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Posttraumatic Stress Disorder After a Car Accident in the Czech Population: Prevalence and Risk Factors For Its Development

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ABSTRACT: The aim of this study is to assess the prevalence of symptoms of posttraumatic stress disorder (PTSD) and to reveal risk factors for its development in a population of people affected by a traffic accident. This has not been the subject of any research study in the Czech Republic so far. Systematic investigation of the psychological impact of traffic accidents is a key condition in the system of their effective prevention and psychological care for road accident participants. The experience of a serious traffic accident can lead to a disturbance of psychological integrity in many people, and some of those involved in traffic accidents subsequently develop mental disorders that have a major impact on their future lives and, in a broader context, on society. Each person responds to a traumatic event in a different way and several situational and individual factors come into play. The online panel questionnaire survey on the prevalence of post-accident phenomena in the Czech population 18+, which was conducted using the CAWI method, involved 2319 respondents who had been involved in or witnessed a traffic accident investigated by the Czech Police in the last ten years. Symptoms of PTSD were identified in 23-30% of the sample. The linear regression model showed the following factors to be statistically significant: Gender, Education, Partnership satisfaction, Stressors one year around CA, Support of the significant others, Dissociation (Intense fear of healing oneself or others, Confusion and difficulty orienting oneself in time and space, Experiencing the situation as unrealistic), Subjective perception of CA as a burdensome life event, Persistent economic impact of CA, Avoidance of driving. The results of this study contribute to a better understanding of the overall impact of traffic accidents in the context of the Czech Republic. Systematic investigation of the psychological impact of traffic accidents is a key condition in the system of their effective prevention and psychological care of the affected persons.

KEYWORDS: Car accident; Postraumatic stress disorder; PTSD; Risk factors

1. INTRODUCTION

The Czech Police investigated a total of 98,460 accidents in 2022, in which a total of 24,186 people were injured and 454 people lost their lives (Policie České republiky, 2023). In relation to the consequences of traffic accidents, it is necessary to also consider their impact on the psychological state of the persons involved. Almost every traffic accident is a potentially traumatic event with the effects on the psychological state of the persons involved, whether they are direct participants, witnesses to the event, or close friends and relatives (Cromer & Smyth, 2010; Frissa et al., 2016).

In the context of Euro-American society, a serious car accident is by far the most common type of traumatic event. These events represent a polarity to the natural concept of the world as a relatively safe and predictable system. A system in which the events and actions of other people create a certain sense of meaning and order. The experience of a serious traffic accident can lead to disturbed psychological integrity in many people, with between 25 % and 36 % of those involved developing mental disorders (Matsuoka et al., 2008; O'Donnell et al., 2004; Mayou & Bryant, 2001).

The most common mental disorder that develops as a result of experiencing a car accident is posttraumatic stress disorder (Ursano et al., 1999 a). This generally arises because of events in which one's own physical integrity, health or life is threatened, or the health or life of others is threatened. The reaction to the event is long term and can develop immediately after the event, but also with some latency of months to years. The victim repeatedly experiences the catastrophic event in vivid thoughts, dreams or flashbacks and avoids situations and places where the traumatic event occurred. Memories of the event are partially distorted, and persistent anxiety, depressive states, sleep disturbances, disturbances in concentration, hypervigilance, and panic or aggressive reactions may be present. Decreased affectivity, emotional numbing, social isolation, feelings of inferiority and suicidal ideation are characteristic (WHO, 2019; Raboch et al., 2015). Posttraumatic stress disorder is often manifested by somatic symptoms. Affected persons may suffer from various pains and may experience anomalous autonomic reactions such as tremors, sweating, tachycardia, hyperventilation, tingling in the limbs, abdominal pain, headaches, etc. These symptoms are the result of persistent activation of the organism and the expectation of an ever-present threat (Vágnerová, 2004).

2. RESEARCH PROBLEM AND GOALS

The prevalence of PTSD in people affected by road traffic accidents varies depending on the methodology of the study. According to Ursano and colleagues (1999), 34 % of participants develop PTSD symptoms after a car accident, and similar results (32 %) were presented in a study by Herrera-Escobar and colleagues (2018). Some studies report that the presence of PTSD was observed in up to half of the respondents (Kupchik et al., 2007; Pires & Maia, 2013). In contrast, Meyer and Steil (1998), estimate a significantly lower prevalence ranging from 1 to 9%. A meta-analysis of fifteen studies reports that the average prevalence of PTSD in road traffic accident participants is 22.25 % (range 6.3-58.3 %) (Lin et al., 2018).

