

## Impacts of stress on occupational exposure of firefighters: an integrative review

*Impactos do estresse na exposição ocupacional de bombeiros: revisão integrativa*

*Impactos del estrés en la exposición ocupacional de los bomberos: una revisión integradora*

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### ABSTRACT

**Objective:** to identify mental health impacts of occupational exposure-related stress among firefighters. **Method:** this integrative literature review searched the CINAHL (EBSCO), PsycINFO, MEDLINE®, LILACS, Web of Science, Scopus and SCIELO databases, using the descriptors: "Occupational Stress", "Firefighters", "Occupational Exposure". The inclusion criteria were: original articles; between the years 2009 and 2019; full text available; cross-sectional studies; in Portuguese, English and/or Spanish; and whose study population included firefighters. **Results:** 11 articles were analyzed. Firefighters' exposure was found to impact the triggering of depressive symptoms and post-traumatic stress disorder. **Conclusion:** the evidence in this study demonstrated that firefighters' occupational exposure interferes with their mental health patterns, causing stress through psychological suffering. This study warns of the need for intervention and promotion of firefighters' health.

**Descriptors:** Firefighters; Occupational exposure; Psychological Distress; Occupational Stress.

### RESUMO

**Objetivo:** identificar os impactos na saúde mental de bombeiros relacionados ao estresse da exposição ocupacional. **Método:** trata-se de uma revisão integrativa da literatura nas bases de dados CINAHL (EBSCO), PsycINFO, MEDLINE®, LILACS, Web of Science, Scopus e SCIELO. Para a estratégia de busca utilizou-se os descritores: "Occupational Stress", "Firefighters", "Occupational Exposure". Como critérios de inclusão estabeleceu-se: artigos originais; entre os anos de 2009 e 2019; disponíveis completos; estudos transversais; nos idiomas português, inglês e/ou espanhol; e cuja população de estudo incluíssem bombeiros. **Resultados:** nessa revisão foram analisados 11 artigos. Evidenciou-se que a exposição de bombeiros impactou o desencadeamento de sintomas de depressão e transtorno de estresse pós-traumático. **Conclusão:** as evidências deste estudo demonstraram que a exposição ocupacional de bombeiros interfere no seu padrão de saúde mental causando estresse por meio do sofrimento psíquico. Este estudo alerta para a necessidade de intervenção e promoção à saúde do bombeiro.

**Descritores:** Bombeiros; Exposição Ocupacional; Estresse Psicológico; Estresse Ocupacional.

### RESUMEN

**Objetivo:** identificar los impactos en la salud mental del estrés relacionado con la exposición ocupacional entre los bomberos. **Método:** esta revisión integradora de la literatura buscó en las bases de datos CINAHL (EBSCO), PsycINFO, MEDLINE®, LILACS, Web of Science, Scopus y SCIELO, demandando los descriptores: "Estrés ocupacional", "Bomberos", "Exposición ocupacional". Los criterios de inclusión fueron: artículos originales; entre los años 2009 y 2019; Texto completo disponible; estudios transversales; en portugués, inglés y / o español; y cuya población de estudio incluyó bomberos. **Resultados:** se analizaron 11 artículos. Se descubrió que la exposición de los bomberos afecta la activación de síntomas depresivos y el trastorno de estrés postraumático. **Conclusión:** la evidencia de este estudio demostró que la exposición ocupacional de los bomberos interfiere con sus patrones de salud mental, provocando estrés a través del sufrimiento psicológico. Este estudio advierte de la necesidad de intervención y promoción de la salud de los bomberos.

**Descriptores:** Bomberos; Exposición ocupacional; Distrés Psicológico; Estrés Ocupacional.

## INTRODUCTION

According to the World Health Organization (WHO), about 300 million people suffer from depression, representing 4.4% of the world population<sup>1</sup>. The work environment can trigger physical and mental disorders in workers, and generate an annual cost of about \$1 trillion USD in lost production. It is estimated that approximately 4 dollars will be returned in health and productivity<sup>2</sup> for every 1 dollar invested in mental health treatment.

