

Lifetime traumatic experiences and their impact on PTSD: a general population study

Karoline Lukaschek · Johannes Kruse ·
Rebecca Thwing Emeny · Maria Elena Lacruz ·
Alexander von Eisenhart Rothe · Karl-Heinz Ladwig

Received: 7 May 2012 / Accepted: 4 September 2012 / Published online: 25 September 2012
© Springer-Verlag 2012

Abstract

Objective Exploring the relationship of exposure to a traumatic event and the subsequent onset of posttraumatic stress disorder (PTSD) in the population.

Methods Posttraumatic stress disorder was assessed using the Impact of Event Scale (IES), Posttraumatic Diagnostic Scale (PDS) and interview data. Logistic regression analyses with sex, age, marital status, educational level and traumatic event characteristics were performed. Prevalences were standardised to the sex and age distribution of the German population.

Results A total of 41 % of the subjects reported exposure to a trauma, leading to full PTSD in 1.7 % and to partial PTSD in 8.8 % of the participants. Logistic regression revealed accidents (OR 2.5, 95 % CI 1.3–4.7), nonsexual assault by known assailants (4.5, 2.1–9.8), combat/war

experiences (5.9, 2.0–17.4), life-threatening illness (4.9, 2.7–8.9) and interpersonal conflicts (15.5, 2.5–96.0) as risk factors for full PTSD; risk factors for partial PTSD were accidents (3.2, 2.4–4.3), sexual (4.6, 2.2–9.6) or nonsexual (2.3, 1.4–3.8) assault by known assailants, life-threatening illness (6.2, 4.6–8.3), death of relatives (5.0, 3.2–7.8) and interpersonal conflicts (22.0, 8.3–58.1).

Conclusions Of subjects exposed to traumatic events, only a minority developed PTSD indicating a relationship between characteristics of the exposure and the individual and the onset of PTSD.

Keywords Posttraumatic stress disorder · Traumatic events · General population study · Germany

Introduction

Posttraumatic stress disorder (PTSD) is a prolonged stress response syndrome whose symptoms develop in the aftermath of extremely stressful life events of exceptionally threatening or catastrophic nature [1, 2]. PTSD is not a static, unidimensional entity, but a multidimensional episodic stress response pattern [3]. The multilevel impact of PTSD on organismic functioning produces syndrome constellations that are built on the triad of core PTSD symptoms: (1) re-experiencing, reliving or re-enacting traumatic memories, (2) avoidance tendencies and psychic numbing, (3) psychobiological changes and physiological reactivity (hyperarousal). Previous research has established that a life-time exposure to events associated with PTSD is common, although the figures vary between countries, e.g. 89.6 % in the 1996 Detroit Area Survey of Trauma [4], 56.2 % in the Australian National Survey of Mental Health and Wellbeing [5] or 55.7 % in the American National

For the KORA investigators.

K. Lukaschek · J. Kruse
Department of Psychosomatic Medicine and Psychotherapy,
University of Gießen, Friedrichstr. 33, 35392 Gießen, Germany

K. Lukaschek · R. T. Emeny · M. E. Lacruz ·
A. von Eisenhart Rothe · K.-H. Ladwig (✉)
Institute of Epidemiology II, Helmholtz Zentrum München,
German Research Centre for Environmental Health,
Ingolstädter Landstr. 1, 85764 Neuherberg, Germany
e-mail: Ladwig@helmholtz-muenchen.de

J. Kruse
Department of Psychosomatic Medicine and Psychotherapy,
University of Marburg, Baldingerstr., 35043 Marburg, Germany

K.-H. Ladwig
Department of Psychosomatic Medicine and Psychotherapy,
Klinikum rechts der Isar, Technische Universität München,
Langerstr. 3, Munich, Germany

Comorbidity Survey (NCS) sample [6]. In Germany, studies reported exposure to traumatic event rates between 20 and 24 % [7–10] and 54.6 % [11]. Despite the high proportion of subjects exposed to events associated with PTSD, life-time prevalence of rates of PTSD is much lower and varies greatly from approximately 1 to 7.8 % across diverse countries [6, 8, 12]. Not surprisingly, studies in trauma populations with high levels of trauma exposure, e.g. war survivors [13, 14], combat veterans [15], peacekeepers [16], rescue responders [17] or terrorist attack survivors [18], have demonstrated higher rates of PTSD.

Preliminary evidence suggests that the impact of the trauma depends on the nature of both, the trauma and the individual. The events that are scientifically defined as traumatic are anchored at the extreme end of the stressor continuum, particularly experiences that involve threat or danger to physical integrity and psychological well-being [4, 6, 10, 19–23].

Aims of the study

The present study sought to explore the relationship of exposure to a traumatic event and the subsequent onset of Posttraumatic stress disorder by assessing the life time frequency of exposure to traumatic life events in a population-based sample and determining the subsequent risk of developing Posttraumatic stress disorder.

