



## Methodological Articles

# Train Accidents: Development of Post-Traumatic Stress Disorder in Train Drivers

Acidentes de comboio: Desenvolvimento da perturbação de stress pós-traumático nos maquinistas

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## Abstract

**Aim:** The objective of this study is to verify whether there is a correlation between PTSD, Depression, Life Events and Experiences of Dissociation Peritraumatic, and what is the effect of these variables on PTSD. Railway accidents are considered potentially traumatic events and one of the consequences is the development of Post-Traumatic Stress Disorder (PTSD). There are few studies that focus on the association between train accidents and the development of PTSD on train drivers.

**Method:** In total, 216 male train drivers with a mean age of 44.85 (SD = 5.70), completed the Portuguese versions of the Beck Depression Inventory (BDI-II), the List of Life Events – Clinician Administered (CAPS), the PTSD Checklist Civilian Version (PCL-C) and the Peritraumatic Dissociative Experiences Questionnaire (PDEQ).

**Results:** A prevalence of PTSD symptoms in train drivers (8.3%) was revealed, as well as the existence of a significant correlation between PTSD and the main variables: Depression ( $r = .70$ ,  $p < .001$ ), Life Events ( $r = .25$ ,  $p < .001$ ) and Peritraumatic Dissociative Experiences ( $r = .63$ ,  $p < .001$ ), and also that variables BDI-II ( $\beta = .51$ ,  $t = 9.60$ ,  $p < .001$ ) and PDEQ ( $\beta = .34$ ,  $t = 6.24$ ,  $p < .001$ ) have a significant impact at the PCL-C ( $R^2 = .58$ ).

**Conclusion:** According to the results obtained and taking into account that 8.3% of train drivers present symptoms of PTSD, we consider important the existence of a reparative and preventive psychological support after the railway accident, in order to minimize the psychological impact on train drivers.

**Keywords:** train accidents, post-traumatic stress disorder, train drivers

## Resumo

**Objetivo:** O objetivo deste estudo foi o de verificar se existe uma correlação entre a PTSD, Depressão, Eventos de Vida e Experiências de Dissociação Peri-traumática, e qual o efeito dessas variáveis na PSPT. Os acidentes ferroviários são considerados eventos potencialmente traumáticos e uma das consequências é o desenvolvimento de Perturbação de Stress Pós-Traumático (PTSD). Há poucos estudos que focam a associação entre acidentes de comboio e o desenvolvimento de PTSD em maquinistas.

**Método:** No total, 216 maquinistas do sexo masculino com média de idade de 44,85 (DP = 5,70) completaram as versões em português do Beck Depression Inventory (BDI-II), a Lista de Eventos de Vida - Administração Clínica (CAPS), o PTSD Checklist Civilian Version (PCL-C) e o Questionário de Experiências Dissociativas Peri-traumáticas (PDEQ).

**Resultados:** A prevalência de sintomas de PSPT em maquinistas (8,3%) foi revelada, bem como a existência de uma correlação significativa entre PSPT e as principais variáveis: Depressão ( $r = .70$ ,  $p < .001$ ), Eventos de Vida ( $r = .25$ ,  $p < .001$ ) e Experiências Dissociativas Peri-traumáticas ( $r = .63$ ,  $p < .001$ ), e também aquelas variáveis BDI-II ( $\beta = .51$ ,  $t = 9,60$ ,  $p < .001$ ) e PDEQ ( $\beta = .34$ ,  $t = 6.24$ ,  $p < .001$ ) têm um impacto significativo no PCL-C ( $R^2 = .58$ ).

**Conclusão:** De acordo com os resultados obtidos e tendo em conta que 8.3% dos maquinistas apresentam sintomas de PTSD, consideramos importante a existência de um suporte psicológico reparador e preventivo após o acidente ferroviário, a fim de minimizar o impacto psicológico nos maquinistas.

**Palavras-Chave:** perturbação de stress pós-traumático, maquinistas, acidentes de comboio

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According to Marques Teixeira (2002), after the invention of the train and the occurrence of the first railway accident, occurrences of nightmares, somatization disorder and other symptoms considered typical of posttraumatic stress disorder were registered.