Each person responds to a traumatic event in a different way and several situational and individual factors come

into play. Pre-traumatic risk factors include female gender (e.g., Khodadadi- Hassankiadech et al., 2017; Ursano et al., 1999a; Herrera-Escobar et al., 2018; Ehlers et al., 1998), a previously diagnosed mental disorder, a previous traumatic event, or a mental disorder within the primary family (Wrenger et al., 2008; Jeavons et al., 2000; Blanchard et al., 1995). Peritraumatic risk factors include intense feelings of fear and concern for one's life or health during an accident and peritraumatic dissociative states (Jeavons et al., 2000; Ehring, Ehlers & Glucksman, 2006; Mayou, Ehlers & Bryant, 2002; Ursano et al., 1999b). Post-event risk factors include the absence of social support, painful conditions, persistent health and economic consequences, sleep disturbances, and the presence of intrusive thoughts (Koren et al., 2002; Pires & Maia, 2013). The accumulation of other events subjectively assessed as highly burdensome, stressful, or life-threatening further increases the risk of developing PTSD (Khodadadi-Hassankiadech et al., 2017; Jeavons et al., 2000; Ursano et al., 1999a; Herrera-Escobar et al., 2018; Ehlers et al., 1998). On the other hand, there are a number of factors that contribute positively to the psychological state and can therefore offset the negative effects of other events to some extent (Brewin et al., 2000).

Based on a regression analysis of Ozer and colleagues' (2003) meta-study, a set of seven of the most significant predictors of PTSD was constructed: previous traumatic event, previous psychological care, psychopathology within family history, feeling threatened to life during the traumatic event, peritraumatic dissociation, intense emotional reactions, and the presence of social support. Together, these factors explained 45% of the variance in the severity of PTSD symptoms (Ehring, Ehlers & Glucksman, 2006). There are also studies that have attempted to construct predictive models of the development of PTSD in road traffic accident participants. For example, a predictive model of PTSD development was published in a study by Ehlers and colleagues (1998), which included eight factors (prior diagnosis of affective disorder, peritraumatic dissociation, intrusive thoughts, thought suppression, anger and irritability, medical injury, financial problems, and court consequences related to the accident) that together predicted 37.6 % PTSD cases within one year of the event. A more recent study that focused on the predictive ability of PTSD following car accidents included eight similar factors-female gender, dissociation during the accident, financial problems, anger and irritability as a result of the accident-which had a predictive ability of 39.3 % (Mayou, Ehlers & Bryant, 2002).

The aim of this study is to assess the prevalence of PTSD symptoms and to reveal risk factors for its development in a cohort of people affected by a traffic accident, which has not been the subject of any research study in the country to date. Systematic investigation of the psychological impact of traffic accidents is a key condition in the system of their effective prevention and psychological care for road accident participants.

3. METHODS

3.1 Data collection process

The survey of the prevalence of post-accident effects in the population of the Czech Republic 18+ was conducted during the months of September and October 2022 and was attended by 2319 respondents who had been involved in or witnessed a traffic accident investigated by the Czech Police in the last ten years. Data collection was conducted online using the CAWI method, respondents were recruited from registered panellists of the supplier agency based on the screening question "experience of a traffic accident in the last 10 years investigated by the Police of the Czech Republic yes/no) and on the basis of quota selection - whether the respondent falls into the required socio-demographic category: gender (male, female), age (18-29 years, 30-44 years, 45-59 years, 60 years and over) and highest educational level (primary education, vocational training, secondary education with school-leaving certificate, university degree). The sample of respondents was further divided according to whether there was a primary respondent (registered panellist) or a secondary respondent (someone else from the panellist's household with experience of a traffic accident in the last 10 years, unless the primary respondent had this experience). The online panels https://nationalpanel.eu/ and https://dialog.stemmark.cz/ were used. Table 1 Final number of interviews shows the sample structure and average length of interviews.

