

Stress coping styles in firemen exposed to severe stress

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Summary

Aim. Emergency service workers such as firemen are exposed to severe stress, which may result in deteriorated functioning and development of post-traumatic stress disorder (PTSD). The aim of the presented study was to assess the stress coping styles of firemen exposed to severe stress, the prevalence of PTSD symptoms, and the correlation between them.

Material and methods. The study was carried out in a group of 147 Polish firemen. Two questionnaires were used: the Coping Inventory for Stressful Situations (CISS) and the PTSD Interview (PTSD-I) in the Polish language version (K-PTSD).

Results. The firemen most frequently demonstrate attempts of active coping with stress tension ($M = 56$ for TOC), whereas the methods involving focusing on oneself and one's negative emotional experiences are the least popular ($M = 31$ for EOS; and $M = 40$ AOS). The ability to involve in the active coping strategies (task-oriented coping, TOC), distinctly differentiated forty-year-olds from the subjects in their twenties; ($p = 0.0330$) $H(2, N = 147) = 6.62$. A correlation between the increase of emotional tension and the tendency to undertake coping strategies focused on emotion was observed in the study group, $Z = (-2.75)$ ($p = 0.005$).

Conclusions. Nearly one third of the investigated group of firemen suffered from symptoms of PTSD, with the stress coping strategy most often observed in that subgroup being style focused on avoidance. Age proved to be a factor associated with the readiness to undertake behavioral measures to cope with stress tension; such behavior tends to be undertaken by older firemen.

Key words: firemen, stress, PTSD

Introduction

The representatives of professions referred to as rescue and emergency services (firefighters, policemen, healthcare professionals) encounter other people's problems that are far beyond the everyday experience of an average person (violence, physical or mental suffering, diseases, death, etc.) during their routine occupational activities

[1, 2]. The firefighters constitute a group particularly exposed to the form of stress referred to as traumatic stress due to involvement in the events which are often threatening to their physical integrity, associated with witnessing death, situations hazardous for life or health of other subjects rescued from various accidents or disasters [3–6]. Special factors characterizing the fireman's work include not only participation in firefighting and rescue operations, full availability and shift work, but also exposure to psychologically burdening situations.

The result of exposure to such situations may be development of Post-Traumatic Stress Disorder (PTSD), which in 1980 was recognized by the American Psychiatric Association as a mental disorder [7]. In the past, it affected mainly the subjects who experienced such traumatic events as imprisonment in one of the Nazi concentration camps (the term previously used for this disorder was Concentration Camp Syndrome), under continuous threat of the loss of life due to bad luck, epidemics, hunger, exhaustion etc. The survivors demonstrated most frequently more or less discrete symptoms of PTSD, persisting for 15–30 years after leaving the camp [8]. The most often mentioned classic PTSD symptoms include: persistent returning to the past and re-experiencing of the traumatic event with simultaneous compulsive avoidance of stimuli associated with the trauma, general emotional numbness and enhanced arousal. Additionally, severe reactions originating from the autonomic system and affecting the heart rate, blood pressure, release of catecholamines, endogenous opioids and glucocorticosteroids have been reported in people at risk for PTSD [9–11]. Thus, severe stress has a significant physiological component. Among proposed models of PTSD the most often are such factors as: intrusion, avoidance, emotional numbness, increased arousal, dysphoria, dysphoric arousal or anxiety arousal [12].

In the USA, 7–37% of the assessed firemen have been estimated to have PTSD [13]. In a study carried out in a group of over 400 German firefighters in 1998, the presence of PTSD symptoms was found in 18.2% of cases [14]. In Poland, the problem was first addressed in the studies conducted by the Institute of Occupational Medicine in Lodz in the late 1990's. As a result of that research, 82% of professional firemen were reported to have experienced traumatic events, 70% – more than one event of that type and over 4% of professional firemen were diagnosed with so severe and long-lasting symptoms that they could be regarded as suffering from the disorder, despite the fact that they remained in service all the time. Additionally, the occurrence of PTSD symptoms in the past, increasing the risk of developing a more severe form of the syndrome due to exposure to further traumatic events, was demonstrated in ca. 2% of the study group [15–17].

Subjects under chronic occupational exposure to traumatic stress resulting from providing assistance in emergency situations (including, undoubtedly, firefighters) may demonstrate distant effects, not only psychological but also physiological ones, affecting adversely the firemen's physical fitness and the quality of their performance – in the profession in which full psychosomatic fitness, exceptional self-control and capability of rational assessment of the situation at the moment of emotional stress is expected

[6, 17]. Critical and crisis situations encountered by the emergency services because of their particular character may be difficult to cope with on one's own. Therefore, it has been postulated to provide their workers with professional medical and psychological assistance. Such severe stress is known to expose the affected person to the risk of serious injuries, threatening his/her physical integrity, when it is necessary to help in extremely dangerous situations, witnessing other people's death, suffering or threat to their life or health [11, 18].