Several researches in other countries have reported physical and psychological impact of the train drivers involvement in accidents (Cothereau et al., 2004). However, in Portugal, was not identified in the studies conducted with train drivers witnesses of accidents and/or suicides, the possible development of Post-Traumatic Stress Disorder (PTSD).

The PTSD is a disorder belonging to the chapter of disorders related to trauma and stressors, whose diagnostic criteria involve exposure to a traumatic or a stressful event. The symptomatology of PTSD includes changes to multiple levels: recurrent and involuntary re-experiencing of the event, avoidance of stimuli related to the event, negative changes in cognition and mood, and changes in arousal and reactivity associated with the traumatic event (American Psychiatric Association [APA], 2014). According to criteria presented in *The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5; APA, 2014), among the first symptoms are difficulties in sleeping or falling asleep, irritability, difficulties in concentration, hyper-vigilance and exaggerated alarm response. For the diagnosis to be made it is necessary that the symptoms of PTSD would be maintained for a period of time upper than one month and that the disorder causes clinically significant distress and social injury to the professional or in other important areas of the individual's life.

According to DSM-5 (APA, 2014), if symptoms persist for periods of less than four weeks, it is ASD (Acute Stress Disorder), if the symptoms and diagnosis persist for three or more months, PTSD is said chronic, but if symptoms appear after six months of the traumatic event, it is considered a late-onset posttraumatic stress disorder. The prevalence of PTSD depends of the trauma severity, its repetition, factors related with the past, social support and the personality of the individual (Vaz Serra, 2003). A study carried out by Norris (1992) that examined the frequency and the impact of 10 potentially traumatic events on a sample of 1.000 adults, found that about 69% of individuals experienced one or more traumatic event in the course of their life, found also that in the 23% of the individuals involved in road accidents, 11.5% developed a post-traumatic stress disorder.

Several authors report that the degree of disturbance varies with the type of accident and how this traumatic event is experienced, and also that individuals who present peritraumatic dissociation (one of the possible consequences of exposure to a traumatic event) have more probability to develop PTSD (Chung, Werrett, Easthope, & Farmer, 2004; Ozer, Best, Lipsey, & Weiss, 2003).

An epidemiological study of PTSD made in Portuguese adult population found a prevalence rate of 7.9%, wherein 22.2% of participants reported that being witness of a serious accident or death constituted a significant traumatic situation. In a life time, 75% of the population is exposed to at least one traumatic event and 43.5% to more than one situation (Albuquerque, Soares, Jesus, & Alves, 2003). Other studies performed by several authors showed a relatively high rate of PTSD after a traumatic event (vehicle accident), in which about 15% of the sample showed evident signs of PTSD 90 days after the traumatic event (Irish et al., 2008; Kupchik, Strous, Erez, Gonen, & Weizman, 2007).

A study developed in Norway and Sweden demonstrated that all train drivers reported intrusive thoughts after an accident, concluding that "... repeated accidents experience should always be considered as a risk factor..." (Karlehagen, Malt, & Hoff, 1993, p. 816). Farmer, Tranah, O'Donnell, and Catalan (1992) conducted a study about the impact of railway suicides and psychological effects on train drivers, and verified that one month after the accident 39.5% of individuals with PTSD developed depressive symptoms and phobic states.

The results presented by various studies indicate the existence of a correlation between repeated traumatic events and the persistence of symptoms, which puts train drivers function as a risky profession for the development of PTSD. One of the most complete studies regarding the effects of multiple suicides in the railway was conducted in Britain and, as expected, the emotional impact on train drivers was diversified (Weiss & Farrell, 2006).

Researchers conducted in other countries have already reported physical and psychological impacts in the involvement of train drivers in accidents; however, we did not identify any studies in Portugal with train drivers that correlate being a witness of accidents and / or suicides and the development of PTSD.