Materials and methods

Sample description and setting

Data are based on the KORA (Cooperative Health Research in the Region of Augsburg) F4 study (2006–2008), a follow-up study of the KORA S4 survey conducted in 1999–2001 [24]. The study area is located in southern Germany, and comprises the city of Augsburg and two surrounding counties, with approximately 600,000 inhabitants, in a mixed urban and rural area whose demographic and socioeconomic characteristics roughly reflect those of the average central European population in general. The region has not been at war since the Second World War, and there were no major natural catastrophes in the twentieth century. Crime rates in Augsburg are in the range of 9,000–10,000 criminal offences per year per 100,000 inhabitants [25].

The study design, sampling method and data collection have been described in detail elsewhere [26]. Briefly, in the baseline S4 survey, men and women aged 25–74 years were randomly selected from population registries. From 6,640 eligible subjects, 4,261 participated at baseline examination. In the 7-year-follow-up F4 study with subjects aged 32–81 years at follow-up, 3,080 subjects participated.

Of those, 48.25 % ($n = 1,486$) were male, 51.75 % ($n = 1,594$) were female. Loss to follow-up was due to subjects who had died ($n = 176$; 4 %), lived too far outside the study region or were lost to follow-up ($n = 206$; 5 %), or had demanded deleting their address data ($n = 12$; 0.2 %). Of the remaining 3,867 subjects, 174 could not be contacted, 218 were too ill, and 395 were unwilling to participate, giving a response rate of 72.3 %. Written informed consent was obtained from each participant. The study was approved by the local ethics committee and performed in the KORA Study Centre, Augsburg. All participants filled in a self-administrated questionnaire and underwent a standardized interview and an extensive medical examination. All procedures were subjected to a constant quality assessment.

Assessing PTSD

Traumatic events

Traumatic events are defined by the existence of stressors that have differential effects on organismic functioning. As described by the current criterion A for PTSD of the ICD-10 [1], the person “must have been exposed to a stressful event or situation of exceptionally threatening or catastrophic nature, which would be likely to cause pervasive distress in almost anyone.” Corresponding to the Posttraumatic Diagnostic Scale (PDS) [27], a list of 11 extremely stressful events was given (e.g. “you have experienced a serious accident”, “...a natural disaster”, “...imprisonment”, “...war”, “...life-threatening illness”, “...torture”, “...non sexual assaults (including being robbed, attacked, stabbed, held at gunpoint or shot)”, “...sexual assault (including rape)”, “...sexual contact when younger than 18 years with a person at least 5 years older (shortened to “sexual abuse” in the following) as well as an open question about other traumatic events. If an individual reported more than one event, she/he was asked to the “most upsetting”.

Intrusion, avoidance and hyperarousal

The intrusion and avoidance criteria (B and C) were assessed using a self-administrated questionnaire following the impact of event scale (IES) by Horowitz et al. [28]. To qualify for the hyperarousal criterion (D), any two of the following symptoms had to be met: irritability, inner tension, uneasiness, difficulty to concentrate, hyperhidrosis and insomnia (assessed by a face to face interview). Sleeping problems were addressed by two separate interview questions concerning the difficulty initiating sleep and the difficulty maintaining sleep.

Subjects who met criteria A–D were counted as full PTSD cases. Subjects who met criterion A and any of the criteria B–D were counted as partial PTSD.

Socioeconomic variables

Age

According to the KORA study protocol, 10-year age groups were defined as follows: 32–41, 42–51, 52–61, 62–71 and 72–81 years.

Marital status

Marital status was assessed by asking subjects whether they lived alone, lived with a partner, were married (living together or separately), divorced or widowed. Living with a partner (married or not married) was defined as being in partnership. Living alone or separately, being divorced or widowed was defined as being without partnership.

Educational level

The educational level was assessed by dichotomizing the variable in less than 12 years (defined as low education) and 12 or more years (defined as high education).

Statistical analysis

Statistical associations were assessed by χ^2 test and Fisher's exact test. To estimate the common odds ratio and to test whether the overall degree of association was significant, the Mantel–Haenszel odds ratio with 95 % confidence intervals was used. A multivariate logistic regression model with backward elimination variable selection was performed for assessing the determinants of full or partial PTSD. Socioeconomic variables (sex, age, marital status, educational level) and all potentially traumatic events (serious accident, natural disaster, sexual or nonsexual assaults by a known or unknown assailants, combat or war zone experience, sexual abuse, imprisonment, torture, life-threatening illness, death of a relative or close person, interpersonal conflicts) were included as determinants. The *c* statistic was used to determine whether the model fit was sufficient. For all statistical analyses, a *p* value <0.05 was considered to be statistically significant. All evaluations were performed with the statistical software SAS Version 9.2.

The prevalences were directly standardised to the sex and age distribution of the population of Germany on 31st December 2009.

