

Torsten Siol, Ann Schaefer, Walter Thomas, Karl Köhle
Institute of Psychosomatic Medicine and Psychotherapy, University of
Cologne, Germany

Posttraumatic Stress Symptoms in Train Drivers Following Serious Accidents: A Pilot Study

ABSTRACT

Being involved in a fatal accident is a common event among train drivers that is likely to precipitate stress responses (1000 annual railway suicides in Germany). This paper presents data from a pilot study that retrospectively assessed the prevalence of severe accidents and consecutive posttraumatic symptoms in 429 train drivers using an accident questionnaire, the IES-R and SCL-90-R.

276 (64.3%) of the respondents had experienced at least one major railway accident, 50% of whom reported to have had stress symptoms of presumable clinical relevance in the first weeks following the accident. At an average of four years after the event, 8.2% still described actual symptoms to an extent complying with DSM-criteria of PTSD.

Key words: posttraumatic stress disorder, railway accidents, train driver

Introduction

Train drivers are at a considerably higher risk than the general population to be confronted with a potentially traumatic event: Taking into account about 1000 annual 'railway suicides' in Germany, roughly 5% of all train drivers are involved in such incidents every year (Schmidtke, 1994). Moreover, a significant number of other serious accidents have to be added. There is a statistical risk for each driver to experience two suicides or other fatal situations during his occupational career. In contrast to other methods, railway suicides have a strong direct or indirect impact on other persons who inevitably are involved. Several authors have argued that people choosing this particularly brutal suicide method show an extremely high potential of aggression, sometimes maybe even wishing to be killed by another person (i.e. the train driver), or wanting to submit themselves passively to an overwhelming physical force (Menninger, 1938). This makes evident the potential negative impact on train drivers: Driving at high speed, they are neither able to stop the train in time nor to move aside to avoid the collision. Being in a situation beyond their control, they are regularly left in a state of helplessness. Moreover, the train driver – not rarely being on his own on the engine – not only has to report the accident, but also to secure the train or to dismount to give first aid to a surviving victim before any

assistance is available. Accordingly, several of the subjective risk factors for PTSD – as identified in clinical surveys (e.g. Green, 1994) – are inherent in railway accidents: unexpectedness of the event, small degree of control over the situation, (subjective) feeling of guilt and delayed appearance of external help. It seems quite obvious that most accidents meet the criterion of a traumatic event in the DSM-IV or ICD-10 system.

One aim of the present study was to assess the requirement of specific therapeutic support for this group. Additionally, different authors have suggested that railway accidents could serve as a model for studying the responses of healthy subjects to trauma (Malt et al., 1993; Vatschelle & Moen, 1997): Due to their high risk to be exposed to a traumatic event, there is a possibility to assess pre-traumatic conditions and relate them to the trauma responses. Differing from other areas, most accident situations are quite uniform (mostly suicides; the driver can neither anticipate nor prevent the accident) and the group of train drivers is rather homogenous regarding sociodemographic variables. These circumstances present an opportunity to examine the role of individual disposition with regard to the aetiology of posttraumatic syndromes.

Starting in the early '80s, in Scandinavian countries as well as in Great Britain psychological concepts were developed and implemented to minimise the negative effects of railway suicides on train drivers (Foss, 1994; Tang, 1994, Williams et al., 1994). Hitherto, a number of empirical studies have been published (Theorell et al., 1992, 1994; Farmer et al., 1992; Tranah & Farmer, 1994; Malt et al., 1993; Karlehagen et al., 1993; Myrtek et al., 1994; Vatschelle & Moen, 1997). But only one study focussing on psychophysiological reactions of subway drivers (Theorell et al., 1992, 1994) assessed the psychological and somatic state of health prior to the accident, however, less than half of the drivers had participated in this screening. Thus, inferences regarding the true effects of the traumatic incident as well as the evaluation of pre-disposing factors could not be made on a firm enough basis.

In an exploratory, retrospective project we tried to assess the frequency of posttraumatic stress reactions and the proportion of long-term disturbances in train drivers following fatal or nearly fatal on-the-track accidents. The results of the study presented in this paper, furthermore are serving as a baseline for a still ongoing prospective project designed to contribute to a more detailed description of objective and subjective variables, which increase the risk of suffering from PTSD after a traumatic event.