Total	Primary	Secondary
2319	1830	489

Table 1: Final number of interviews.

3.2 Questionnaire

The basis for the questionnaire was data obtained from the preliminary analyses (results of foreign research, e.g., Czech data from the National Traffic Accident Survey) and data obtained in the qualitative part of the research (individual interviews and focus groups with experts in post-accident care about the current state of post-accident care in the Czech Republic). The questionnaire was repeatedly commented on by members of the research team, agency researchers and an independent expert on post-accident care. Prior to the actual data collection, the agency piloted the survey with a sample of 184 respondents.

The prevalence of post-accident effects was determined using the Impact of Event Scale (IES-R), a self-assessment screening instrument, the Czech version of which was created by double blind translation of the original version. The content of the questionnaire is based on the DSM-IV diagnostic criteria for posttraumatic stress disorder. The three main symptoms of PTSD correspond to the three subscales of the IES-R, which comprise a total of 22 items - Avoidance, Intrusion and Hyperarousal. The questionnaire contains 22 statements to which the respondent responds using a five-point scale (Motlagh, 2010). In 2008, a study by Beck and colleagues was published which assessed the psychometric properties of the IES-R in the context of a group of respondents who had experienced a serious road traffic accident. The results of the factor analysis confirmed the validity of the three-factor structure (Avoidance, Intrusion, and Hyperarousal) proposed by the authors of the revised scale, Weiss and Marmar (1997). The internal consistency values and the correlation values between the subscales were also very satisfactory. The internal consistency values of the subscales were as follows: (Avoidance $\alpha = 0.86$, SD = 0.90); (Intrusion $\alpha = 0.90$, SD = 0.99); (Hyperarousal $\alpha = 0.85$ SD = 1.07); (Overall $\alpha = 0.95$, SD = 0.90). The correlation between the subscales was found to range from r = 0.71 to 0.86. The authors recommend using means instead of raw sums for each of these subscale scores. Although the IES-R was not designed as a diagnostic tool, the results of an examination of the discriminant validity of this method suggest that the scale discriminates reliably between individuals with and without a diagnosis of PTSD. The IES-R correctly identified PTSD symptoms in 69 % of respondents. The psychometric properties of the scale have been confirmed by other studies, e.g., Creamer et al. (2003), Brunet et al. (2003). However, some other authors have pointed out that the factor structure of the IES is not straightforward, e.g., in a study by Shevlin, Hunt and Robbins (2000), the results of exploratory factor analysis show a two-factor structure as the

preferred solution, Wu and Chan (2003) described a one-factor structure in their sample, whereas authors Andrews, Shewlin, Troop and Joseph (2004) argue for a four-factor structure. Creamer, Bell and Failla (2003) arrive at an ambiguous one or two factor solution. These studies fit into the broader debate about the overall structure of the IES (e.g., Asmundson et al. 2000, DuHamel et al. 2004).

In our case, the internal consistency of the scales described in the study by Beck et al. (2008) was tested via Cronbach's α and reached the following values: Intrusion = 0.893, Avoidance = 0.867, and Hyperarousal = 0.79. The correlation between the subscales also reaches satisfactory values of r = 0.749 - 0.865.

3.2 Data analysis

The data analysis was performed using IBM SPSS version 21. Descriptive statistics were used to describe the structure of the sample and categorize respondents according to PTSD level, as well as means to compare scores of individual items of the IES-R scale and linear regression to reveal variables affecting the IES-R score, which is an indicator of posttraumatic stress disorder.

4. RESULTS

The sample was constructed according to the quota sampling described in the Methods section, the actual distribution of males and females in each age category is shown in Table 2: Sample structure in terms of cross gender and age quotas.

Age	gender	N	% gender	% total
18-29	female	196	16.2	8.5
	male	168	15.2	7.2
30-44	female	330	27.3	14.2
	male	325	29.3	14.0
45-59	female	290	23.9	12.5
	male	286	25.8	12.3
60+	female	395	32.6	17.0
	male	329	29.7	14.3
Total	female	1211	100.0	52.2
	male	1108	100.0	47.8

Table 2: Sample structure in terms of cross gender and age quotas.