Results

Experience of traumatic life events

In the sample of $n = 3\,080$ subjects, a considerable proportion ($n = 1,247$, 41 %, 95 % CI 38.7–42.2) had

experienced at least one potential traumatic event in life, thereby fulfilling PTSD criterion A. Of those, men ($n = 618$, 49.6 %, 95 % CI 46.8–52.3) and women ($n = 629$, 50.4 %, 95 % CI 47.7–53.0) were equally likely to have experienced any traumatic episode ($p = 0.24$). Regarding the number of experienced events (Table 1), there was no statistically significant difference between the sexes ($p = 0.6$). The most frequent traumatic events were “Serious accident, fire or explosion” (21.2 %) and “Life-threatening illness” (13.1 %). However, more men than women experienced traumata relating to serious accidents (OR 2.3, 95 % CI 2.0–2.8, $p < 0.001$), natural disaster (OR 2.0, 95 % CI 1.4–3.0, $p = 0.0001$), nonsexual assault by unknown assailant (OR 1.8, 95 % CI 1.3–2.5, $p = 0.0002$), combat experience (OR 2.3, 95 % CI 1.3–4.2, $p = 0.005$) and imprisonment (OR 7.3, 95 % CI 1.6–32.3, $p = 0.002$). Women had a higher risk to experience traumata relating to sexual assault by a known (OR 5.0, 95 % CI 2.5–10.0, $p < 0.0001$) or unknown (OR 5.0, 95 % CI 3.3–10, $p < 0.0001$) assailant, sexual abuse (OR 1.4, 95 % CI 1.1–2.0, $p = 0.007$) or death of a close person (OR 2.5, 95 % CI 1.7–3.3, $p < 0.0001$).

Full and partial PTSD in the community

A total of 51 participants (1.7 %, 95 % CI 1.3–2.2, mean age 54.5 years) qualified for full PTSD. The prevalence in men was 1.3 % (95 % CI 0.7–1.9), in women 2.0 % (95 % CI 1.3–2.6) leading to a 1.7 times higher risk in women ($p = 0.09$). Subjects were evenly distributed among age groups, with a slight increase in individuals aged 62–71 years.

A total of 271 subjects (8.8 %, 95 % CI 7.8–9.8, mean age 52.6 years) qualified for partial PTSD. The prevalence for men was 7.3 % (95 % CI 5.9–8.6), for women 10.4 % (95 % CI 8.9–11.9) leading to a 1.7 times higher risk in women ($p = 0.0005$). Regarding age groups, subjects aged 52–61 years were significantly more likely to have partial PTSD (OR 1.48, 95 % CI 1.13–1.93, $p = 0.004$).

Traumatic events and PTSD

Table 2 displays the impact of particular traumatic events on developing PTSD. Among men, the experience of interpersonal conflicts (OR 32.2, 95 % CI 5.5–188.1, $p < 0.0001$), torture (OR 10.1, 95 % CI 1.2–88.4, $p = 0.01$), combat or war zone (OR 8.4, 95 % CI 2.3–30.8, $p < 0.0001$) and sexual (OR 8.7, 95 % CI 1.0–74.2, $p = 0.02$) or nonsexual (OR 7.7, 95 % CI 2.4–24.4, $p < 0.0001$) assaults by known assailants were the events that substantially increased the risk for full PTSD. Among women, those who had experienced life-threatening illness (OR 8.0, 95 % CI 3.9–16.3, $p < 0.0001$), combat or war zone (OR 7.7, 95 % CI 1.6–36.5, $p = 0.003$), and nonsexual assaults by known assailants (OR 7.6, 95 %

Table 1 Traumatic events experienced by subjects of the KORA F4 study population ($n = 3,080$, $n_{\text{male}} = 1,486$, $n_{\text{female}} = 1,594$)