Extensive studies were carried out, among others, in a large group of firemen from the southwest part of the USA [13]. The study of that group focused on the assessment of mental state and the presence of any mental disorders. Other studies [12, 18] focused on the search for correlations between the techniques of acting out stress and the indicators of mental health such as anxiety, depression, post-traumatic stress symptoms, as well as between the coping potential and personal resources of the firefighters. The above variables are mentioned in the theories of stress and stress coping developed in the areas of psychology and traumatology [9, 19]. All of them are very important for the course and dynamics of the stress reaction, which is therefore complex and problematic. As it follows from detailed analysis of the relevant literature, subjects who have experienced traumatic situations constitute a risk group with increased probability of developing a number of somatic, mental and social functioning disorders [20, 21].

Although many years of discussion over the clinical presentation of PTSD and publication of DSM-5 in 2013 and ICD-11* publication plans for 2017, the researchers still have neither comprehensible idea about diagnosis of this disorder nor the factor structure of PTSD symptoms [7]. As a result the K-PTSD questionnaire is used in this paper. This tool was developed on the background of PTSD criteria described in DSM-III-R. However, its original version was based on criteria introduced in DSM-III. Out of many analyses, the five-factor model seems to be exceptionally interesting. It includes intrusion, emotional avoidance and increased arousal (recognized as anxiety arousal). Moreover, it divides such symptom as dysphoria into numbness and dysphoric arousal.

The aim of this study was to assess the stress coping styles in firefighters taking part in rescue operations associated with high stress burden.

The following research question was formulated: Do firefighters exposed to severe stress develop symptoms of post-traumatic stress disorder (PTSD) and does the occurrence of severe stress features correlate with stress coping styles?

Material and method

The study was carried out in a group of 147 firemen from the State Fire Service in the Greater Poland Province, working in a fire brigade (in 24 hours on-duty, 48 hours

* Editorial note: information on the publication of ICD-11 can be found on the WHO website.

off-duty system) aged 19–49 years, with positive results of periodic medical examinations assessing their fitness for work. All the investigated subjects were males; the mean age in the study group was 33 years, whereas the average duration of service was 10 years and 6 months. The fireman with the shortest duration of employment had started the service 3 months before the commencement of the study, the longest service duration was 21 years. The participants of the study were relatively young: 61 subjects (41% of the study population) were in their twenties, 51 subjects (35%) were thirty-year-olds. There were 35 forty-year-olds (24%). From the point of view of their fitness for service, all the participants presented up-to date medical certificates. It was important to assess their stress coping styles and to compare them with subjects not employed in emergency services.

The questionnaire was administered after one of the traumatic events mentioned in the Introduction, to which the respondents had been called while on duty in one of the fire-fighting units in the Greater Poland Province (event associated with a large number of casualties, death of a person involved, injuries or death of a child/children, or injuries or death of a fellow fireman). The number of respondents of the questionnaire allowed statistically valid analyses. The participation in the study was voluntary and anonymous.

The stress coping styles were assessed by means of the Coping Inventory for Stressful Situations (CISS) adapted by Strelau, Jaworowska, Wrześniewski, and Szczepaniak [22]. This tool consists of 48 statements concerning behaviors of the questioned subjects in stressful situations. The questionnaire comprises 3 scales, each containing 16 statements. The scale for task-oriented coping style (TOC) describes the style involving undertaking actions and efforts with the aim to solve the problem by changing the problematic situation, or by cognitive transformation. The emotion-oriented coping (EOC) scale concerns the style represented by subjects focusing on the experienced emotions, wishful thinking and fantasies to relieve emotional stress. The third and last scale characterizing the avoidance-oriented coping style (AOC) describes the coping measures taken by subjects who avoid thinking, experiencing or re-experiencing a stressful or problematic situation. The scale contains two distinct subscales: social diversion (SOD) and distraction (D).