The International Labor Organization (ILO) reveals that occupational stress in Europe represents the second health problem and affects about 40 million individuals. Furthermore, mental and behavioral disorders appear as the third cause for granting sickness benefits and disability retirement in Brazil<sup>3</sup>.

Occupational stress refers to psychological disorders or psychological distress due to work experience and is related to inadequate adaptations to stressful events. It is also characterized as recurrent and contributes to work disability, in addition to favoring early retirement and the risk of suicide<sup>4</sup>.

Psychological suffering caused by stress in the work environment appears as a strategy for coping with non-illness and associated with the psychodynamics of work<sup>5</sup>. It is a way of fighting the emotional state and related to psychological and physical symptoms, and is considered a common mental disorder (CMD), meaning that it is not necessarily linked to the pre-existence of a mental disorder. It is associated with the presence of non-psychotic symptoms such as insomnia, headaches, asthenia, abdominal pain and depressive symptoms, which reduce occupational well-being<sup>6,7</sup>.

In this context, being a firefighter is perceived as a profession which deals with stressful situations in their daily work. They are subject to post-traumatic stress disorder (PTSD) and burnout related to their performed activities<sup>8</sup>.

The fire brigade is responsible for being “coordinator and executing the actions of civil defense, public protection and assistance, fire prevention and combat, fire and explosion expertise in accidents, search and rescue”,<sup>9</sup> in addition to having to attend calls to act in the event of war as a ground force.

Firefighters belong to a little studied population group, and are exposed to various stressful and traumatic events at work. They have high rates of PTSD and substance use such as alcohol in response to experienced situations. The use of alcohol and tobacco in this professional category is associated with depressive symptoms<sup>10</sup>.

These professionals are susceptible to frequent toxic exposures to smoke during firefighting. They respond to all types of emergencies and are exposed to occupational risks of thermal stress, in addition to strenuous physical and mental demands which corroborate mental disorders<sup>11</sup>. Ergonomic risks also favor repetitive strain injuries, mental fatigue, musculoskeletal disorders, sleep disorders and poor posture by first-respondent rescuers<sup>12</sup>. The relationship between work and health of firefighters is only addressed in a few studies in Brazil, especially in relation to the mental health of these professionals<sup>13</sup>.

Thus, this study has social relevance, since firefighters are public security agents who are responsible for safeguarding the population and the importance of promoting subsidies for their career civility is evident. When considering the mental health impacts associated with work, it will allow managers to direct or reframe proposals, attitudes and practices which reduce worker stress. This work academically contributes to understanding factors which interfere in transforming work processes in health, education and safety. To this end, this study aims to identify the mental health impacts of firefighters related to occupational stress exposure.

## METHODS

This is an integrative review of the scientific literature which allows critical knowledge for practice in order to base conduct and guidelines for decision-making<sup>14</sup>.

The six steps proposed for building an integrative review were followed<sup>14</sup>: identification of the theme and elaboration of the guiding question of the research; searching for articles in the scientific literature and establishing criteria for inclusion and exclusion of studies; data collection; critical analysis of the studies included in the review; analysis and interpretation of results; and presentation of the review.

Data collection was carried out in April 2020. The selection of articles included in the review was carried out by two reviewers independently. The theme on the mental health impacts of firefighters related to occupational exposure stress was defined. The guiding question was developed according to the PICO strategy<sup>15,16</sup>, which refers to an acronym which means: participant; phenomenon of interest; and context. Thus, firefighters were considered “P”, impacts of occupational exposure on mental health as “I”, and stressful work environment as “Co”. Thus, the research question was: “What are the impacts of occupational stress exposure on the mental health of firefighters?”