Event	Experienced by participant ^a								
	Total			Male			Female		
	<i>n</i>	% <i>n</i>	95 % CI	<i>n</i>	% <i>n</i> _{male}	95 % CI	<i>n</i>	% <i>n</i> _{female}	95 % CI
Serious accident ^c	684	22.2	20.8–23.7	427	28.7	26.5–31.1	257	16.1	14.4–18.1
Natural disaster	130	4.2	3.6–5.0	83	5.6	4.5–6.9	47	3.0	2.2–3.9
Nonsexual assault (known assailant)	131	4.3	3.6–5.0	53	3.6	2.7–4.6	78	4.9	3.9–6.1
Nonsexual assault (unknown assailant) ^d	173	5.6	4.9–6.5	106	7.1	5.9–8.6	67	4.2	3.3–5.3
Sexual assault (known assailant) ^c	52	1.7	1.3–2.2	8	0.5	0.3–1.1	44	2.8	2.1–3.7
Sexual assault (unknown assailant) ^c	81	2.6	2.1–3.2	12	0.8	0.5–1.4	69	4.3	3.4–5.4
Combat/war zone ^d	49	1.6	1.2–2.1	33	2.2	1.6–3.1	16	1.0	0.6–1.6
Sexual abuse ^d	192	6.2	5.4–7.1	73	4.9	3.9–6.1	119	7.5	6.3–8.9
Imprisonment ^d	15	0.5	0.3–0.8	13	0.9	0.5–1.5	2	0.1	0.04–0.5
Torture	9	0.3	0.2–0.6	7	0.5	0.2–1.0	2	0.1	0.04–0.5
Life-threatening illness	404	13.1	12.0–14.4	182	12.2	10.7–14.1	222	13.9	12.3–15.7
Death of a close person or relative ^c	134	4.4	3.7–5.1	39	2.6	1.9–3.6	95	6.0	4.9–7.2
Interpersonal conflict	26	0.8	0.6–1.2	12	0.8	0.5–1.4	14	0.9	0.5–1.5
Others	11	0.4	0.2–0.6	6	0.4	0.2–0.9	5	0.3	0.1–0.7
	<i>n</i> '	%	95 % CI						
Number of traumatic episodes ($n = 1,247$) ^b									
One episode	733	58.8	56.0–61.5						
Two episodes	317	25.4	23.1–28.0						
Three episodes	124	10.0	8.4–11.7						
Four episodes	72	5.8	4.6–7.2						

n' = number of subjects in each category

^a Multiple answers permitted

^b Multiple answers not permitted

^c Difference between the sexes statistically significant ($p < 0.0001$)

^d Difference between the sexes statistically significant ($p < 0.05$)

CI 3.1–18.6, $p < 0.0001$) were most likely to develop full PTSD.

Regarding the development of partial PTSD, the highest risk for men was the experience of interpersonal conflicts (OR 16.8, 95 % CI 4.7–60.5, $p < 0.0001$), followed by life-threatening illness (OR 5.2, 95 % CI 3.4–8.1, $p < 0.0001$) and serious accident (OR 4.3, 95 % CI 2.8–6.6, $p < 0.0001$). For women, the onset of partial PTSD was most likely triggered by interpersonal conflicts (OR 13.2, 95 % CI 4.3–39.7, $p < 0.0001$), sexual (OR 8.2, 95 % CI 4.4–15.3, $p < 0.0001$) or nonsexual (OR 6.0, 95 % CI 3.6–9.9, $p < 0.0001$) assaults by known assailants and life-threatening illness (OR 6.9, 95 % CI 4.8–9.8, $p < 0.0001$).

Logistic regression analysis

The sex-adjusted model revealed the experience of a serious accident (OR 2.5, 95 % CI 1.3–4.7, $p = 0.004$),

nonsexual assault by a known assailant (OR 4.5, 95 % CI 2.1–9.8, $p = 0.0001$), combat or war zone (OR 5.9, 95 % CI 2.0–17.4, $p = 0.001$), life-threatening illness (OR 4.9, 95 % CI 2.7–8.9, $p < 0.0001$) and interpersonal conflicts (OR 15.5, 95 % CI 2.5–96.0, $p = 0.003$) as factors that statistically significantly increased the odds for full PTSD (Fig. 1). As indicated by the *c* statistic ($p = 0.8$), the model predicts the onset of full PTSD reasonably well. For partial PTSD, the model revealed the experience of a serious accident (OR 3.2, 95 % CI 2.4–4.3, $p < 0.0001$), sexual (OR 4.6, 95 % CI 2.2–9.6, $p < 0.0001$) or nonsexual (OR 2.3, 95 % CI 1.4–3.8, $p = 0.0009$) assault by a known assailant, life-threatening illness (OR 6.2, 95 % CI 4.6–8.3, $p < 0.0001$), death of a relative or close person (OR 5.0, 95 % CI 3.2–7.8, $p < 0.0001$) and interpersonal conflicts (OR 22.0, 95 % CI 8.3–58.1, $p < 0.0003$) as factors that statistically significantly increased the odds (Fig. 2). As indicated by the *c* statistic ($p = 0.9$), the model predicts the onset of partial PTSD reasonably well.

Table 2 Comparison of Odds ratios: likelihood for men and women exposed to a traumatogenic event to suffer from full or partial PTSD