Through the Annual Report and Security of the Portuguese Railways (*Relatório anual de desempenho e segurança* 2013), it was estimated that in the period 2008-2012 the total number of significant accidents were 620, having as consequences 371 dead and 116 wounded with severe injuries. Regarding the suicides we the same report recorded a total of 244 suicides in the same period [2008 (49), 2009 (61), 2010 (49), 2011 (35), and 2012 (50)]

The main objective of this research is to study the psychological impact of railway accidents on train drivers, through the analysis of the relationship between PTSD, depression, life events and peritraumatic dissociative experiences. Following, the hypotheses of the present work are as follows: (1) There is a positive correlation between PTSD symptoms and depression, life events and peritraumatic dissociative experiences; (2) The variables depression, life events and peritraumatic experiences predict the symptoms of PTSD.

## Method

### Participants

In a population of approximately 1,200 train drivers a sample of 216 train drivers was used, all belonging to the only Railway company of Portugal selected through a non-probabilistic convenience sampling process after responding to an invitation and consenting to its participation in the present study.

To better understand the impact of train accidents (including suicides on the railway) considering that these accidents are traumatic events that can lead to the development of PTSD in train drivers, we invited as participants only the train drivers who have suffered and/or viewed train accidents during the course of their duties. The drivers that declared that did not suffer any accident during their duties were excluded from this study. The data were collected in the personnel services according to the geographic location (Lisbon - Santa Apolónia, Cais do Sodré, Lisbon - Rossio, Barreiro, Entroncamento, Contumil and Porto-S. Bento).

All train drivers were male gender ( $n = 216$ ). To characterize the sample, we also collected socio-demographic information. Participants have a mean age of 44.85 ( $SD = 5.70$ ), with a minimum of 28 years and a maximum of 62 years old. Regarding marital status, 76.4% are married; 13% divorced; 8.8% single; 1.4% non-marital partnership and 5% are widowers. At the level of education, 25% have the 9th year; 73.2% have the 12th year, and only 0.9% have a bachelor's degree or higher. In terms of years of occupation, the highest percentage are between 16 and 20 years old (61.1%) followed by 16.2% for the 21 to 25-year-old and only .9% had between 1 to 5 years of profession. Regarding the number of children, 11.6% did not have children; 79.5% had 1 to 2; 8.4% had between 3 and 4, and only 5% had more than 4 children.

## Measures

### Socio-Demographic Information

For the specific purposes of the investigation, it was necessary to develop an instrument that would include some important questions that were not included in the instruments used. The sociodemographic questionnaire served to collect information to characterize the sample of the study in a general way, and in particular concerning the characteristics of the profession. It was composed of 26 questions covering different topics concerning the history of the individual and the accidents suffered and / or witnessed (e.g. number of accidents suffered / witnessed, if there were mortal victims, if he was afraid to die or to be seriously injured, if was in state of shock, was unable to provide assistance, felt guilty / responsible for the accident, among others).

### Depression

The Depression was assessed using the Beck Depression Inventory (Beck Depression Inventory - BDI-II; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). This is a questionnaire that evaluates the depressive symptomatology, based on the clinical observation of depressed patients. Gauged for the Portuguese population by Ponciano, Cardoso, and Pereira (2004) the BDI-II consists of 21 categories of symptoms and attitudes that encompass the manifestations existing in the different intensities in the depressive clinical picture. Each item is composed of four phrases with values from 0 to 3 points in order of increasing intensity in a Likert scale, with 0 for the first phrase and 3 to the fourth phrase (with the exception of items 16 and 18 with seven phrases, keeping the score from 0 to 3). The total score of the questionnaire is between 0 and 63 points, depending on the individuals' responses and the final result being obtained by summing each of the 21 items. The American Cognitive Therapy Center, according to Figueiredo (2007) defined the following quotation: 0-9 minimal or non-existent depression (not Depressed); 10-18 mild to moderate depression (minimal depression); 19-29 Depression moderate to severe and 30-63 severe depression. These cut-off points were used for the results. In the present study, BDI-II showed good internal consistency for the total scale with a Cronbach's alpha value of .88.

