

Firefighters under alert: psychological morbidity, empathy and alexithymia between firefighters and non-firefighters

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Abstract: Firefighters have high exposure to traumatic events and have an increased risk of developing symptoms related to trauma. The current study assessed the psychological morbidity, empathy and alexithymia of volunteer firefighters compared to career firefighters and to non-firefighter comparators from the general population. Group differences were assessed using multivariate comparisons and univariate tests and discriminant analysis for individual measures. A total of 1062 individuals completed the protocol. Considering firefighters as the focus of analysis, data suggested that both career and volunteer firefighters presented higher trauma than the comparison group. In subscales of empathy, compared to the comparison group, career firefighters scored higher on the perspective-taking scale, while firefighters showed less personal discomfort and less fantasy. Firefighters showed less alexithymia, in the outward-oriented style of thinking than the comparison group. The findings suggest the need for more prevention and treatment efforts for firefighters, with the introduction of educational and therapeutic interventions.

Keywords: Firefighters; Psychological morbidity; Trauma; Psychological distress; Empathy; Alexithymia.

Exposure to active stress and catastrophic, traumatic experience is outside ordinary human experience and causes an anxious reaction in a healthy person (De Jong et al., 2001). Emergency or first responders and crisis workers deal with a range of emergencies, with little or no prior knowledge about what they are about to encounter. They are frequently confronted with difficult, risky situations requiring rapid decision-making and action under complexity (Armstrong et al., 2014; Regehr et al., 2008).

Given the stressful nature of emergency work, firefighters have high exposure to traumatic events, and they may be more likely to perceive their stressors as uncontrollable and threatening, which in turn increases the risk of developing Post-Traumatic Stress Disorder (PTSD) or traumatic symptoms (Berger et al., 2012; Lee et al., 2014). It is known that the extent of exposure to traumatic events is related to the severity and chronicity of psychological distress (Brown et al., 2002). The study of Stanley and colleagues (2017) found that volunteer firefighters reported significantly elevated levels of psychiatric symptoms, like depression, post-traumatic stress, and suicidal symptoms compared to career firefighters, and greater structural barriers to mental health treatment may explain this link.

The literature suggests a relationship between emotions, cognitions and trauma (Hayes et al., 2012), with critical incidents inducing more traumatic symptoms (Pinto et al., 2015) and the presence of trauma affecting the capacity to recognize emotions (Kurtić & Pranjić, 2011). Less problem-focused and more emotion-focused coping may be associated with psychological distress following traumatic stressors (Brown et al., 2002). Moreover, exposure to catastrophic stress could lead to cognitive dysfunction, including processing and recognizing facial expressions of emotions, as well as changes in psychosocial functioning (Kurtić & Pranjić, 2011). In view of the above regarding the high relation between trauma and psychological distress, we suggest the term psychological morbidity, which includes the evaluation of trauma and psychological distress.

People from the general populations frequently use their emotion-handling skills to consciously dissociate themselves from their emotional reactions. Thus, this conscious strategy is adaptive and allows them to increase their ability to focus on the treatment plan, try to prevent long-term emotional distress, and recognize emotions among victims, trying to comfort or calm them (Armstrong et al., 2014; Meda et al.,

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2012; Regehr et al., 2008). However, the gradual loss of control over this conscious strategy can lead to the inability to relate emotionally to loved ones and engage in an emotional relationship (Regehr et al., 2008).

Empathy and alexithymia are considered important characteristics of those who work with traumas, enabling greater understanding of the client's emotional experience, being more able to differentiate between the needs of self and client, more adept at conceptualizing "client dynamics", and giving better victim assistance (Figley, 1995). In a broad sense, empathy is the ability to react to the experiences one observes in another (Kim et al., 2018). Empathy helps to understand the traumatic process the victim is going through, but during the understanding process, the professional can become traumatized in the same way (Figley, 1995). In turn, this can be increased by the individual's history of disorders along with their traumatic memories (Figley, 1995). Furthermore, emotional empathy may increase the vulnerability to traumatic stress and other negative emotional symptoms (Regehr et al., 2002). In the context of emergency services, excessive empathy may be accompanied by increased stress (Grevin, 1996; Regehr et al., 2002), with emotional empathy predicting traumatic stress symptoms, somatization, interpersonal sensitivity, depression, anxiety and phobic anxiety (Wagner et al., 2019).