The IES-R scale was used for PTSD screening. Because the questions for the IES-R battery were explicitly related to the experience of the traffic accident (*Please focus on the effect of the traffic accident on you and your psychological state now. To what extent have these symptoms been bothersome to you over the past seven days?*) we believe that this is as indicative as possible of the impact of experiencing a CA on the development of PTSD. The mean scores of the three subscales are presented in detail in Table 3: Mean scores of the IES-R subscales.

The presence of posttraumatic stress disorder symptoms was assessed by cut off scores according to Creamer et al. (2003) and Coffey et al. (2006). It ranges from 23-30 %, see Table 4 Prevalence of PTSD in road traffic accident participants and witnesses for more details.

Authors	Cut off score	N	%
Creamer (2003)	33	525	23 %
Coffey (2006)	27	703	30 %

Table 4: Prevalence of PTSD in road traffic accident participants and witnesses.

The dependent variable IES-R score is measured at the interval level, the scale has a range of 0-88, so we use linear regression. Potential explanatory variables as described in the literature - sociodemographic variables, variables indicative of psychological state before CA, variables indicative of the context of the traffic accident, and variables related to the individual's current state after CA - were added to the model stepwise. Table 5 provides a summary of all variables tested.

Table 6 presents the three phases of the final model construction, corresponding to the variable sections presented in Table 5 above. These variables were added stepwise, and the model extended after the presented blocks, the Enter method was chosen. Values indicating collinearity were checked throughout the analysis - none of the presented models violated the values reported by Rabušic et al. (2019: 391-392) as critical. For the resulting model, the VIF is in the interval (1.071- 3.005), and the tolerance reaches (0.961 - 0.333).

The M1 model explains 5.9 % of the variance. The variables of gender, education, and the use of psychopharmaceuticals during life have the greatest explanatory power. While partner relationship satisfaction is a predictor, the existence of a partner relationship itself was found to be insignificant and will be removed from further analysis.

	Intrusion	Hyperarousal	Avoidance
Mean	0.7918	0.8059	0.9840
Std. Dev.	0.79161	0.79817	0.81890
Statements	1. Any reminder brought back feelings about it.	4. I felt irritable and angry.	5. I avoided letting myself get upset when I thought about it or was reminded of it.
	2. I had trouble staying asleep.	10. I was jumpy and easily startled.	7. I felt as if it hadn't happened or wasn't real.
	3. Other things kept making me think about it.	15. I had trouble falling asleep.	8. I stayed away from reminders about it.
	6. I thought about it when I didn't mean to.	18. I had trouble concentrating.	11. I tried not to think about it.
	9. Pictures about it popped into my mind.	19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.	12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.
	14. I found myself acting or feeling like I was back at that time.	21. I felt watchful and on guard.	13. My feelings about it were kind of numb.
	16. I had waves of strong feelings about it.		17. I tried to remove it from my memory.
	20. I had dreams about it.		22. I tried not to talk about it.

Table 3: Mean scores of the IES-R subscales.

Characteristics	Variable	Values
Sociodemographics, well-being and mental health before the CA	Gender	male, female
	Age	18-29 years old, 30-44, 45-59, 60+
	Education	primary education, vocational training, secondary education with school-leaving certificate, university degree
	Being in a relationhip	yes, no
	Partnership satisfaction	Definitely satisfied, satisfied, rather dissatisfied, not at all satisfied
	Prescribed psychopharmaceuticals at any time in life[1]	Yes, no
Circumstances of the CA	years since the accident	0-10
	subjective guilt for causing CA	definitely yes, rather yes, rather no, definitely no
	subjective feeling of harm within the CA	definitely yes, rather yes, rather no, definitely no
	Party at fault according to the police investigation	Yes, no, do not know yet
	Number of other stressors in the twelve months before	0-8
	subjective feeling of support of significant others after CA	definitely yes, rather yes, rather no, definitely no
	Dissociation - I have experienced intense fear for my health or fear for the health of others.	Yes, no
	Dissociation - I was confused and had trouble orienting myself in time and space.	
	Dissociation - I perceived the stressful event as unreal, as if it were taking place in a movie.	
	Dissociation - The visual field was very limited, like in a tunnel.	
	Dissociation - I have only fragmented or incomplete memories.	
Current state	subjective assessment of the severity of CA compared to other difficult situations in life	quite easy, rather difficult, significantly difficult, extremely difficult
	Persistent physical limitations	Yes, no
	Persistent economic impacts	Yes, no
	Driving avoidance	Yes, no

[1] The questionnaire also asked about receiving psychological help. Obtaining psychological help and taking psychopharmaceuticals are significantly correlated (0.82); the variable taking psychopharmaceuticals has a greater explanatory power, so only this variable has been chosen for the model.