Another tool used in the study was the Questionnaire for Measurement of Post-Traumatic Stress Disorder in the Polish language version (K-PTSD) [23]. It is the Polish version of the tool developed by Watson et al. as the PTSD-Interview (PTSD-I). The criterion for reaction to severe stress was underlining by the respondent of at least 1 symptom of re-experiencing, avoidance or arousal (with the score of 4 for severity/frequency of the symptom). Such easing of the criterion was justified by the design of the study, focusing on the instant effect of a traumatic experience on the respondent's psyche. The questionnaires were administered within the first 72 hours following participation in a firefighting rescue operation hazardous for life or health. Adopting such a lenient criterion for diagnosing the respondent as presenting features of PTSD results from the fact that if a criterion of admitting to at least 1 re-experiencing symptom, 3

avoidance and 2 arousal ones occurring relatively often (with the score of at least 4 in the severity scale and duration no shorter than 1 month) had been used, none of the investigated subjects would have demonstrated the presence of PTSD (according to DSM criteria – ASD due to the time between examination and the traumatic situation). Low scores in the PTSD–I correlate with similar results obtained by Koniarek and Dudek, who studied a group of 947 firemen, only 41 of whom (4.2% of the investigated population) were diagnosed with PTSD symptoms [16]. The authors of this study then stayed at the term “reaction to severe stress”, describing the reaction of respondents witnessing traumatic events and presenting a broad spectrum of emotional and cognitive reactions associated with this event.

The statistical analysis was made on the basis of STATISTICA 10.0 (StatSoft). The measured variables were in ordinal scale. The comparison of two groups was made using the Mann-Whitney U test. In the case of comparing more than two groups the Kruskal-Wallis test and post-hoc Dunn’s tests were used. The tests were statistical significant at $p < 0.05$.

Results

Table 1 presents the stress coping styles reported by the respondents’ answers to the CISS questionnaire. As it results from the data, attempts of active coping with stress were most frequent. Focusing on oneself and one’s negative emotions was the least popular style. The constructive coping strategy indicates that the respondents can draw on the resources allowing to cope with the work-related burdens.

Table 1. **Stress coping in the study group $N = 147$**

Style of coping with stress	Mean	Median	SD	Min.	Max.
TOC	54.80	56	9.16	28	80
EOC	31.40	31	8.52	16	51
AOC	38.73	40	9.08	19	63
D	16.21	16	4.70	8	32
SOD	15.02	15	3.65	6	24

SD – standard deviation

The descriptive statistics for two groups: with and without reaction to severe stress were presented in the table below.

Table 2. Stress coping in subjects diagnosed with PTSD and without PTSD symptoms

Style of coping with stress	N	Mean	Median	SD	Min.	Max.
With PTSD symptoms	47					
TOC		56.57	56	8.02	35	71
EOC		34.17	33	7.43	20	51
AOC		41.19	42	8.59	22	61
D		15.77	15	4.50	8	15
SOD		14.57	15	3.73	6	24
Without PTSD symptoms	100					
TOC		53.97	56	9.49	28	80
EOC		30.10	29	8.64	16	50
AOC		37.58	38	9.03	19	61
D		15.77	15	4.52	8	26
SOD		14.57	15	3.75	6	24

SD – standard deviation

The participants presented statistically significant heterogeneity in terms of the distribution of answers to PTSD-I items. It was presented in Table 3. The data in the table include both the whole population and subgroups with and without symptoms of severe stress. The differences between groups were statistically significant. Table 3 also includes descriptive statistics obtained in the scales of the PTSD-I in particular subgroups.

Table 3. Descriptive statistics of answers to PTSD-I items

Specification	N	Mean	Median	SD
All participants	147			
Re-experiencing		7.41	7	4.37
Avoidance		9.31	8	5.56
Arousal		6.34	5	4.19
With PTSD symptoms	47			
Re-experiencing		11.49	11	3.93
Avoidance		14.64	13	5.08
Arousal		9.91	9	4.67
Without PTSD symptoms	100			
Re-experiencing		5.49	6	3.92
Avoidance		6.81	7	3.71
Arousal		4.66	5	2.60

SD – standard deviation

Another area of interest was the coping style observed in the groups with intense reaction to severe stress versus the firefighters showing no evidence of the syndrome. The study revealed certain differentiation of answers to the items of the questionnaire between two subgroups. The finding that subjects with intense reaction to severe stress more frequently attempted to cope with stress actively, searching for solutions to emotionally burdensome situations, and responded more actively in terms of avoidance strategies, is an unexpected result. As it results from the analysis, firefighters experiencing high levels of stress and anxiety undertake active attempts to relieve the stress-related discomfort.

The results presented in Table 3 indicate an interesting trend towards more active coping among subjects with PTSD symptoms. However, the differences between the values did not reach statistical significance for the task-oriented style. There were significant differences between groups in terms of emotion-oriented style, avoidance-oriented style and social diversion.