Alexithymia is a psychological construct characterized by difficulty in identifying, describing and/or expressing emotions and an externally-oriented style of thinking (Taylor & Bagby, 2004). It is not simply related to the level of trauma exposure, but rather to the symptomatic responses to the event(s) (McCaslin et al., 2006).

The literature suggests that alexithymia has a positive correlation with traumatic stress and with the risk of developing PTSD in emergency workers (Declercq et al., 2010; Heinrichs et al., 2005; McCaslin et al., 2006). Halpern and colleagues (2012) understood that firefighters' difficulty in identifying feelings has an association with symptoms and the degree of expressed feelings relates to the number of helpful contacts with others in the first 24 hours post-incident.

Given the above, and as far as we know, no study has empirically examined differences in psychological morbidity, empathy and alexithymia symptoms between volunteer and career firefighters. Building on existing literature, the main purpose of this study was to assess the similarities and differences between volunteer firefighters and career firefighters, comparing with a comparison group, regarding characteristics such as psychological morbidity, which includes trauma and psychological distress, and concerning empathy and alexithymia.

Following previous findings, our first hypothesis was that firefighters would have more psychological morbidity than comparison participants. More specifically, the firefighter group would present higher levels of trauma than the comparison group, given their frequent exposure to emergencies, and, as an exploratory hypothesis, we expected that volunteers would present more trauma than career firefighters. We also hypothesized exploratively that there would be differences in levels of empathy among the groups, with firefighters scoring higher on the perspective-taking scale, and lower on personal discomfort and fantasy scales than non-firefighters. Concerning alexithymia, and by its relation with traumatic stress in emergency workers, we hypothesized that firefighters would score lower than comparators.

METHOD

Participants

Eligible participants were over 18 years old, with Portuguese nationality, and without any cognitive or physical inability that would prevent them from independently replying to the self-report measures. Firefighters belonged to several fire departments in Portugal. The comparison group was recruited from the general population, involving non-firefighters resident in North and Central Portugal. The researcher invited 1068 individuals to participate in the study. We decided to only include participants who were Portuguese nationals, so as to understand the reality of the situation for Portugal, its firefighters and its population. Thus, all those who did not mention Portuguese nationality in the socio-demographic questionnaire were excluded.

Of these, following the inclusion criteria, a total of 1062 participants were recruited, including 660 firefighters, of which 363 were career firefighters, 297 volunteer firefighters and 402 non-firefighters from the general population (comparison group).

Table 1 presents comparisons between career firefighters, volunteer firefighters, and comparators regarding socio-demographic characteristics. Differences were found between groups when analyzing age, sex, marital status, and level of education. The average age at enrollment of people included in the comparison group was significantly lower than in the career firefighter, $p < .05$ and volunteer firefighter, $p = .013$ groups. Regarding sex, firefighter groups had fewer women than the comparison group. In the career

firefighter and comparison groups, the majority were not married, while in the volunteer firefighter group most were married or in a partnership. Most people in the sample had at least secondary education.

As for the category in the firefighter corporation, most of the firefighters were 1st class (6.45%), 2nd class (14.4%), or 3rd class (23.8%). In decreasing order, the firefighter sample was divided into chief / sub-chief (6.9%), command team (4.6%), intern (3.0%), official (1.3%) and specialist driver (0.5%). Average length of service as a firefighter was 14.09 ($SD = 10.81$) years, with volunteer firefighters having 15.33 ($SD = 9.43$) years of experience and career firefighters 13.08 ($SD = 11.72$) years of experience, $p = .008$.