The inclusion criteria were established as the original articles published between the years 2009 to 2019 developed at the national and international level, available electronically in full and whose titles and abstracts exclusively referred to the study theme, in Portuguese, English and/or Spanish, cross-sectional studies, and whose study population included firefighters. Duplicate articles, editorials, opinion and review articles, letters, comments, notes, theses, dissertations and manuals were excluded<sup>14,17</sup>.

A consultation with the Health Sciences Descriptors (DeCS) was carried out to ensure the identification of words and control of vocabulary, and therefore three descriptors associated with the theme were selected: “Occupational Stress”, “Firefighters”, and “Occupational Exposure”. After searching the DECS, it was possible to search the descriptors in the Medical Subject Headings (MESH), PsycINFO Thesaurus and CINAHL Headings.

Crosses were made for the search strategies using the selected descriptors and corresponding keywords combining the Boolean methods OR and AND according to each base: (“Occupational Stress” OR “Job Stress” OR “Work-

related Stress" OR "Workplace Stress" OR "Professional Stress" OR "Job-related Stress") AND ("Firefighters" OR "Fire and Rescue Personnel" OR "Fire Fighters") AND ("Occupational Exposure" OR "Occupational Exposures").

The following databases were used: *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) and the Medical Literature Analysis and Retrieval System Online (MEDLINE®) via *Biblioteca Virtual em Saúde* (BVS); in Psychology Information – PsycINFO, in the CINAHL with Full Text (EBSCO), Web of Science (Institute for Scientific Information) and Scopus (both interface with the CAPES portal) databases; and in the Scientific Electronic Library Online (SCIELO) database.

The items proposed by Ursi's instrument (2006)<sup>17</sup> were followed in extracting information from the articles: name of the original article, methodological characteristics, methodological rigor, measured interventions and results<sup>14,17</sup>.

The articles included in the review were evaluated using the standardized Critical Appraisal Skills Program (CASP)<sup>16</sup> instrument, which is a checklist that assists in critically analyzing quantitative studies regarding rigor and credibility according to the following criteria: clear objective; methodological design appropriate to the objectives; methodological procedures; adequate sample selection; described data collection; relationship between researcher and researched; ethical aspects; reasoned data analysis; results presented and discussed; and relevance of the research.

The strength and type of evidence of the articles<sup>16</sup> were evaluated. Thus, the following were used for the analysis and subsequent synthesis of the articles which met the inclusion criteria and for forming a synoptic table: country and year; study method/participants; results/conclusions<sup>17</sup>. This stage aimed to gather and synthesize the evidence available in the literature, as well as the discussion and conclusion<sup>14</sup>.

## RESULTS

A total of 151 articles were found in the selected databases, however 38 duplicate articles were excluded, thus maintaining only one version of each. After reading the titles, 54 did not meet the inclusion criteria, while another 40 were discarded in reading abstracts as they did not meet the established methodology. Therefore, 19 studies were included for reading in full. After this last stage, 8 did not meet the study eligibility criteria, so finally 11 articles were selected in this integrative review. The number of journals selected in each database were: LILACS = 0, MEDLINE® = 01, PsycINFO = 04, SCIELO = 01, CINAHL (EBSCO) = 02, Web of Science = 0 and Scopus = 3. Figure 1 shows the search diagram as recommended by the PRISMA<sup>18</sup> group for the studies selected by the reviewers.

