Platelet monoamine oxidase, smoking cessation, and tobacco withdrawal symptoms. Nicotine Tob. Res. 3, 383–390.

Saal, D., Dong, Y., Bonci, A., Malenka, R.C., 2003. Drugs of abuse and stress trigger a common synaptic adaptation in dopamine neurons. Neuron 37, 577–582.

Stewart, S.H., 1996. Alcohol abuse in individuals exposed to trauma: a critical review. Psychol. Bull. 120, 83–112.

Van der Ploeg, E., Mooren, T.M., Kleber, R.J., Van der Velden, P.G., Brom, D., 2004. Construct validation of the Dutch version of the Impact of Event Scale. Psychol. Assess. 16, 16–26.

Van der Velden, P.G., Christiaanse, B., Kleber, R.J., Marcelissen, F.M.G., Dorresteijn, A.M., Drogendijk, A.N., Roskam, A.J., Grievink, L., Gersons, B.P.R., Olff, M., Meewisse, M.L., 2006. The effects of disaster exposure and post-disaster critical incidents on intrusions, avoidance and health problems among firefighters: a comparative study. Stress Trauma Crisis 9, 73–93.

Van der Velden, P.G., Grievink, L., Olff, M., Gersons, B.P.R., Kleber, R.J., 2007. Smoking as a risk factor for mental health disturbances after a disaster: a prospective comparative study. J. Clin. Psychiatry 69, 87–92.

Van Kamp, I., Van der Velden, P.G., Stellato, R., Roorda, J., Van Loon, J., Kleber, R.J., Gersons, B.P.R., Lebret, E., 2005. Physical and mental health shortly

after a disaster: first results from the Enschede Fireworks Disaster study. Eur. J. Public Health 16, 253–259.

Vlahov, D., Galea, S., Resnick, H., Ahern, J., Boscarino, J.A., Bucuvalas, M., Kilpatrick, D., 2002. Increased use of cigarettes, alcohol, and marijuana among Manhattan, New York, residents after the September 11th terrorists attacks. Am. J. Epidemiol. 155, 988–996.

Vlahov, D., Galea, S., Resnick, H., Ahern, J., Resnick, H., Boscarino, J.A., Gold, J., Bucuvalas, M., Kilpatrick, D., 2004. Consumption of cigarettes, alcohol and marijuana among New York city residents six months after the September 11 terrorist attacks. Am. J. Drug Alcohol Abuse 30, 385–407.