Table 1. Sample characteristics.

			Career firefighters (<i>n</i> = 363)	Volunteer firefighters (<i>n</i> = 297)	Comparison group (<i>n</i> = 402)	$\chi^2/F, p$
Age (years)		Mean (<i>SD</i>)	34.66 (12.63)	36.57 (9.84)	33.86 (13.77)	4.15, .016
Sex	Woman	<i>n</i> (%)	121 (33.3)	69 (23.2)	224 (55.7)	45.01, < .001
	Man	<i>n</i> (%)	242 (66.7)	228 (76.8)	178 (44.3)	
Marital status	Not married	<i>n</i> (%)	186 (51.2)	112 (37.7)	232 (57.7)	15.69, < .001
	Married/ partnership	<i>n</i> (%)	156 (43.0)	154 (51.9)	154 (38.3)	
	Widowed/ separated/ divorced	<i>n</i> (%)	21 (5.8)	31 (10.4)	16 (4.0)	
Level of education	Basic education	<i>n</i> (%)	97 (26.7)	83 (27.9)	43 (10.7)	61.39, < .001

Note: *SD* = Standard deviation.

In the following analyses, the characteristics of age and sex will be incorporated as covariates already known from previous studies (Bartlett et al., 2018; Semmens et al., 2016).

Measures

All participants completed a socio-demographic questionnaire to collect information about age, sex, partnership status and level of education. Firefighters also completed a questionnaire that included questions related to their category in the firefighter corporation and years of experience.

Kessler Psychological Distress Scale (K10; Pereira et al., 2019). The K10 is a self-report measure that assesses the frequency of non-specific psychological distress symptoms over the last 30 days and is based on questions about anxiety and depression symptoms. The K10 contains ten items rated on a 5-point Likert scale ranging from 1 (never) to 5 (all the time). The total scores range from 10 to 50, with higher scores indicating higher levels of distress and scores higher than 22 suggesting the risk of having a mental disorder. Scores from 10 to 15 indicate “low distress”, 16 to 21 “moderate”, 22 to 29 “high” and 30 to 50 “very high”. The Cronbach alpha of our sample was .933, confirming good internal consistency.

Impact of Event Scale-Revised (IES-R; Matos et al., 2011). The IES-R assesses subjective suffering from a specific life event. It contains 22 items distributed over three sub-scales: intrusion (8 items), avoidance (8 items) and hyperarousal (6 items). Each item is answered using a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). In this study, the Cronbach alpha coefficient was .976.

Interpersonal Reactivity Index (IRI; Limpo et al., 2013). The IRI is a measure of empathy consisting of 24 statements about feelings or thoughts a person might or might not have experienced. Based on a multidimensional conception, empathy integrates four topics: Perspective-Taking, which reflects the tendency to adopt the other's point of view; Empathic Concern, which measures the ability to experience feelings of compassion and concern for others; Personal Discomfort, which assesses feelings of anxiety, apprehension and discomfort in tense interpersonal contexts; and Fantasy, which assesses the person's propensity to put themselves in fictitious situations (Limpo et al., 2013). Each sub-scale has six items, which are answered on a 5-point Likert Scale ranging from 0 (“does not describe me well”) to 4 (“describes me very well”). The Cronbach alpha of this sample for the four sub-scales were .624 (perspective-taking), .670 (empathic concern), .692 (fantasy), and .726 (personal discomfort).

Toronto Alexithymia Scale (TAS-20; Praceres et al., 2000). The TAS-20 is a self-report instrument formed by 20 items distributed over three factors, according to the construct of alexithymia: difficulty in identifying feelings and distinguishing them from the bodily sensations of emotions; difficulty in describing feelings to others and outward-oriented style of thinking. Each item is answered using a 5-point Likert scale

ranging from 1 (strongly disagree) to 5 (strongly agree). The alpha coefficient was good in this sample ($\alpha = .850$).