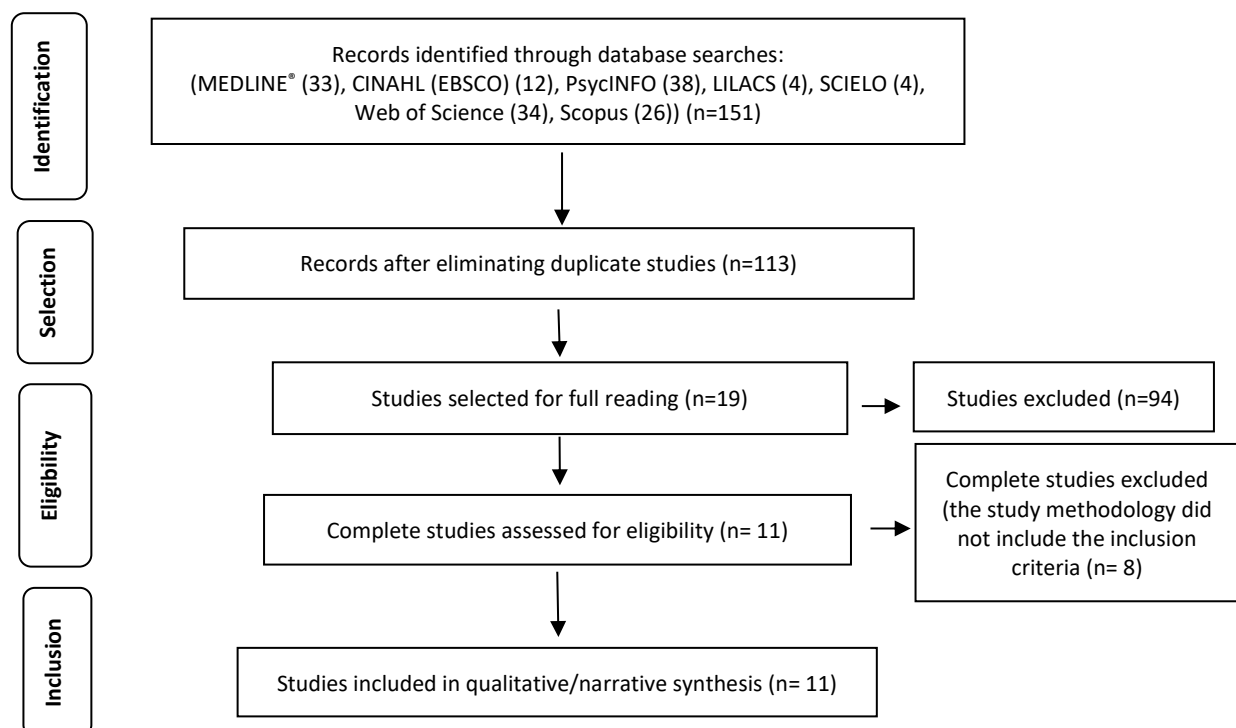


FIGURE 1: Diagram according to PRISMA<sup>18</sup> group regarding the study selection stages by the reviewers (attached).

The articles identified were from different countries (Figure 2), with Brazil and Canada corresponding to the same proportion of 25% (2), while the other countries (United States, Greece, Jamaica, Guatemala, Germany and European countries) presented a proportion of 12.5% (1). Germany and Poland were also present in the survey of European countries. All included studies included cross-sectional designs. The articles were published in different journals in Brazil including the UFPE Nursing Journal online and *Cad. Saúde Pública*; other countries were published in the journals of: Women's Health Issue; Canadian Journal of Behavioral Science; Occupational Medicine; Psychological Trauma: Theory, Research, Practice, and Policy; Journal of Counseling Psychology; Traumatology; Can J Psychiatry; Psychiatr Pol.; and Ann Glob Health.

The year of publication of the articles ranged from 2014 to 2019 (Figure 2). The studies were classified as evidence level 4 (cross-sectional studies) regarding the measurement of the evidence type and strength of each study included in the integrative review<sup>16</sup>. The CASP<sup>16</sup> instrument was applied to the selected articles and contemplated both the instrument items and received a score above 6 points, which indicates good methodological quality and reduced bias.

The synthesis of the articles is grouped in Figures 2 and 3, referring to the characterization of country, year, study method/participants and results/conclusions.