Table 5: A summary of all variables tested.

	M1		M2		M3	
	Beta	Sig.	Beta	Sig.	Beta	Sig.
Gender	-0.129	0.000	-.086	.000	-0.053	0.019
Age	-0.073	0.000	-.049	.029	-0.020	0.389
Education	-0.115	0.001	-.089	.000	-0.086	0.000
Relationship	-0.003	0.873				
Partnership satisfaction	0.087	0.000	.051	.027	0.047	0.043
Taking psychopharmaceuticals	-0.105	0.000	-.056	.015	-0.020	0.093
Year of the CA			-0.034	0.146		
Feeling guilty for the CA			-0.044	0.064		
Feeling of harm within the CA			-.069	.017	-0.053	0.016
Party at fault according to police			0.002	0.780		
Number of other stressors in the twelve months before CA			.097	.000	0.079	0.001
subjective feeling of support of significant others after CA			.086	.000	0.078	0.001
Dissociation 1 - fear			-0.165	0.000	-0.128	0.000
Dissociation 2 - orientation			-0.152	0.000	-0.136	0.000
Dissociation 3 - unreality			-0.115	0.000	-0.087	0.000
Dissociation 4 – limited visual field			-0.007	0.795		
Dissociation 5 – incomplete memories			-0.042	0.142		
Subjective assessment of the severity of CA					0.152	0.000
Persistent physical limitations					-0.049	0.068
Persistent economic impacts					-0.105	0.000
Driving avoidance					-0.160	0.000

Table 6: Stages of regression model construction.

The M2 model is extended with the CA circumstance variables as presented in Table 6 above. The model explains 19.6 % of the variance. Out of the variables added, three of the five dissociation variables have the greatest explanatory power - I experienced intense fear for my health or fear for the health of others, I was confused and had difficulty orienting myself in time and space, I perceived the stressful event as unrealistic, as if it were taking place in a movie. The influence of other stressful events in the year prior to the CA and the support of significant others after the CA is also confirmed. Subjective sense of harm during CA is also a predictor. In contrast, years since the accident, feeling guilty for causing CA, and objective fault according to the police investigation are not explanatory variables and will be further eliminated. The remaining two dissociation variables will also be removed from further analysis as non-significant.

The final M3 model is augmented with the current situation variables as presented in Table 6 above. The model explains 21.8 % of the variance. Of the newly added variables, driving avoidance and subjective ratings of the severity of CA relative to other life situations have the greatest contribution. The economic consequences variable is also significant.

Thus, in the final model, the significant variables are as follows- Gender (β= -0.053, sig. = 0.019), Education (β= -0.086, sig. = 0.000), Partnership-Satisfaction (β= 0.047, sig. 0.043), Stressors year around DN (β=0.078, sig. 0.001), Support of significant others (β=0.078, sig. 0.001), Dissociation (intense fear of healing self or others β= -128, sig. = 0.000, confusion and difficulty orienting in time and space β=-136, sig.= 0.000, experiencing the situation as unrealistic β=-0.087, sig.= 0.000), subjective perception of CA as a burdensome life event (β= -0.152, sig. 0.000) Persistent economic impact (β= -0.105, sig.=0.000) Driving avoidance (β=-0.160, sig. = 0.000).

5. DISCUSSION

This study focused on post-traumatic stress disorder in the context of serious road traffic accidents. The main research objectives were to evaluate the prevalence and risk factors for the development of PTSD in participants and witnesses of traffic accidents in the Czech Republic.