Procedures

This study was approved by the Ethics and Deontology Council of the University of Aveiro. Those in charge of 41 Portuguese Fire Departments were initially contacted to obtain authorization to administer the questionnaires to the firefighters at the beginning or end of instruction/a meeting or another time. Cultural and recreational associations were contacted to recruit a population for the comparison group. The associations disseminated the study to the region's population and face-to-face collection times were arranged. The aims of the study were explained to the leaders and firefighters, and the comparison group. It was emphasized that their cooperation was voluntary, and confidentiality was ensured. Paper-and-pencil questionnaires were the preferential data-collection method adopted in this study. However, the entire protocol was also available via the online server of the University of Aveiro to increase the sample size, since there is extensive evidence that the two forms of data collection are equivalent (Gwaltney et al., 2008). The formats applied to each participant depended on the individual's own decision. Informed consent was obtained from all participants.

Statistical analysis

Statistical analyses were performed using SPSS Version 26.0 (IBM Corp. Released 2019). Descriptive statistics (means, standard deviation, frequencies) were used to summarize the socio-demographic information of the participants included in the three groups. One-way analysis of variance (ANOVA) and Chi-square tests were used to determine the group differences considering continuous (e.g., age) and categorical variables (e.g., gender), respectively. Multivariate Analyses of Covariance (MANCOVA) using Pillai's trace criterion for handling unequal sample sizes (Tabachnick & Fidell, 2007) were conducted to provide comparisons between the career firefighters group, volunteer firefighters group and the comparison group regarding three combined variables. These were designated 1) psychological morbidity, including trauma and psychological distress; 2) empathy, including the sub-scales of perspective-taking, empathic concern, personal discomfort and fantasy; and 3) alexithymia, with the sub-scales of "difficulty in identifying feelings and distinguishing them from bodily feelings of emotion", "difficulty in describing feelings to others", and "Outward-oriented style of thinking". To test the hypotheses, age (continuous) and sex (2 levels) were inserted as covariates in all analyses. These analyses were followed by both univariate tests.

RESULTS

Psychological morbidity (Trauma and Psychological distress)

A multivariate group effect was observed. In other words, the MANCOVA model found a significant effect of group (career firefighter, volunteer firefighter or comparators) on a combined dependent variable called psychological morbidity, $V = 0.033$, $F(4, 1568) = 6.557 = 4.00$, $p < .001$, $\eta_p^2 = .016$. When we examined the univariate main effects and marginal means of each of the two variables included, we found there was a principal effect of group for the variable trauma, but not for psychological distress, after we controlled for age and sex (Table 2). Although there was a group effect for trauma, there were only differences between the firefighter groups and the comparison group. Career and volunteer firefighters obtained higher trauma scores than the comparison group, $p = .01$ and $p < .001$, respectively.

Empathy

There was a significant group main effect regarding empathy and its subscales, $V = 0.068$, $F(8, 1356) = 6.007$, $p < .001$, $\eta_p^2 = .034$. Results from the univariate ANOVAS and estimated marginal means showed that there was a principal effect of group on the sub-scales of perspective-taking, personal discomfort, and fantasy, but not for empathic concern, controlling for age and sex (Table 2). This showed that career firefighters scored higher on the perspective-taking scale than the comparison group, $p < .01$. Furthermore, firefighter groups scored lower on the personal discomfort sub-scale than the comparison group, $p < .01$; while career firefighters and volunteer firefighters had lower scores on the fantasy sub-scale than the comparison group, respectively, $p = .04$ and $p = .02$.

Table 2. Descriptive statistics, multivariate and univariate analysis: a comparative analysis between career firefighter, volunteer firefighter and comparator.