Method

Procedure

In co-operation with the occupational health service, the ombudspersons and the regional railway administration, a questionnaire was sent to all train drivers in active service in Cologne (August 1997), a total of 942 persons, who had been acquainted with the aims and procedures of the study. They were informed that the questionnaire should be a preparation for a

prospective research regarding post-traumatic distress of train drivers. Considering a relatively low response rate of 38.5% ($n = 363$) after 3 months, we decided to contact all subjects once again; with respect to the supposed scepticism of the train drivers regarding the confidentiality of the data, we included an answer-sheet with a different coding system. Thus, additional 66 questionnaires could be obtained, leading to an overall response rate of 45.5%. Statistical analysis was performed using SPSS 9.0; cases with incomplete data have been excluded.

Measures

Accident questionnaire: We developed this questionnaire basing on Myrtek's (1994) instrument asking for a detailed description of the accident, previous treatment and social support. Train drivers having experienced more than one serious accident were asked to focus on the subjectively most distressing event.

IES-R (Horowitz, 1979; Weiss & Marmar, 1996): The German version of the revised Impact of Event-Scale, authorised by M. Horowitz (Maercker & Schützwohl, 1998), was applied to assess the distress related to the accident. The Scale consists of 22 items with a four-point scoring range, comprehended to three sub-scales: *intrusion*, *avoidance* and *hyperarousal*. The drivers first were invited to report the current symptoms and then – to avoid possible triggering effects – asked to describe their distress in the first month after the event retrospectively.

SCL-90-R (DeRogatis, 1977; German version: Franke, 1995): This multi-dimensional instrument estimates the subjective impairment by psychological and somatic complaints. There are nine sub-scales (somatisation, obsessive-compulsive symptoms, social insecurity, depression, anxiety, aggression, phobic fear, paranoid thinking and psychoticism) and an assessment of the global psychological strain. The SCL-90-R is the most common questionnaire for these purposes with reference results for a broad spectrum of somatic and psychiatric disorders.

Participants

429 train drivers returned the questionnaire, 99.3% of whom were male. The mean age was 39.1 years ($SD = 9.5$ yr.); the respondents had a mean experience as train drivers of 15.7 years ($SD = 8.9$ yr.). 75.5% were married or with a constant partner, 17.5% single and 7% divorced. In order to investigate, whether our respondents form a representative group, we examined the sociodemographic data of all 1073 active train drivers in Cologne, who were on average about one year younger (mean = 38.2 yr.), but one year longer in service (mean = 17.0 yr.) than our sample at the time. Thus, we could calculate that the non-respondents were on average about two years younger and one year longer in service than the respondents. With the exception of a higher proportion of married participants among our correspondents, these differences regarding sociodemographic variables were not statistically significant.

Results

429 of the 942 questionnaires were returned, representing a response rate of 45.5%. 276 of

the 429 respondents (64.3%) confirmed to have experienced at least one major railway accident (range 1-11; 43.4% reported of one, 29.6% of two, 15.7% of three and 11.2% of four or more events). Suicide attempts (54.3%) were the most common experience, followed by non-suicide accidents (15.2%), collisions with other trains (9.4%), accidents at railroad crossings (7.4%) and derailments (3.9%). In 61.6% of the reported events at least one person was killed; 82.1% of these fatal accidents were suicides. The majority (55.3%) of the specified events had occurred within the last 4 years (median = 4 years). Actual IES-R scores on all three subscales were lower than those computed for the recalled distress in the first four weeks after the accident (see Table 1).

Table 1: Mean Scores on the IES-R Subscales

	Actual IES-R scores (n = 232)		Recalled IES-R scores (n = 232)	
	Mean	SD	Mean	SD
Intrusion	8.3	7.6	14.2	9.5
Avoidance	10.2	10.1	13.0	10.9
Hyperarousal	7.7	7.7	11.4	9.4

Summarising the scores of the intrusion and the avoidance subscale, a general score was computed to estimate the clinical significance of the reported symptoms (Table 2).