5.1 Prevalence of PTSD in road traffic accident victims

The first objective of this study was to assess the prevalence of PTSD symptoms in road traffic accident victims in the Czech Republic. The results of the screening questionnaire revealed a prevalence of the disorder in the range of 23-30% according to the value of the selected cut-off score. To compare the prevalence values found, we present studies that used the same screening tool, the IES-R scale. Coffey and colleagues (2006) found an average prevalence of PTSD in 37 % of respondents thirty days after a car accident. The IES-R was also used by Kupchik and colleagues (2007) in their study, who detected PTSD symptoms in half of the respondents ninety days after the car accident, and Platts-Mills and colleagues (2017) noted the presence of PTSD in 21 % of respondents six months after the accident using the IES-R.

An interesting finding emerging from our research is that the severity of PTSD symptoms was not dependent on the elapsed time since the car accident (β = -0.034, sig. = 0.146). In this context, Hepp and colleagues (2018) conceptualize the development of PTSD symptoms over time after a car accident not as a universal process, but as a process that can have essentially three scenarios. One group of road accident participants may experience acute symptoms of stress in the short term, but these tend to disappear spontaneously. The second type of symptom development involves the persistence of initial symptoms, which tend to become chronic after six months. Finally, the third type of development implies the development of symptoms with a certain latency, which also tend to persist over a long period and are unlikely to resolve spontaneously. Our finding that the intensity of PTSD symptoms was not related to the time elapsed since the car accident can also be interpreted based on this finding.

5.2 Pretraumatic and dispositional factors

In terms of dispositional factors, female gender is generally viewed as one of the most significant predictors of the development of PTSD following a road traffic accident (e.g., Mayou, Ehlers & Bryant, 2002; Herrera-Escobar et al., 2018; Wrenger et al., 2008). These findings are consistent with the results of our data analysis (β = 0.077, sig. 0.001). The higher prevalence of PTSD in women may be related to differences in the psychophysiology of the stress response in men and women and differences in the coping strategies employed (Olff et al., 2007). According to our research findings, people with lower levels of education are also at significantly higher risk of developing PTSD symptoms (β= -0.076, sig. 0.001). One possible explanation is that people with higher levels of education have better access to information. They also often have higher economic status and, accordingly, may be able to mobilize more resources and thus use more effective coping strategies in stressful situations (Li et al., 2020). The association between lower social status and a higher risk of PTSD following a car accident was also highlighted by Ursano and colleagues (1999a).

Studies by Khodadadi-Hassankiadech and colleagues (2017) and Herrera-Escobar and colleagues (2018) suggest that individuals who are not in a stable partner relationship have a higher risk of developing the disorder. Despite these findings, the analysis of the data obtained does not show the presence of a partnership itself as a significant factor; what is relevant is the quality of the relationship, or the respondents' satisfaction in the partnership (β = 0.047, sig. 0.043). A relatively strong consensus within the literature was found in relation to previously diagnosed mental disorder as a significant predictor of PTSD following a car accident (e.g., Wrenger et al., 2008; Jeavons et al., 2000; Blanchard et al., 1995; Ursano et al., 1999a). Despite the findings of several studies addressing the development of PTSD following a road traffic accident (Jeavons et al., 2000; Khodadadi- Hassankiadeh et al., 2017; Ursano et al., 1999a), our study revealed an increased risk of developing the disorder in individuals who had experienced a traumatic event or intense stress in the twelve months prior to the car accident (β=0.079, sig. 0.001). These findings can be interpreted as suggesting that the presence of mental illness and the experience of intense stress prior to the traumatic event may in some way impair an individual's psychological well-being, leading to greater vulnerability and reinforcing the traumatic impact of the event. Ozer and colleagues (2003), who included both factors in their predictive model of a preceding stressful event, talk about the comparison with influenza and a person's immune system - those whose immune systems are fragile are at higher risk of contracting the disease.

5.3 Peritraumatic factors

Experiencing intense fear for one's own health or the health of loved ones was one of the strongest predictors of PTSD in our study (β = 0.127, sig.= 0.000). This finding highlights the importance of subjective appraisal of the event experienced. The traumatic experience is processed through cognitive processes that are closely related to the appraisal of the whole event and its consequences. These evaluations are significant not only in terms of the development but also the maintenance of mental disorders, including PTSD, beyond objective measures such as frequency and severity of trauma (Cromer & Smyth, 2010; Frissa et al., 2016).