Table 4. Differences in stress coping style in the group with and without intense reaction to stress

Variable	Mann-Whitney U test (adjusted for continuity) against variable: PTSD, The results marked in bold are significant at $p < 0.050$						
	Rank-sum Without PTSD	Rank-sum With PTSD	U	Z	p	adjusted Z	p
TOC	7034.0	3844.0	1984.0	-1.518	0.129	-1.519	0.128
EOC	6729.0	4149.0	1679.0	-2.785	0.005	-2.787	0.005
AOS	6838.5	4039.5	1788.5	-2.330	0.019	-2.332	0.019
D	6965.0	3913.0	1915.0	-1.805	0.071	-1.809	0.070
SOD	6840.5	4037.5	1790.5	-2.322	0.020	-2.330	0.019

Results marked in bold are statistically significant; U – Mann-Whitney U test result; Z – test statistic; p – probability coefficient

In the whole group, a correlation between the downgrading of stress intensity and the tendency to choose emotion-oriented coping strategies (EOC) with the aim to control the intensity of emotions was observed. For this relationship between variables the value of the statistics was $Z = -2.75$ ($p = 0.005$). The above result indicates the presence of a significant negative correlation between the analyzed variables in the study group. The distribution of firemen's answers to the questions concerning their stress coping styles allows to observe that there is a statistical correlation between emotion-oriented coping with stressful situations (EOC) and reduced stress demonstrated by the increase in the PTSD-I scores. The analysis proved that the higher stress intensity, the stronger the tendency to control stress by avoidance strategies (AOS). For this relationship the z value was $Z = -2.33$ at $p = 0.019$. The relationship between the variables indicating the severity of PTSD symptoms and the tendency to avoiding and distancing from stressful situation was the strongest. The analogous tendency

was found in the subscale of AOS which was social diversion. The values of these coefficients were $Z = (-2.32)$ at $p = 0.019$.

The ways of answering the PTSD-I items indicate that intensity of stress reaction is associated with the coherent way of answering. The results on the scales: re-experiencing, avoidance and arousal are increased in relation to the whole study population. It can show that the participants worked out a coherent strategy of coping with negative emotions. Moreover, they are in crisis implied as the moment of exceptional sensitivity and vulnerability to mental hurt. Results obtained in this area can indicate the need of psychological counseling to work out effective strategies of coping with psychological burden.

Table 5. Stress coping strategies in both groups

Variable	Mann-Whitney U test (adjusted for continuity against variable: PTSD The results marked in bold are significant at $p < 0.050$)						
	Rank-sum without PTSD	Rank-sum with PTSD	U	Z	p	adjusted Z	p
Re-experiencing	5551.0	5327.0	501.0	-7.678	0.000	-7.741	0.000
Avoidance	5479.5	5398.5	429.5	-7.975	0.000	-8.067	0.000
Arousal	5698.0	5180.0	648.0	-7.067	0.000	-7.354	0.000

Results marked in bold are statistically significant; U – Mann-Whitney U test result; Z – test statistic; p – probability coefficient

A separate analysis was carried out for coping styles employed in stressful situations measured with the CISS scales according to the respondents' age. More advanced age was found to correlate with a growing tendency to active coping with stress. Forty-year-olds took definitely more active measures to control stress, demonstrating readiness to make efforts to solve the problem, or to change the situation in order to reduce the burden. The TOC scale markedly differentiated the subjects in their forties from the twenty-year-olds; the difference reached statistical significance at $p = 0.0330$; $H(2, N = 147) = 6.82$. The descriptive statistics are presented in Table 6 and comparison of the use of TOC in age groups is presented in Table 7.

Table 6. Descriptive statistics of stress coping styles in different age groups (mean values)

Age	N	TOC	EOC	AOC	D	SOD
19–29	61					
Mean		52.87*	30.48	38.72	16.20	14.97
Median		54	31	40	17	15
SD		8.94	8.69	8.22	4.28	3.59
30–39	51					

table continued on the next page

Mean		55.57	31.80	38.06	15.88	14.71
Median		56	31	39	15	15
SD		9.61	8.44	10.31	5.19	3.88
40–49	35					
Mean		57.06*	32.43	39.74	16.77	15.60
Mediana		59	33	40	16	16
SD		8.43	8.39	8.76	4.73	3.42

TOC – Task-oriented Coping Style; EOC – Emotion-oriented Coping Style; AOC – Avoidance-oriented Coping Style; D – distraction; SOD – social diversion; * $p < 0.05$

Table 7. Comparison of Task-oriented Style between age groups

Dependent variable:	P value for multiple comparisons (two-tailed); TOC, Independent variable: age Kruskal-Wallis Test: $H(2, N = 147) = 6.822; p = 0.0330$		
	19–29	30–39	40–49
TOC	R: 64.189	R: 76.667	R: 87.214
19–29		0.367	0.032
30–39	0.367		0.777
40–49	0.032	0.777	

Results marked in bold are statistically significant

As it results from Table 6 and 7, the oldest subjects responded most actively to stress and obtained the highest scores on the CISS scales. This may indicate greater inhibition and resignation from coping activities in younger firemen or their lower level of skills and personal resources necessary to cope with stress. However, a statistically significant difference in the distribution of answers was observed only with respect to TOC between the oldest firemen and the youngest ones.