Table 2: Percentage of Drivers at the Different Levels of Distress According to the IES-R (Intrusion and Avoidance Subscale only)

	Percentage with level of distress			
	no significant distress (0-8)	low distress (9-25)	medium distress (26-43)	high distress (> 43)
Actual (n = 232; mean = 18.5; sd = 16.3)	37.9%	31.0%	21.1%	9.9%
Recalled (n = 232; mean = 27.2, sd = 18.3)	22.8%	27.2%	29.7%	20.3%

With respect to the problematic simple addition of IES-subscale scores (see Zilberg et al., 1982), Maercker & Schützwohl (1998) proposed an estimation equation including the hyperarousal subscale ($X = -.02 * \text{intrusion score} + .07 * \text{avoidance score} + .15 * \text{hyperarousal score} - 4.36$). They showed that in 82.8% the diagnosis of PTSD (if $X > 0$) could be assigned in

consistency with a structured diagnostic interview basing on DSM-III-R (sensitivity = .76, specificity = .88). According to this estimation equation, in our sample 8.2% of the train drivers having experienced a serious accident reported actual posttraumatic distress on the IES-R to an extent suggesting to comply with DSM-III-R criteria of PTSD; with respect to the retrospectively recalled distress in the first 4 weeks after the event 17.7% met these standards. Only 3.9% visited a psychiatrist or psychotherapist; mean sickness leave (self-reported) was 11.9 days ($sd = 14.1$). Asked about their sensations when passing the point of the accident, 30.3% reported to feel indifferent, 57.7% stated that the event was brought back to mind, 6.4% that they got quite nervous each time and 5.6% described additional somatic symptoms.

There were no statistically significant differences in the SCL-90-R scores (subscales and global indices) between train drivers, who had been confronted with a serious accident, and their colleagues without such an experience or the standard sample of the general population. Train drivers with a history of an accident were slightly older (40.2 vs. 37.0 yrs.; $p < .01$) and more experienced on the job (17.0 vs. 13.4 yrs.; $p < .001$). Drivers who reported an accident with casualties ($n = 203$) were longer on sick leave (13.9 vs. 3.9 days; $p < .001$), showed stronger reactions when passing the site of the accident ($CC = .237$; $p < .01$) and reported more distinct present symptoms of intrusion (mean = 9.2 vs. 5.5; $p < .01$) and avoidance (mean = 11.3 vs. 7.0; $p < .01$) than those, who specified accidents with only material damage ($n = 52$).

Discussion

We present the results of an exploratory, retrospective survey, focussing on the assessment of posttraumatic symptoms in train drivers. The response rate of 45.5% is not very high, and makes us cautious about the interpretation of our results. We cannot exclude a bias (under- or overestimation regarding the frequency of accidents) due to the low response rate, although a comparison of sociodemographic data showed, that our respondents were predominantly representative for all train drivers with reference to sex, age and experience in service. However, as Heberlein and Baumgartner have argued (1978), due to numerous factors affecting mailed questionnaires, already a response rate of 45-50% can be seen as a success. As the train drivers confirmed in the prospective phase of our study, the limited readiness to participate could be attributed to a restructuring of the railway company at the time, leading to massive insecurity regarding the future of their jobs, to hesitations regarding the confidentiality of the data and to a more general scepticism in respect of psychological and psychotherapeutic proposals.

Our findings endorse the results of other studies with respect to the extraordinary strain on employees in this occupation through on-the-track accidents (Farmer et al., 1992, Theorell et al., 1992, Malt et al., 1993, Vatshelle & Moen, 1997). Almost two thirds of the respondents had experienced at least one traumatic event meeting the DSM-IV-criteria (in 62% of the accidents at least one person was killed). Due to the limited response rate and the retrospective

nature of our data, the study does not allow for an exact estimation of posttraumatic symptoms in train drivers. Given these cautions, our findings suggest that in the first weeks after the traumatic event about 50% of train drivers show stress syndromes at a level of clinical relevance; more than 30% report medium or high distress several years after the accident. It can be assumed that only a minority of these train drivers present with a PTSD meeting DSM-criteria (17.7% adjacent to the accident and 8.2% at the time of the inquiry according to the IES estimation equation) and that subsyndromal affections prevail. Furthermore, it should be considered that our study included only train drivers in active service. Thus, we cannot exclude an underestimation of posttraumatic syndromes as train drivers unable to return to the train-service due to posttraumatic symptoms could not be taken into account.