Event	OR of subjects suffering from full PTSD (<i>n</i> = 51)				OR of subjects suffering from partial PTSD (<i>n</i> = 271)			
	Male	95 % CI	Female	95 % CI	Male	95 % CI	Female	95 % CI
Serious accident	3.7	1.5–9.6	3.7	1.8–7.7	4.3	2.8–6.6	3.4	2.4–4.8
Natural disaster	1.7	0.4–7.6	1.0	0.1–7.8	1.7	0.9–3.4	2.3	1.1–4.5
Nonsexual assault (known assailant)	7.7	2.4–24.2	7.6	3.1–18.6	3.8	1.9–7.4	6.0	3.6–9.9
Nonsexual assault (unknown assailant)	5.5	2.0–14.9	3.2	1.1–9.6	2.0	1.1–3.6	2.1	1.1–3.8
Sexual assault (known assailant) ^a	8.7	1.0–74.2	1.8	0.2–13.4	–	–	8.2	4.4–15.3
Sexual assault (unknown assailant)	6.1	0.7–49.8	0.8	0.1–5.7	1.1	0.1–8.4	3.4	2.0–5.9
Combat or war zone	8.4	2.3–30.8	7.7	1.6–36.5	2.8	1.1–6.9	2.8	0.9–9.1
Sexual abuse	3.4	1.0–12.1	2.3	0.9–6.1	2.6	1.4–5.0	2.5	1.6–4.0
Imprisonment ^a	5.5	0.7–44.9	–	–	1	0.1–7.5	–	–
Torture ^a	10.1	1.2–88.4	–	–	–	–	–	–
Life-threatening illness	4.3	1.6–11.0	8.0	3.9–16.3	5.2	3.4–8.1	6.9	4.8–9.8
Death of a close person	4.1	0.9–18.1	2.8	1.0–8.3	2.1	0.9–5.2	5.2	3.3–8.3
Interpersonal conflict ^a	32.2	5.5–188.1	–	–	16.8	4.7–60.5	13.1	4.3–39.7

Multiple answers permitted

^a Some ORs cannot be calculated due to zero values in at least one of the cells: all women (*n* = 2) with imprisonment experience developed full PTSD. All women (*n* = 2) who had been tortured developed partial PTSD. Among the seven men who had experienced torture, one full PTSD case but no partial PTSD was found. Eight men experienced a sexual assault by a known assailant; this exposure led to one full PTSD case. Among the 14 women who had experienced interpersonal conflicts, no case of full PTSD was found

A subanalysis of the data did not show a dose–response relationship between the experience of repetitive traumata and the onset of PTSD.

Discussion

The first major finding of the present investigation shows that a considerable proportion of subjects (40.5 %) experienced an event associated with PTSD during their lifetime. Compared to other studies on German population samples [7–9], this rate is high, although not as high as the rate reported from northeastern Germany [11]. In part, these differences might be due to methodological issues of the instruments applied, but may also reflect differences in living environments. Multiple traumata were experienced by 41.1 % of those with trauma experience, which is similar to the results reported by Hauffa et al. [8]. In contrast to previous findings [5, 6, 9, 23], a balanced life time exposure to any traumatic event between men and women was found, corroborating results by Hapke et al. [7] who also did not observe a difference in exposure between the sexes. However, the types of event that men and women experience are not equivalent: Women are more likely to report the death of a relative or close person, sexual assaults or sexual abuse, whereas men are more likely to report being exposed to accidents, natural disaster,

nonsexual assaults and combat, which is consistent with previous studies [4, 29, 30].

Only a minority of subjects who had experienced trauma went on to develop PTSD. A major result of this investigation shows life time frequencies of 1.7 % (*n* = 51) for full ICD-10 PTSD and of 8.8 % (*n* = 271) for partial PTSD in a population-based sample aged 32–81 years. The prevalence for men suffering from full PTSD was 1.3 % (95 % CI 0.7–1.9), for women 2.0 %. The prevalence for men suffering from partial PTSD was 7.3 % (95 % CI 5.9–8.6), for women 10.4 %.

Findings across studies are hard to compare owing to different methodologies, the use of different diagnostic criteria, and the fact that some studies report lifetime rates while others report current rates of the disorder. Notably, the life time frequency of full PTSD in the south-German population under investigation is much lower than the life time prevalence of 7.8 % reported in the American NCS or the 6.8 % reported in the NCS-Replication [6, 31]. However, our results corroborate international studies that report comparably low lifetime prevalence rates of PTSD: Sareen et al. [12] analysed data from the Canadian Community Health Survey cycle and estimated a prevalence of PTSD of 1.0 %. In Mexico, Medina-MorcaIcaza et al. [32] found a lifetime prevalence of 1.4 % among 18- to 65-year-old subjects. The European study of the Epidemiology of Mental Disorders (ESEMED), covering data from several

Fig. 1 Potentially traumatogenic events (ORs, 95 % CIs) associated with an increased risk for full PTSD. Results from the first logistic regression model. Socioeconomic variables (sex, age, marital status, educational level) and potentially traumatogenic events were included as determinants. For clarity, the experience of interpersonal conflict (OR 15.5, 95 % CI 2.5–96.0) has been omitted from the drawing. *By a known assailant