Country/Year	Study method/Participants	Results/Conclusions
Brazil, 2014 <sup>12</sup> .	Cross-sectional study. Checklist used: age, gender, weight and height, working hours and ergonomics, mapping of musculoskeletal symptoms. Conducted with 60 firefighters.	56.7% of the military had mental fatigue and 81.7% muscle; 18.3% had already suffered some type of accident at work. Ergonomic risks are related to psychological, physiological and sleep disorders, in addition to musculoskeletal injuries.
Brazil, 2015 <sup>19</sup> .	Cross-sectional study. The Beck Depression Inventory (BDI) was used. 711 male firefighters participated.	The prevalence of depression in the studied sample was 5.5%. It is higher in those who reported symptoms of post-traumatic stress, and exposure to extreme situations at work may be associated with depression and alcohol abuse.
Czech Republic, Germany, Italy, Poland, Spain, Sweden, United Kingdom and Turkey, 2015 <sup>20</sup> .	Cross-sectional study. Behavior, Security, and Culture – First Responder (BeSeCuFR, Impact of Event Scale-Revised (IES-R) and Post-traumatic Growth Inventory-Short Form (PTGI-SF) were used. 1916 firefighters participated.	Predictors of post-event suffering and growth revealed 29% of the variation in post-event stress and 26% in growth. Exposure to distressing or traumatic work-related incidents can result in negative and positive conditions for firefighters.
Greece, 2016 <sup>21</sup> .	Cross-sectional study. The Self-Report Questionnaire, the Maslach Burnout Inventory (MBI) and the Impact of Event Scale-Revised-Greek version were used. 3289 firefighters participated.	Age, work experience and physical condition were related to psychological exhaustion and post-traumatic stress syndrome, but the condition of being responsible for people's lives was related to stress depression. Traumatic events and occupational activities/obligations can favor the onset of psychological disorders such as depression and musculoskeletal problems.
The United States, 2017 <sup>11</sup> .	Cross-sectional study which used individual demographic data, questions about alcohol use, anxiety history, occupational injuries, job satisfaction. They also used the Short Depression Scale, the Trauma Screening Questionnaire. 256 firefighters participated.	17% of the participants were abstinent from alcohol. Consuming alcohol was strongly associated with emotional health indicators, and 2.5 times more likely to be diagnosed with depressive disorder or post-traumatic stress symptoms. High levels of occupational stress and toxic exposures at firefighters' work increased work-related medical and mental health disorders.

**FIGURE 2:** Presentation of the summary of articles published between 2014 and 2017 included in the integrative review. Uberaba, MG, Brazil, 2019.