## Life Events

Life events were evaluated by the instrument Clinician-Administered PTSD Scale – CAPS (Blake et al., 1995). This is a questionnaire with a scale based on a clinical interview that allows the identification of different potentially traumatic life events and establish the diagnosis of PTSD. The original instrument contains a list of life events, which was translated by Maia and Fernandes (2003). This list consists of 17 items where some events (e.g. fire, accidents, violence, death, among others) are presented. Each item is rated on a Likert scale of 0 to 4 points (0 = "it happened to me", 1 = "I saw it happen", 2 = "I knew it happened", 3 = "I'm not sure" and 4 = "does not apply"). In relation to the quotation, this scale can be quoted by assigning the following score: 0 = "not applicable", 1 = "not sure", 2 = "knew it happened", 3 = "saw it happen", 4 = "happened to me". In this way of quoting the scale will vary between 0 and 68 points, with the highest score being attributed to a high level of exposure to events. For the present study, the CAPS presented a good internal consistency with a Cronbach's alpha value of .81.

## Post-Traumatic Stress Disorder

PTSD was evaluated from the Checklist Civilian Version (PCL-C; Weathers, Litz, Herman, Huska, & Keane, 1993) that diagnoses and monitors the severity of PTSD symptoms. The Portuguese version of the PCL-C, was translated and adapted by Gonçalves, Lima, and Marques Pinto (2006). The PCL-C allows evaluating the 17 fundamental symptoms for the diagnosis of PTSD, this instrument is composed of 17 items answered on a 5-point Likert scale (1 = "Nothing" to 5 = "Extremely"), it is requested to the individual to indicate to what extent had these traumatic symptoms. The quotation of the results was performed by calculating the sum of the 17 items (scores ranging from 17 to 85), with a cutoff point of 50 for diagnosis of PTSD, as applied in cases of road accident by the National Centre for PTSD (NCP, 2010). In the present sample, the internal consistency analysis showed good psychometric qualities with a Cronbach's alpha value of .95.

## Dissociative Experiences

The acute dissociative responses at the time of exposure to the traumatic event, indicative of subsequent development of chronic PTSD, were assessed from the Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar, Weiss, & Metzler, 1997). We used the translated version of the scale by Maia, Moreira, and Fernandes (2009) for the Portuguese population, consisting of 10 items that assess the dissociative experiences related to the events. The hypotheses of response are presented in a Likert scale of 5 points (1 = "not true", 2 = "slightly true", 3 = "fairly true", 4 = "very true", and 5 = "extremely true"). According to Pires (2005), the literature does not make any reference as far as its quotation is concerned. Therefore, for this study, we consider the total responses obtained (Global subscale of Peritraumatic Dissociation) that varies between 10 and 50 points. In the interpretation of the results we consider that the greater the Total obtained in the Global Scale of Peritraumatic Dissociation, the more dissociation symptoms the subject experienced during the exposure to the event. In the present study, the PDEQ presented a good internal consistency with a Cronbach's alpha value of .91.

## Procedure

First, for the current study, an application for written authorization was sent to the Portuguese trains driver's humans resources department for approval. Subsequently, it was communicated to the train drivers the permission granted to carry out the study. The participants were informed regarding the nature and purpose of the study as well as the confidentiality of the data, thus guaranteeing a voluntary participation of each one, the

questionnaires were delivered in several places, applied in a room granted for the effect and filled by their own because it was considered that there would not be difficulties of interpretation.

This investigation includes only one moment of evaluation which resulted in the application of all the questionnaires and was aimed at collecting data to identify within the participants the train drivers who presented PTSD indices.

## Data Analysis

First, descriptive analyses were conducted. In order to analyze the associations between variables, bivariate Pearson correlations were conducted between depression, life events, peritraumatic dissociative experiences, and posttraumatic stress disorder symptoms.

After verifying the self-correlation assumptions of the residues by calculating the Durbin-Watson (= 2) and Multicollinearity values by calculating the Tolerance (> .200) and FIV (<5) values, in order to test the effect of the variables under study in the PTSD, a Multiple Linear Regression was performed and were introduced in the model as predictive variables depression, life events and peritraumatic dissociative experiences, and PTSD was introduced as dependent variable.