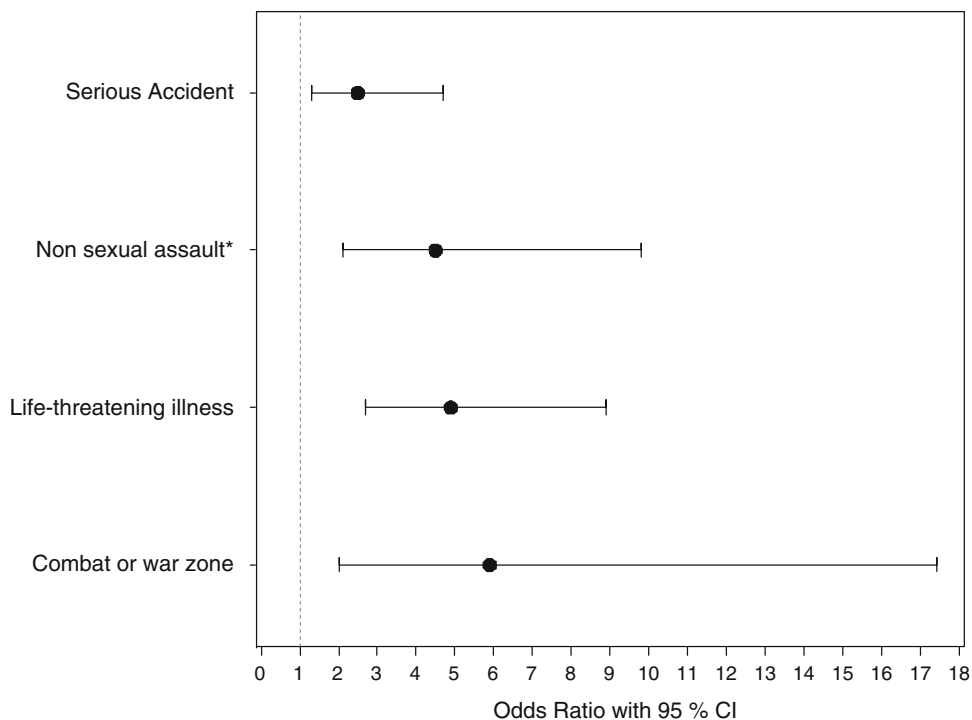
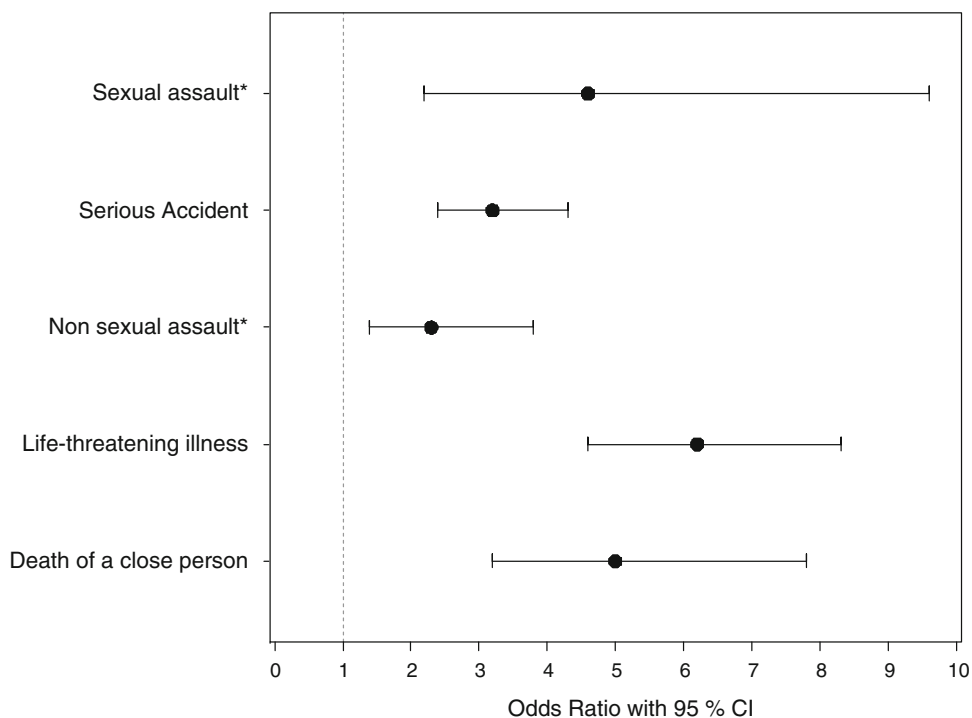


Fig. 2 Potentially traumatogenic events (ORs, 95 % CIs) associated with an increased risk for partial PTSD. Results from the first logistic regression model. Socioeconomic variables (sex, age, marital status, educational level) and potentially traumatogenic events were included as determinants. For clarity, the experience of interpersonal conflict (OR 22.0, 95 % CI 8.3–58.1) has been omitted from the drawing. *By a known assailant



European countries, found lifetime prevalences of PTSD of 1.4 % [33]. In Germany, Hapke et al. [7] reported a lifetime prevalence of PTSD of 1.4 %, Perkonig et al. [34] of 1.3 % among subjects aged 14–24 years, Hauffa et al. 2.9 % [8] and Spitzer et al. 2.0 % [11].