Country/Year	Study method/Participants	Results/Conclusions
Jamaica, 2018 <sup>22</sup> .	Cross-sectional study. Used the Job-Specific Scales Assessment, Exposure Scale Assessment, Family Contact Scale, Beck Depression Inventory-II, Posttraumatic Stress Diagnostic Scale, Self-Blame Subscale, PTCI. 259 professionals participated, including firefighters, police officers and medical examiners.	The results showed an increase in negative cognitions related to exposure to trauma in the workplace with symptoms of post-traumatic stress disorder depression. Exposure to trauma in the workplace has effects on sociocognitive processes which contribute to mental health risks, such as depression and post-traumatic stress disorder.
Germany, 2018 <sup>23</sup> .	Cross-sectional study. The Self-Compassion Scale, Patient Health Questionnaire (PHQ-9-D), Posttraumatic Diagnostic Scale, validated German version of the PDS was used. 123 firefighters participated.	The contributions of self-pity to depression symptoms and to stressful and potentially traumatic events only occurred in firefighters with substantial amounts of work experience. Firefighters are exposed to severe traumas and the development of depressive symptoms, self-pity can act as a protective factor for those who work longer hours.
Canada, 2018 <sup>24</sup> .	Cross-sectional study by online research using the instruments: PTSD (PCL-5), Depression (PHQ-9), Anxiety (GAD-7), Social Anxiety Disorder (SIPS), Panic Disorder (PDSS-SR), and Alcohol Use Disorder (AUDIT). 2058 public security officials participated (dispatchers, correctional workers, firefighters, police and paramedics).	The participants had a 44.5% prevalence of mental disorders. This increase was associated with longer working hours and also with older workers (> 27 years). Those who were older in the services had more opportunities for exposure to traumatic events. Firefighters had a higher report of alcohol consumption associated with a coping mechanism. The prevalence of mental disorders was very high in relation to the general population (10.1%), and the inclusion of a complete epidemiological study is suggested to support the mental health of public safety workers.
Poland, 2018 <sup>25</sup> .	Cross-sectional study which used: Coping Inventory for Stressful Situations (CISS) and PTSD Interview (PTSD-I) in the Polish language version (K-PTSD). 147 firefighters participated.	Almost a third of the firefighters in the investigation had symptoms of PTSD associated with exposure to traumatic stress during the service. Older firefighters (40 to 49 years old) have taken better behavioral measures to deal with the stress at work. Psychological support is recommended for younger firefighters, with a higher frequency of PTSD.
Guatemala, 2018 <sup>26</sup> .	Cross-sectional study which answered sociodemographic questions, working conditions and mental health (General Health Questionnaire, GHQ-12). 141 firefighters participated.	Exposure to violence in the workplace was 37%. The prevalence of mental suffering was higher in firefighters exposed to violence (54%). Middle-aged firefighters (40-49 years) had greater suffering from stress. Violence is present in the work of firefighters and associated with mental health problems in this category.
Canada, 2019 <sup>27</sup> .	Cross-sectional study. Data were collected using a self-report survey. They also used The Life Events Checklist for the DSM – 5, the PTSD Check List 5. 4,441 public security officials (dispatchers, correctional workers, firefighters, police and paramedics) participated.	Participants reported exposure to various events at work, including sudden violent (93.8%) or accidental death (93.7%), serious transport accidents (93.2%) and physical assaults (90.6%). Exposure to stressful events at work was associated with several mental disorders, including, but not limited to, post-traumatic stress disorder.

**FIGURE 3:** Presentation of the summary of articles published between 2018 and 2019 included in the integrative review. Uberaba, MG, Brazil, 2019.

## DISCUSSION

In evaluating the work of firefighters in this review, it was observed that ergonomic risks, such as repetitive efforts in managing and removing patients, inadequate posture of the first responders and long shifts contributed to psychological and physical disorders, in addition to impaired sleep and musculoskeletal injuries<sup>12</sup>. Trauma situations considered extreme in the work environment of these professionals were associated with depression symptoms, PTSD and alcohol abuse<sup>19,24</sup>.

A study conducted with public health officials involving firefighters showed a high prevalence of mental disorders (44.5%) associated with older individuals and longer working hours<sup>24</sup>. However, investigations in Poland have pointed out that PTSD symptoms can occur in younger professionals who are not experienced in dealing with work trauma<sup>25</sup>. A survey conducted by 85 studies carried out in 39 countries to verify the prevalence of CMD in the world population estimated 29.2%<sup>28</sup>, a lower value compared to public safety agents.

Research which identified stressors in the occupational environment and the psychological distress of firefighters showed that these events experienced at work are risk factors for developing PTSD and psychological distress<sup>26,29-31</sup>. They are more susceptible to physical diseases<sup>31</sup>, stress due to effort and even shift work with irregular sleep schedules contributing to psychological disorders and risk of suicide<sup>32</sup>.

In an investigation carried out with 1916 firefighters from eight predominantly European countries, it was revealed that exposure to distressing or traumatic events at work can generate negative adaptations such as the triggering of psychological suffering, as well as positive adaptations regarding the individual's resilience capacity<sup>20</sup>. The profession's routine activity itself can contribute to psychological disorders such as depression, in addition to musculoskeletal injuries<sup>21</sup>.