The data obtained were analysed using the *Statistical Package for the Social Sciences* (SPSS, version 18.0 for Windows).

## Results

Through the sociodemographic questionnaire we obtained results that we considered relevant for the study. We found that 63% of the subjects "*Saw the person(s) to suffer the accident*" and that 74.5% of the subjects who witnessed between 1 and 5 accidents only 4.6% reported having had "*fear of dying or getting seriously injured*", and only 31% perceived accidents as "*very threatening*". In addition to witnessing accidents and suicides in the performance of their duties, 53.2% of the subjects had other accidents throughout life not related to the professional activity (44% of road traffic), and 10.6% considered they had been exposed to situations potentially traumatic. Concerning the feeling of "*guilt or responsibility*" in accidents, 95.4% stated that they did not feel guilty / responsible for the accidents, and regarding the feeling of "*support while waiting for the help*", 65.8% reported never having felt any support, regarding after-work activities, 56.7% of the subjects do not had have any type of hobbies, but this did not lead to further development of PTSD.

We performed a descriptive analysis of the variables under study, and [Table 1](#) shows the maximum and minimum scores as well as the mean and standard deviation of the main variables: life events, depression, peritraumatic dissociative experiences and posttraumatic stress disorder symptoms.

In what regards life events, about 35.6% of individuals had a score between 17 and 37 points, 53.8% had a score between 38 and 58 points and 10.6% had a score between 59 and 85 points. Regarding depression, 55.1% of the individuals did not present symptoms of depression, 31.5% presented minimal depression, 11.1% presented moderate to severe depression, and 2.3% presented severe depression.

Table 1

Descriptive Statistic of Main Variables ( $n = 216$ )

Variable	Minimum	Maximum	<i>M</i>	<i>SD</i>
Life events	17	71	42.12	11.56
Depression	0	44	8.01	8.21
Peritraumatic dissociative experiences	10	48	13.46	6.78
Posttraumatic stress disorder	17	78	28.01	12.04

Concerning peritraumatic dissociative experiences, 83.3% had a score between 10 and 20 points, 13% had a score between 20 and 30 points, 2.3% had a score between 30 and 40 points, and 1.4% had a score between 40 and 50 points.

In this study, regarding the posttraumatic stress variable, and taking into account the cutoff point 50 suggested by the NCP (2010) for diagnosis of PTSD, we verified that 8.3% of the individuals present a result equal to or higher than 50 points. We also verified that 75.5% of the individuals reported that symptoms appeared after the traumatic event in the first six months and 10.2% reported that appeared after six months or more. Regarding the length of time after the occurrence of the traumatic event in which the symptoms occurred, 37.5% reported that they only had symptoms for less than a month, 19% reported having had symptoms for less than three months, and 29.2% had symptoms for three or more months.

We found that PTSD is significantly and positively associated with depression, life events and peritraumatic dissociative experiences. The results shown in Table 2 indicate a positive relationship between total depression and the life events ( $r = .175$ ,  $p = .010$ ), the posttraumatic stress ( $r = .700$ ,  $p < .001$ ) as well as all the dimensions of posttraumatic stress [Criterion B ( $r = .606$ ,  $p < .001$ ); Criterion C ( $r = .648$ ,  $p < .001$ ) and Criterion D ( $r = .667$ ,  $p < .001$ )] and the peritraumatic dissociative experiences ( $r = .541$ ,  $p < .001$ ). The data presented also showed a positive relationship between life events of the subject and the peritraumatic dissociative experiences ( $r = .288$ ,  $p < .001$ ), the posttraumatic stress ( $r = .246$ ,  $p < .001$ ), as well as the dimensions of posttraumatic stress criterion (B) ( $r = .228$ ,  $p = .001$ ), posttraumatic stress criterion (C) ( $r = .176$ ,  $p = .010$ ) and posttraumatic stress criterion (D) ( $r = .266$ ,  $p < .001$ ). Results also allowed us to verify a positive relationship between peritraumatic dissociative experiences and posttraumatic stress ( $r = .629$ ,  $p < .001$ ) and see that peritraumatic dissociative experiences are related positively the dimensions of posttraumatic stress criterion (B) ( $r = .649$ ,  $p < .001$ ), posttraumatic stress criterion (C) ( $r = .542$ ,  $p < .001$ ) and posttraumatic stress criterion (D) ( $r = .553$ ,  $p < .001$ ). We also verified in this study a positive relationship between life events and the *Number of accidents suffered* ( $r = .253$ ,  $p < .001$ ) and the *Number of mortal victims* ( $r = .214$ ,  $p = .002$ ) and a negative relationship with *Time elapsed since the last accident* ( $r = -.142$ ,  $p = .037$ ). We also found a negative relationship between posttraumatic stress and *Time elapsed since the last accident* ( $r = -.178$ ,  $p = .009$ ).