The discrepancy between rather high levels of posttraumatic burden and a relatively low psychotherapeutic / psychiatric consultation rate (3.9%) seems to suggest that the support offered to traumatised train drivers has to be improved. Despite the limitations of our study, our findings provide the basis for further research. In a still ongoing prospective study we try to contribute to a more detailed description of objective, subjective, individual and psychosocial factors that influence the appearance and course of PTSD in train drivers and to develop adequate support and intervention strategies.

Acknowledgement:

We are grateful to the Lotte-Köhler Foundation, Munich, for supporting this study.

References

- Farmer, R., Tranah, T., O'Donnel, I., & Catalan, J. (1992). Railway Suicide: The Psychological Effects on Drivers. *Psychological Medicine*, 22, 407-414.
- Franke, G. (1995). SCL-90-R. Die Symptom-Checkliste von Derogatis (German version). Beltz-Test, Göttingen.
- Green, B.L. (1994). Psychosocial research in traumatic stress: an update. *Journal of Traumatic Stress*, 7, 341-362.
- Heberlein T.A., & Baumgartner R. (1978). Factors affecting response rate to mailed questionnaires: a quantitative analysis of the published literature. *American Social Review*, 43, 447-462.
- Horowitz, M.J., Wilner, N., & Alvarez W. (1979). The Impact of Event Scale: A Measure of Subjective Stress. *Psychosomatic Medicine*, 41, 209-218.
- Malt, U.F., Karlehagen, S., Hoff, H., Herrstromer, U., Hildingson, K., Tibell, E., & Leymann, H. (1993). The Effect of Major Railway Accidents on the Psychological Health of Train Drivers – 1. Acute Psychological Responses to Accidents, *Journal of Psychosomatic Reserach*, 37, 793-805.
- Maercker, A., & Schützwohl, M. (1998). Erfassung von psychischen Belastungsfolgen: Die Impact of Event Skala – revidierte Version (IES-R). *Diagnostica*, 44, 130-141.

- Myrtek, M., Itte, H., Zimmermann, W., & Brügger, G. (1994). Psychische Bewältigung von Unfällen bei Lokomotivführern: Die Relevanz von Copingfragebögen zur Erfassung von funktionalen und dysfunktionalen Copingprozessen. *Zeitschrift fuer Klinische Psychologie*, 23, 293-304.
- Schmidtke, A. (1994). Suicidal Behaviour on Railways in the FRG, *Social Science and Medicine*, 38, 419-426.
- Theorell, T., Leymann, H., Jodko, M., Konarski, K., Norbeck, H.E., & Eneroth, P. (1992). Person under Train Incidents: Medical Consequences for Subway Drivers. *Psychosomatic Medicine*, 54, 480-488.
- Vatschelle, A., & Moen, B.E. (1997). Serious On-The-Track Accidents Experienced by Train Drivers: Psychological Reactions and Long-Term Health Effects. *Journal of Psychosomatic Research*, 42, 43-52.
- Weiss, D.S., & Marmar, C.R. (1996). The Impact of Event-Scale-Revised. In J.P. Wilson & T.M. Keane (Eds.), *Assessing psychological Trauma and PTSD: A handbook for practitioners* (pp. 399-411). New York: Guilford Press.
- Williams, C., Miller, J., Watson, G., & Hunt, N. (1994). A Strategy for Trauma Debriefing after Railway Suicides, *Social Science and Medicine*, 38, 483-487.
- Zilberg, N., Weiss, D. & Horowitz, M.J. (1982). Impact of Event Scale: A cross-validation Study and some empirical evidence supporting a conceptual model of stress response syndromes. *Journal of Consulting and Clinical Psychology*, 50, 407-414.

Correspondence address:

Torsten Siol

Institute of Psychosomatic Medicine and Psychotherapy

University of Cologne

Joseph-Stelzmann-Str. 9

D-50924 Cologne

Germany

Phone: ++49 / 221 / 478-4103

Fax: ++49 / 221 / 478-3103

Email: torsten.siol@dpv-mail.de