In our analysis, more women than men developed full PTSD but the difference was not statistically significant. Furthermore, women had a 1.7 times higher risk than men to develop partial PTSD and the difference was statistically significant. Our findings are consistent with previous

general population studies reporting higher rates for women than for men [6, 19, 30, 35–39]. The mechanisms behind the disparity of the sexes may involve characteristics of the exposure (e.g. intensity, duration) and of the individual (e.g. age at exposure), but also factors beyond exposure, e.g. differences in social relationships as well as in cognitive processes [40]. In the sex-adjusted logistic regression model, the experience of a serious accident, nonsexual assaults by a known assailant, life-threatening illnesses and interpersonal conflicts stood out as factors that significantly increased the odds for full and for partial PTSD.

In our sample, older age (52–61 years) was significantly associated with partial PTSD only. In some countries, especially in Germany, older adults are considered to be more likely to have PTSD, but findings on age are inconclusive [6, 8, 9, 11, 41, 42].

This study showed that certain traumatic event characteristics contribute to the onset of a long-lasting stress reaction after an individual's exposure to an exceptionally threatening situation, but the mechanisms that prevent subjects from developing PTSD are not yet fully understood. Human resilience dictates that a large number of victims will naturally recover from the traumatic event over time without having severe, long-lasting mental health issues. Resilience to PTSD could be increased by social support, coping confidence and psychological framework, but more research needs to be done to elucidate the role of resilience and adjustment factors in preventing PTSD.

Acknowledgments The KORA research platform and the KORA Augsburg studies are financed by the Helmholtz Zentrum München, German Research Center for Environmental Health (GmbH), which is funded by the German Federal Ministry of Education, Science, Research and Technology and by the State of Bavaria. The authors would like to thank Jens Baumert (HMGU), Mike Bernhardt (MPI) and Klaus Strassburger (DDZ) for their statistical advice.

Conflict of interest None declared.

References

- International Classification of Diseases (1992) Tenth Revision (ICD-10)
- Green B, Schnurr PP (2000) Trauma and physical health. *Clin Q* 9:3–5
- Wilson J (2004) PTSD and complex PTSD. In: Wilson JP, Keane TM (eds) *Assessing psychological trauma and PTSD*. Guilford Press, New York, pp 7–44
- Breslau N, Kessler RC, Chilcoat HD, Schultz LR, Davis GC, Andreski P (1998) Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. *Arch Gen Psychiatry* 55(7):626–632
- Creamer M, Burgess P, McFarlane AC (2001) Post-traumatic stress disorder: findings from the Australian National Survey of mental health and well-being. *Psychol Med* 31(7):1237–1247
- Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB (1995) Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry* 52(12):1048–1060
- Hapke U, Schumann A, Rumpf HJ, John U, Meyer C (2006) Post-traumatic stress disorder: the role of trauma, pre-existing psychiatric disorders, and gender. *Eur Arch Psychiatry Clin Neurosci* 256(5):299–306
- Hauffa R, Rief W, Braehler E, Martin A, Mewes R, Glaesmer H (2011) Lifetime traumatic experiences and posttraumatic stress disorder in the German population: results of a representative population survey. *J Nerv Ment Dis* 199(12):934–939
- Maercker A, Forstmeier S, Wagner B, Glaesmer H, Braehler E (2008) Post-traumatic stress disorder in Germany. Results of a nationwide epidemiological study. *Nervenarzt* 79(5):577–586
- Perkonig A, Kessler RC, Storz S, Wittchen HU (2000) Traumatic events and post-traumatic stress disorder in the community: prevalence, risk factors and comorbidity. *Acta Psychiatr Scand* 101(1):46–59
- Spitzer C, Barnow S, Volzke H, John U, Freyberger HJ, Grabe HJ (2009) Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. *Psychosom Med* 71(9):1012–1017
- Sareen J, Cox BJ, Stein MB, Afifi TO, Fleet C, Asmundson GJ (2007) Physical and mental comorbidity, disability, and suicidal behavior associated with posttraumatic stress disorder in a large community sample. *Psychosom Med* 69(3):242–248
- Bramsen I, van der Ploeg HM (1999) Fifty years later: the long-term psychological adjustment of ageing World War II survivors. *Acta Psychiatr Scand* 100(5):350–358
- Eytan A, Gex-Fabry M (2011) Use of healthcare services 8 years after the war in Kosovo: role of post-traumatic stress disorder and depression. *Eur J Public Health*. doi:10.1093/eurpub/ckr096
- Green BL, Grace MC, Lindy JD, Gleser GC, Leonard A (1990) Risk factors for PTSD and other diagnoses in a general sample of Vietnam veterans. *Am J Psychiatry* 147(6):729–733
- Litz BT, Orsillo SM, Friedman M, Ehlich P, Batres A (1997) Post-traumatic stress disorder associated with peacekeeping duty in Somalia for US military personnel. *Am J Psychiatry* 154(2):178–184
- Perrin MA, DiGrande L, Wheeler K, Thorpe L, Farfel M, Brackbill R (2007) Differences in PTSD prevalence and associated risk factors among World Trade Center disaster rescue and recovery workers. *Am J Psychiatry* 164(9):1385–1394
- Marshall RD, Galea S, Kilpatrick D (2002) Psychiatric consequences of September 11. *JAMA* 288(21):2683–2684
- Breslau N, Davis GC, Andreski P, Peterson E (1991) Traumatic events and posttraumatic stress disorder in an urban population of young adults. *Arch Gen Psychiatry* 48(3):216–222
- Breslau N, Chilcoat HD, Kessler RC, Peterson EL, Lucia VC (1999) Vulnerability to assaultive violence: further specification of the sex difference in post-traumatic stress disorder. *Psychol Med* 29(4):813–821
- Breslau N (2002) Epidemiologic studies of trauma, posttraumatic stress disorder, and other psychiatric disorders. *Can J Psychiatry* 47(10):923–929
- Resnick HS, Kilpatrick DG, Dansky BS, Saunders BE, Best CL (1993) Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. *J Consult Clin Psychol* 61(6):984–991
- Breslau N (2009) The epidemiology of trauma, PTSD, and other posttrauma disorders. *Trauma Violence Abuse* 10(3):198–210
- Rathmann W, Haastert B, Icks A, Lowel H, Meisinger C, Holle R, Giani G (2003) High prevalence of undiagnosed diabetes mellitus in Southern Germany: target populations for efficient screening. *The KORA survey 2000. Diabetologia* 46(2):182–189
- Bavarian State Ministry of the Interior (2011) Federal statistics of criminality in Bavaria