Table 2

*Pearson Correlations Between Depression, Life Events, Posttraumatic Stress and Peritraumatic Dissociative Experiences*

Variable	1	2	3	4	5	6	7
1. Depression	–	.175*	.541***	.700***	.606***	.648***	.667***
2. Life events		–	.288**	.246***	.228**	.176*	.266***
3. Peritraumatic dissociative experiences			–	.629***	.649**	.542***	.553***
4. Posttraumatic stress (total)				–	.913***	.916***	.918***
5. Posttraumatic stress criterion (B)					–	.752***	.761***
6. Posttraumatic stress criterion (C)						–	.769***
7. Posttraumatic stress criterion (D)							–

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

In order to analyse whether the variables depression, life events and peritraumatic experiences predict the symptoms of PTSD, a multiple linear regression was performed, the results of which are presented in Table 3.

Table 3

*Multiple Linear Regression Results*

Variable	$\beta$	$t$	$p$
Depression	.51	9.60	<.001
Life Events	.06	1.29	.200
Peritraumatic experiences	.34	6.24	<.001

Note.  $R^2 = .58$ ,  $F(3, 212) = 98.48$ ,  $p < .001$ .

Analysing Table 3, we found that both depression ( $\beta = .51$ ,  $t = 9.60$ ,  $p < .001$ ) and the peritraumatic experiences ( $\beta = .34$ ,  $t = 6.24$ ,  $p < .001$ ) have a significant impact on the posttraumatic stress disorder symptoms. We also verified that the life events ( $\beta = .06$ ,  $t = 1.29$ ,  $p = .200$ ) did not reveal a significant impact on the posttraumatic stress. We obtained  $R^2 = .58$ , which means that these variables were accounted for 58% of the variability of the PTSD. The model was statistically significant ( $F(3, 212) = 98.48$ ,  $p < .001$ ).

## Discussion

It is common that train drivers could testify accidents and/or suicides involving deaths or severe injuries, and they may therefore suffer a psychic trauma causing anxiety, insomnia, psychophysiological symptoms, depression and other psychopathologies.

The relevance of the data obtained through the Portuguese Railways Annual Report (Comboios de Portugal, 2013), which estimated approximately 620 significant accidents with a number of 244 suicides between 2008 and 2012, justified the present study. This research aimed to study the psychological impact of rail accidents in drivers, thematic not yet studied in Portugal, through the study of variables: PTSD, depression, life events and peritraumatic dissociative experiences.

Train drivers are often exposed to adverse situations, which leads to the interest of trying to understand the possibility of developing PTSD and other pathologies related to this disorder. PTSD may occur regardless of

whether the train driver was or if he was not at risk of physical harm (Rautji & Dogra, 2004; Weiss & Farrell, 2006). A study carried out in England, found that the London Underground train drivers suffered symptoms of psychological suffering after incidents involving suicides, and 16.3% of train drivers presented symptoms of PTSD (Farmer et al., 1992).

Dissociation and dissociative responses are one of the principal interveners and peritraumatic risk factors for developing PTSD (Barton, Blanchard, & Hickling, 1996; McNally, Bryant, & Ehlers, 2003). In this study subjects who reported fear of dying or getting seriously injured (perception of danger) experienced more dissociation symptoms, which is significantly correlated with the value obtained for PTSD symptomatology.