Discussion

This research focused on describing emotional reactions of firemen in stressful situations, which may lead to emotional consequences such as post-traumatic stress disorder (PTSD). This research project concerned firemen exposed to severe stress associated with participating in rescue operations, and development of features of stress reaction as a consequence of these operations, and mechanisms of coping. Somewhat different proceeded the research carried out by Ogińska-Bulik and Langer which involved analysis of personality traits in the context of severity of PTSD symptoms [5]. In our study, no analysis focusing on detailed monitoring of personality traits in the context of the employed coping strategies has been undertaken. Undoubtedly, personality traits as resources for coping and effectiveness of the employed coping strategies can become a necessary direction of further research [24]. Further studies

should also take into account resilience and the sense of coherence as important personal resources, allowing the firemen to resist effectively the hazards associated with traumatic situations. The research in the group of 552 Korean firemen indicated that high level of resilience correlated with better coping both with the immediate and long-term consequences of post-traumatic stress [25]. Also the aspect of correlation between the emotion-oriented coping style and involvement in distractive activities in smokers observed in the study by Pietras et al. [26] seems to be of considerable importance, particularly in view of the percentage of firefighters who admit to smoking (over 40% of the 69 questioned firemen from municipal and county fire brigade of the Greater Poland Province) reported in the study by Witt and Romańczukiewicz [27]. On the other hand, Koniarek and Dudek [16] demonstrate a correlation between the duration of employment, regarded by them as an important factor increasing the symptoms of PTSD, and the severity of PTSD symptoms. In the present study, the age of participants, as a broader category associated with the duration of employment and including the psychosocial background of the study subjects, was included in the analysis. Indeed, age has been demonstrated to be a factor associated with active use of various coping strategies. The area requiring clarification is investigation of the sources of social support as a factor protecting the firemen against PTSD and professional burnout syndrome. As observed by Ogińska-Bulik and Langer [5], involvement in a traumatizing event is a condition necessary but not sufficient for the development of PTSD.

Among the factors predisposing for, or preventing the development of disorders in subjects exposed to severe stress, personality and temperament variables, manifested by the individual stress coping style, are mentioned [24]. In this respect, the individual's resources and coping abilities, determining his/her resistance to stress, become particularly important [28, 29]. The least active stress coping styles demonstrated by younger participants indicate the necessity to provide a training program aimed at development of coping mechanisms and personal resources helpful in stress coping, especially for younger firemen with shorter duration of service. Providing support for that category of professional firemen may improve their psychosomatic condition and broadly defined mental health [30]. The correlation between the presence of PTSD symptoms and the tendency to choose avoidance strategies, demonstrated in this study, supports the necessity to provide firefighters with a psychological support program. Emergency services, similarly as the direct victims of a catastrophe, are exposed to traumatic stress during their service. Participation in rescue operations and confrontation with accumulated losses: human suffering and death, loss of property, often involves the threat to health and life of rescuers. The work of emergency services is often an overload and requires full availability. Therefore, the presented research on reactions to extreme overload and contact with dangerous situations illustrates to some extent the image of psychological response to post-traumatic stress (PTSD and ASD).

Psychological support and education seem to be indispensable for the firemen's professional competences and adequate functioning in the profession [31, 32]. Unfortunately, there is still huge disproportion between the number of events with fatalities,

or situations in which firemen worked under extreme psychological strain and the number of psychological consultations providing support after such experiences [33]. Further studies are recommended to highlight the extent to which post-traumatic stress disorder in the study population results from constant contact with life-threatening situations, the risk of physical injuries or contact with human suffering and the need to make important decisions in a situation of physical and mental burden.

Conclusions

1. Firefighters are capable of coping constructively with stress.
2. Nearly one third of the study group of firemen suffered from symptoms of severe stress.
3. Firemen suffering from severe stress reaction more often employ stress coping strategies based on emotions and avoidance, including social diversion.
4. Age is a factor associated with readiness to undertake behavioral measures to cope with stress tension. Older firemen tend to use active stress coping strategies.

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