Ehlers & Clark (2000) propose that the development of posttraumatic stress disorder occurs when the worry and experience of threat does not end with exposure to the traumatic event, but continuously persists into the present. Their proposed cognitive model proposes that this state of threat in trauma victims is maintained by two key processes: 1) cognitive assessment of the burden associated with the traumatic event and its aftermath; and 2) the inability to include the traumatic experience among other memories in autobiographical memory. These findings are also consistent with our finding that individuals who retrospectively rated the car accident as a significantly more burdensome event compared to other challenging events in their personal histories also simultaneously showed statistically more severe PTSD symptoms (β= 0.152, sig.= 0.000).

In situations of intense fear associated with threats to health and life, the affected person may develop dissociative states as an extreme way of maintaining psychological integrity. The association between the manifestation of dissociation during a car accident and the development of PTSD has been confirmed by several studies (e.g., Hodgson, & Webster, 2011; Ehring, Ehlers & Glucksman, 2006; Mayou, Ehlers & Bryant, 2002; Murray, Ehlers & Mayou, 2002), Also, in the meta-study by Ozer et al. (2003), peritraumatic dissociation is one of the most significant factors. This association may be explained, for example, by the limited function of autobiographical memory in the processing of traumatic memories, which may lead to an unwanted reliving of the event (Brewin, Dagleish, & Joseph, 1996; Ehlers & Clark, 2000; Foa & Hearst-Ikeda, 1996; van der Kolk & Fisler, 1995). Ursano and colleagues (1999b) report in their study that the most common manifestation of dissociative states was changes in time perception. In our research, four items inquired about the manifestations of dissociation. Two items related to the inability to orient oneself in time and space (β=138, sig.= 0.000) and the perception of an event as unreal (β= 0.095, sig.= 0.000) reached statistical significance. These findings are consistent with the results of clinical studies that explain changes in time perception during a traumatic event by decreased cerebellar blood flow and, conversely, increased blood flow in the left hemisphere (Mathew et al., 1998). However, the remaining two items related to visual field limitation (β= --0.007, sig. 0.795) and disturbed memories of the accident (β= -0.042, sig. 0.142), were found to be nonsignificant. This may be explained by the chosen method of examining memory fragmentation. Respondents' self-assessment of the completeness of memories may in certain cases tend to be positively biased compared to expert memory examination. Halligan (1999) reports that expert assessment of memory fragmentation is a more reliable predictor of the development of PTSD than the results of a self-report questionnaire. Based on these findings, we can hypothesize that the level of fragmentation of memories of the accident may have been higher than our questionnaire survey indicated.

Our research also focused on the issue of fault for the car accident (β= --0.002, sig. 0.780) and on the factor of experienced guilt for causing the car accident (β= --0.044, sig. 0.064). Continuous feelings of guilt, shame and beliefs of personal failure following a traumatic event are significant predictors of posttraumatic stress disorder (Cunningham et al., 2018). The discrepancy between the mental representation of self and the representation of the person who caused, or at least did not prevent, the car accident can make emotional processing of the traumatic memory difficult (Lee, Scragg, & Turner, 2001; Brewin, Dalgleish, & Joseph, 1996). Feelings of guilt and shame may also be associated with a group of avoidance symptoms of PTSD and perceptions of self-responsibility for something bad having happened (Ehlers & Clark, 2000), or in situations where rehabilitation is not possible (Kubany, 1998). Although the factor of experienced guilt does not emerge as statistically significant in our research, some significance may be attributed to it given the value of β coefficient.

5.4 Posttraumatic factors

Our study indicated the importance of social support as a protective factor in the development of PTSD in survivors of car accidents (β= 0.077, sig. 0.001). This finding is consistent with the findings of several meta-studies that have addressed the issue (Ozer et al., 2003; Trickey et al., 2012; Wright et al., 2013) and which report that individuals with social support are relatively resistant to the harmful effects of a traumatic event. The opportunity to vent feelings and thoughts in a relationship with another person provides an opportunity to assimilate the traumatic experience and develops coping skills to manage negative emotions, thereby reducing the distress experienced (Horowitz, 1976). Importantly, perceived social support is not tied to its origin; support from colleagues, supervisors, therapists, or hospital staff is as beneficial as support from family members and friends (Wang et al., 2021).