According to the ICD-10 classification of mental and behavioral disorders linked to the World Health Organization (WHO), post-traumatic stress refers to inadequate or poorly adapted responses to severe stress. It is a reaction to the stress of truly threatening events (threatening the safety of loved ones, natural disasters, accidents of various kinds, assault, rape, sudden change of social position and/or interpersonal relationships)<sup>33</sup>.

In a study carried out with 4,441 public safety officials from Canada, stressful and traumatic events included sudden violent or accidental death, serious transport accidents and physical assaults<sup>24</sup>. The limitations of work demands or difficulties in performing any task was reported by firefighters in a study in Korea with 618 professionals. Threats, personal injury, fatalities or injured patients were related to traumatic events. Prolonged and repeated exposure to these events can compromise mental health<sup>34</sup>.

PTSD appears as a late response to a stressful situation and can be of short or long duration, causing distress in individuals who experience it. PTSD symptoms can include inattention, disorientation, stupor or agitation and hyperactivity, tachycardia, sweating, partial or complete amnesia, emotional dullness, withdrawal from others, anxiety, depression, and/or suicidal ideation. The use of alcohol or drugs can complicate the condition<sup>33</sup>.

Among female firefighters, it was shown that alcohol use was related to occupational stress and trauma<sup>11</sup>. The indicators of depression and PTSD disorders were associated with toxic exposures and traumatic events at work<sup>11,22,27</sup>.

Discrimination and harassment harm the mental and physical health of women in the fire department. The types of harassment suffered at work are verbal, written, sexual and assault. Professionals who experienced discrimination and moderate to severe harassment were susceptible to depressive symptoms, anxiety and PTSD and having a greater problem with alcohol consumption. Such associations are reflected in job dissatisfaction and family stress<sup>30</sup>.

Firefighters experience occupational stress and situations considered to be severe which accentuate depressive symptoms, but those with more experience may have the help of self-compassion as a protective coping strategy<sup>23</sup>. It was observed that the most stressful events for many of these professionals were those experienced in everyday life, such as fires in houses or automobile accidents. Regular work situations generated post-stressful distress, and the conditions which imply resilience and learning after these factors depend on individual conditions<sup>35</sup>.

In addition to the 24-hour duty, military rigidity, and verbal aggression, firefighters still face fear and insecurity of urban violence, where calls to the population can be made in distant and unknown places. Such situations favor the illness and suffering of these professionals<sup>13</sup>.

## CONCLUSION

The evidence from this study demonstrates that occupational exposure by firefighters generated stress through psychological distress. These professionals are exposed to stressful, traumatic and ergonomic events at work. The severity of the events experienced interfered in the mental health pattern causing psychological damage.



The main impacts on the mental health of firefighters due to exposure to occupational stress were depressive symptoms and PTSD. Sleep disorders, use of substances such as alcohol and musculoskeletal injuries were also related to the effects of exposure to occupational stress. However, despite the traumatic events being considered as extreme situations, it was noticed that traumatic experience occurs even in routine situations in the firefighter's work. A high rate of mental disorder and risk of PTSD was found in both experienced professionals and in young people, so exposure to work contributes damage to mental health.

Although it was not the subject of this study, self-compassion appears in one of the studies as a protective factor against mental disorders in workers with longer service time, and therefore more trauma experiences. The development of professional resilience through exposure to stress was presented in one of the articles, but depending on individual conditions. However, these two articles reinforce the presence of depressive symptoms due to the exposure of trauma in the workplace.

This study warns of the need for intervention and promotion of firefighter health as a way to alleviate the psychological suffering inherent to the profession. This is a drastic reality in the context of society. The importance of managing firefighter work organization is in preventing or mitigating mental health risks, and not only corroborates with the profession, but also with all public safety. There is no intention to exhaust the topic, but to express attention and care to the mental health of firefighters. The use of only one psychology base is presented as a study limitation, and no base in the area of public administration was selected, so therefore further studies are recommended to expand the search and results.

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