26. Holle R, Happich M, Lowel H, Wichmann HE (2005) KORA—a research platform for population based health research. *Gesundheitswesen* 67(Suppl 1):S19–S25
27. Foa EB, Cashman L, Jaycox L, Perry K (1997) The validation of a self-report measure of posttraumatic stress disorder: the Posttraumatic Diagnostic Scale. *Psychol Assess* 9:445–451
28. Horowitz M, Wilner N, Alvarez W (1979) Impact of event scale: a measure of subjective stress. *Psychosom Med* 41(3):209–218
29. Norris FH (1992) Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. *J Consult Clin Psychol* 60(3):409–418
30. Shalev AY, Freedman S, Peri T, Brandes D, Sahar T, Orr SP, Pitman RK (1998) Prospective study of posttraumatic stress disorder and depression following trauma. *Am J Psychiatry* 155(5):630–637
31. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE (2005) Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Arch Gen Psychiatry* 62(6):593–602
32. Medina-Morca Icaza ME, Borges-Guimaraes G, Lara C (2005) Prevalence of violent events and post-traumatic stress disorder in the Mexican population. *Salud Publica Mex* 47:8–22
33. Alonso J, Angermeyer MC, Bernert S et al (2004) Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta Psychiatr Scand Suppl* 420:21–27
34. Perkonig A, Pfister H, Stein MB, Hoyer M, Lieb R, Maercker A, Wittchen HU (2005) Longitudinal course of posttraumatic stress disorder and posttraumatic stress disorder symptoms in a community sample of adolescents and young adults. *Am J Psychiatry* 162(7):1320–1327
35. Davidson JR, Hughes D, Blazer DG, George LK (1991) Posttraumatic stress disorder in the community: an epidemiological study. *Psychol Med* 21(3):713–721
36. Helzer JE, Robins LN, McEvoy L (1987) Post-traumatic stress disorder in the general population. Findings of the epidemiologic catchment area survey. *N Engl J Med* 317(26):1630–1634
37. Nemeroff CB, Bremner JD, Foa EB, Mayberg HS, North CS, Stein MB (2006) Posttraumatic stress disorder: a state-of-the-science review. *J Psychiatr Res* 40(1):1–21
38. Rosenberg HJ, Rosenberg SD, Wolford GL, Manganiello PD, Brunette MF, Boynton RA (2000) The relationship between trauma, PTSD, and medical utilization in three high risk medical populations. *Int J Psychiatry Med* 30(3):247–259
39. Stein MB, Walker JR, Forde DR (2000) Gender differences in susceptibility to posttraumatic stress disorder. *Behav Res Ther* 38(6):619–628
40. Tolin D, Foa EB (2002) Gender and PTSD: a cognitive model. In: Kimerling R, Quimette P, Wolfe J (eds) *Gender and PTSD*. Guilford Press, New York, pp 76–97
41. Breslau N (2001) The epidemiology of posttraumatic stress disorder: what is the extent of the problem? *J Clin Psychiatry* 62(Suppl 17):16–22
42. Glaesmer H, Braehler E, Gundel H, Riedel-Heller SG (2011) The association of traumatic experiences and posttraumatic stress disorder with physical morbidity in old age: a German population-based study. *Psychosom Med* 73(5):401–406