Due to the specific nature of their job, the train drivers are subject to a repeated exposure to traumatic situations which may be identified as traumatic events (Fernandes & Maia, 2001; Maia, Fernandes, & Horta-Moreira, 2003, 2004; Pires & Maia, 2005). In addition to witnessing in the exercise of their duties traumatic events such as accidents and / or suicides in the railroad, the subjects also had other types of accidents throughout life (road accidents and falls, among others) that are considered as exposures to potentially traumatic situations.

There was an existence of comorbidity between depression and PTSD in which subjects with PTSD present higher depression scores than those who did not develop this disorder (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). One study on the impact of rail suicides and the psychological effects in train drivers showed that one month after the accident, 39.5% of subjects with PTSD presented depressive symptoms and phobic states (Farmer et al., 1992). In the present study, a significant percentage of subjects presented severe depressive symptomatology.

There are sociodemographic characteristics that can be related to the development of PTSD. There are factors that tend to exacerbate or attenuate stress, for example a factor that can exacerbate stress is the fact that the train driver has to wait alone often in the darkness, the arrival of help (Weiss & Farrell, 2006). We verified in the current study that only a very small percentage of individuals who witnessed various accidents reported having "*fear of die or get seriously hurt*" or perceived the accidents as "*very threatening*".

Concerning the feeling of "*guilt or responsibility*" for accidents, most of the participants did not feel guilty / responsible for the accidents. Regarding the feeling of "*support while waiting for help*," few reported having had support. Some researchers refer that the perceived control over events can be an important factor in the development of perturbation (Mayou, Bryant, & Ehlers, 2001).

In this study the majority of the participants saw the person (s) suffer the accident, according to the exposed in the DSM-5 "*to observe a happening that involves death, injury or threat to the physical integrity of another person...*" is a traumatic situation and contributes to the the development of PTSD. (DSM-5; APA, 2014, p. 324)

Coping plays a key role in posttraumatic factors, since it is constituted of forms of resolution and problem management (Lazarus & Folkman, 1984). We tried to perceive the existence of coping strategies as a defense against the development of PTSD in the way of after-work activities and we verified that most of the participants did not have any hobbies type, but that fact did not lead to greater development of PTSD.

With this research we aimed to contribute somewhat to knowledge the psychological consequences of rail accidents in train drivers, namely in terms of PTSD. We can conclude that 8.3% of the participants presented val-

ues that pointed to the diagnosis of PTSD, in 10.2% the symptoms appeared after six months or more, and in 37.5% the symptoms manifested for less than a month.

There exists a significant correlation between PTSD, depression, life events and peritraumatic dissociative experiences, that is elucidative according to data from a sample of professional Portuguese train drivers. These data are in agreement with other studies carried out in this area. The depression as well as peritraumatic dissociative experiences have a significant impact at the development of PTSD. In fact, the results showed that depression, life events and dissociative experiences are strong predictors of PTSD, since the multiple regression model explained 58% of PTSD variance. Moreover, from the three variables, a life event was the weak predictor of PTSD.

Taking into account the results obtained in this study, we can then suggest the importance of implementing a psychological repair program specifically for train drivers presenting PTSD diagnosis, as well as a preventive psychological support for the immediate psychological impact to the accident as a way to minimize and prevent possible psychic disturbances.

Despite the importance of these aspects addressed, there are limitations in this research. The type of methodology used only evaluates the presence of PTSD symptoms at a certain moment and not in a continued manner, which can call into question the generalization of the obtained results, also the fact of the questionnaires were self-administered and some were completed outside the researcher's supervision, especially the CAPS (which is of clinical application and not to self-administered, became more difficult to control the external variables.

The values themselves obtained in the interpretation of the results provided only indirect information on the presence of symptomatology, since they were based on self-report measures carried out by the train drivers.

It would be important in future studies to understand the evolution and/or remission of symptomatology through longitudinal studies, with regular reassessments to train drivers in order to know in the medium and long term the extent of this problem and the possibility of planning interventions to provide support for train drivers, as well one precocious control of the psychological consequences and better management of risks and of traumatic situations.

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## **Competing Interests**

The authors have declared that no competing interests exist.

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