	Career firefighter (n = 363)			Volunteer firefighter (n = 297)			Comparators (n = 402)			F, p	η_p^2
<i>Psychological morbidity</i>											
Trauma	13.52	1.03	(11.50-15.54)	15.06	1.15	(12.82-17.31)	8.33	1.05	(6.28-10.39)	10.35, < .001	.026
Psychological distress	16.96	.41	(16.15-17.77)	17.60	.460	(16.70-18.51)	17.49	.42	(16.67-18.32)	.66, > .05	.002
<i>Empathy</i>											
Perspective-taking	2.79	.04	2.70-2.87	2.66	.05	(2.57-2.75)	2.61	.04	(2.53-2.69)	4.69, .01	.004
Empathic concern	2.66	.04	2.58-2.75	2.66	.05	(2.57-2.75)	2.68	.04	(2.60-2.76)	.07, > .05	.014
Personal discomfort	1.22	.05	1.13-1.30	1.07	.05	(.97-1.17)	1.46	.04	(1.37-1.54)	17.84, < .001	.000
Fantasy	1.86	.05	1.77-1.96	1.84	.05	(1.73-1.94)	2.03	.05	(1.94-2.12)	4.79, < .001	.050
<i>Alexithymia</i>											
Difficulty in identifying feelings and distinguishing them from bodily feelings of emotion	16.14	.35	15.46-16.82	16.14	.39	(15.37-16.91)	16.63	.36	(15.92-17.34)	.59, > .05	.002
Difficulty in describing feelings to others	13.96	.22	13.53-14.39	13.82	.25	(13.34-14.31)	14.56	.23	(14.12-15.01)	2.81, > .05	.007
Outward-oriented style of thinking	25.07	.31	24.47-25.68	24.41	.35	(23.72-25.09)	26.47	.32	(25.84-27.1)	9.73, < .001	.025

Note: Estimated marginal means were used; post hoc analysis using Bonferroni approach. SE standard errors. ^aUsing Pillai's Trace.

Alexithymia

Concerning alexithymia, a significant group main effect was found, $V = 0.028$, $F(6, 1512) = 3.582$, $p = .002$, $\eta_p^2 = .014$. When we examined the univariate main effects and marginal means of each of the three variables included, we found that there was a principal effect of group on the variable “Outward-oriented style of thinking”, but not on “difficulty in identifying feelings and distinguishing them from bodily feelings of emotion”, or on “difficulty in describing feelings to others”, after we controlled for age and sex (Table 2). The results from the univariate ANOVAS and estimated marginal means showed that career and volunteer firefighters showed lower levels of alexithymia than the comparison group, respectively, $p = .006$ and $p < .01$.

DISCUSSION

This study described the psychological morbidity, empathy and alexithymia of career firefighters compared to volunteer firefighters and comparators. Overall, the findings show that psychological morbidity, empathy and alexithymia are distinguishing features and can be considered vulnerability factors of mental health and mental disorders. During emergencies, firefighters are exposed to extreme conditions and repeated traumatic events, impacting physical, psychological and emotional stress. They are therefore more likely to develop secondary trauma (Armstrong et al., 2014; Meda et al., 2012).

Not surprisingly, firefighters, frequently exposed to emergencies, perceived more trauma than the general population, controlling for age and sex. It is known that due to the stressful nature of emergency work, firefighters are frequently exposed to highly unpredictable traumatic events involving serious risks (Armstrong et al., 2014; Meda et al., 2012). With high levels of traumatic stress, the stressors are perceived as uncontrollable and threatening, leading to this population’s increased risk of developing of PTSD symptoms or traumatic symptoms (Berger et al., 2012; Lee et al., 2014).

Empathy is considered an important characteristic of those who work with traumas (Figley, 1995). However, it is known that greater empathy can lead to increased stress and emotional empathy can predict symptoms of traumatic stress (Wagner et al., 2019). Faced with emergencies, career firefighters reported feeling more empathy than comparators, i.e., they tend to adopt the views of another person. In general, compared with non-firefighters, firefighters reported feeling less personal discomfort, such as feelings of anxiety and apprehension in tense interpersonal contexts. This result confirms that they use adaptive resources and strategies to lower their suffering when they are focused on rescue actions (Armstrong et al., 2014; Meda et al., 2012; Regehr et al., 2008). However, firefighters score lower on fantasy, i.e., they are less likely to put themselves in fictitious situations (Stanley et al., 2017). They seem to be more pragmatic and realistic in tense situations, which can allow them to adopt the perspective of others and experience less discomfort. They seem to develop an adaptive mechanism that, emotionally distancing themselves, allows them to function in a constantly stressful and emotional work environment, to cope with the anxiety of confronting illness, emotional distress and suffering (Grevin, 1996; Regehr et al., 2002).