As one of the significant risk factors after a car accident, persistent economic problems resulting from the car accident emerged as a significant risk factor (β= -0.015, sig. 0.000). Financial loss and persistent medical complications were included in the study based on the predictive models of PTSD developed in the studies by Mayou, Ehlers, and Bryant (2002) and Ozer et al. (2003). Both factors represent chronic sources of stress that limit victims' ability to cope with the traumatic event. Ultimately, they may represent a kind of memento that makes it impossible to close the traumatic event as something that happened in the past and does not interfere with the present (Mayou, Ehlers & Bryant, 2002). Despite the findings of the above studies, health complications caused by the car accident did not reach statistical significance in our research in relation to the development of PTSD (β= -0.049, sig. 0.068). This may be explained by the low number of individuals in our research who were injured during CA (N = 284). Given the relatively low representation and severity of the accidents we studied, it can be assumed that our results are underestimated in this respect and that permanent physical consequences play a role as a factor in the development of PTSD.

Post-traumatic stress disorder due to road traffic accidents is often accompanied by fear of driving. People avoid specific situations such as driving at high speed on the motorway, driving on unfamiliar roads, or cope with fear-inducing traffic situations with an extensive degree of caution (Kaussner et al., 2020; Ehlers et al., 2007; Taylor & Deane, 2000). The association between the development of PTSD and avoidance behaviour in traffic was also confirmed in our research (β= -0.160, sig.= 0.000). Although avoidance behaviour may be a useful strategy in the short term, in the long term it appears to be counterproductive in the processing of the traumatic event (Boden et al., 2013) and may ultimately accelerate and exacerbate symptoms of PTSD itself (Badour et al., 2012). The results of a study by Mairean (2020) indicated a positive correlation between the development of PTSD and increased errors due to inattention and an overall unintentional tendency towards risky driving behaviours. These findings highlight the need to concentrate psychological care on road accident victims also to ensure greater road safety.

5.5 Recommendations for further research

In relation to the results of our research, a follow-up study could focus on the design of a screening method that would detect the presence of risk factors shortly after a traffic accident, specifically targeting road accident participants in the

Czech Republic. Such an instrument would enable to focus psychological care on persons in need.

5.6 Limitations

The research conducted has certain limitations that need to be considered when interpreting the findings. As one of the limiting factors of our research is the retrospective approach to assessing the impact of traffic accidents, in some cases even ten years. The retrospective approach limits the possibility of evaluating causal relationships between the determinant and outcome variables.

Further limitations also stem from the data collection methods used. A limitation on the part of the IES-R may be the lack of a standardized version for the Czech population and the cut-off scores used had to be taken from foreign studies assessing the validity of the instrument in the population of road accident participants. The second limitation, based on the data collection methods used, is the absence of a standardized method to assess the presence of dissociative states that has been validated in the Czech population. Another limitation of self-assessment methods in general is that in some cases their results may be overestimated. In the case of the IES-R, however, this limitation is negligible given the good psychometric properties of this method.

Finally, the CAWI method and the use of online panels (as any other data collection method) pose some limitations regarding the representativeness of the data collected. The CAWI survey technique excludes subgroups with limited or no internet access. Online panels rely on people who have been approached as part of the recruitment process and are willing to join the panel. Therefore, the results of our research can only be applied to the online population of the Czech Republic. However, with the increasing availability of the Internet, the ability to reach challenging groups such as the elderly, less educated, low-income groups or those living in remote areas has improved significantly. Sampling bias due to respondents' necessary consent to participate in the survey applies to all data collection methods probability sampling included.

6. CONCLUSION

The cumulative prevalence of PTSD in participants and witnesses of traffic accidents in the Czech Republic is in the range of 23-30 %. A total of 10 factors were assessed as explanatory (female gender, lower level of education, satisfaction in partner relationship, previous period of stress, peritraumatic dissociation, concern for own life or health, subjective evaluation of the event as extremely burdensome, absence of social support, persistent economic burden, and avoidance of driving). The resulting model explained 21.8 % of the variance. The results of this study contribute to a better understanding of the overall impact of traffic accidents in the context of the Czech Republic. Systematic investigation of the psychological impact of traffic accidents is a key condition in the system of their effective prevention and psychological care of the affected persons.

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