Alexithymia is seen as a risk factor for developing various clinical disorders (Bagby et al., 1994; Praceres et al., 2000). Firefighters seem to show lower levels of alexithymia, namely in an outward-oriented style of thinking. In other words, firefighters show thinking not so much with a stimulus-bound, externally oriented cognitive style, but give more attention to feelings and emotions, namely victims’ feelings and experience, which corresponds to empathy.

Regarding the years of experience for firefighters, also a characteristic assessed in this study, we know that personal distress was negatively predicted by experience working in emergency services (Francis et al., 2018). Thus, emergency department experience is negatively related to measures of social functioning, such as emotionality, described as a self-oriented trait associated with fear and empathic sensitivity (Francis et al., 2018), with serious impacts on firefighters’ mental health.

Given the stressful nature of emergency work, professionals often consciously dissociate themselves from their emotional reactions both to increase their ability to focus on the treatment plan and to try to prevent long-term emotional distress (Regehr et al., 2002). This conscious strategy is adaptive for professionals who encounter such situations frequently. While interpreting the distress of another with cognitive awareness may be beneficial for emergency responders, an emotional connection may increase the vulnerability to traumatic stress and other negative emotional symptoms (Regehr et al., 2002). In addition to health benefits, stress tolerance may contribute to preventing lower performance in situations where health and life are at stake (Janka & Duschek, 2018). However, this emotional withdrawal, when used frequently and without control, can lead to the inability to relate emotionally in various types of relationships, in a professional but also personal, family and social setting. This occupational group is frequently neglected in research, although they are the first to respond, and sometimes the last to seek help. It is important to pay more attention to their emotional states after rescue situations. Regular assessment of trauma and related symptoms, levels of empathy and alexithymia among firefighters are essential in

order to prevent a negative impact on mental health, well-being and emotional recognition skills, which are crucial for good performance when helping victims.

Some limitations of this study are related to our sample of firefighters, which included mostly males. Research on female firefighters is needed. On the other hand, the comparison group sample, notwithstanding being the "gold" sample, was mainly female, which can introduce bias in the results regarding firefighter vs non-firefighter differences. Secondly, only status as a volunteer or career firefighter was assessed, with no data on individuals who changed from one role to another.

Future studies could analyze comparisons between the general population and firefighters in terms of different essential characteristics not assessed in this study, such as risk behaviors, burnout and coping strategies. Furthermore, in addition to assessing the same characteristics integrated in this study, it may be interesting to use a population comparison group, more specifically health or helping professionals. Based on the findings of the present research, we suggest that more prevention and treatment work should be directed at firefighters. A further suggestion is to carry out educational and therapeutic interventions that focus on strategies to deal with trauma, to enhance empathy and decrease alexithymia, with benefits for emotional management among these critical members of the emergency service community. The current study indicates that intervention strategies should emphasize personalized support in handling emotions.

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Fabiana Rodrigues: Conceptualization; Data Curation; Formal analysis; Investigation; Methodology; Visualization; Writing - Original Draft; Writing - Review & Editing. **Ana Bártolo:** Conceptualization; Data Curation; Formal analysis; Investigation; Methodology; Resources; Writing - Original Draft. **Isabel M. Santos:** Conceptualization; Data Curation; Formal analysis; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing - Original Draft; Writing - Review & Editing. **Anabela Pereira:** Formal analysis; Investigation; Project administration; Supervision; Validation;

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