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# Analysis of Stress-Inducing Factors in the Firefighting Profession and Prioritization of Coping Strategies Using the AHP Method

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**Abstract:**
Firefighting is a crucial profession in society that is essential for ensuring public safety and health. This job demands a great deal of skill, background, and both physical and mental preparedness. This study aims to pinpoint stressors in firefighting occupations and suggest and prioritize coping mechanisms. Through the utilization of questionnaires, articles, expert insights, and various information sources, this study explored the main stressors and discovered methods to address them. The stress factors and corresponding coping strategies are as follows: factors ( Confronting risk , watching heartbreaking scenes, irregular work shifts, heavy responsibility, lack of control); strategies (improving safety equipment and facilities, improving working conditions, promoting a supportive organizational culture, crisis planning and management, resilience training, emotion regulation training). To find the best and most effective strategy, we used the Analytical Hierarchy Process (AHP) to prioritize them. The results of the study, considering all the criteria, showed that crisis planning and management ranked the highest, followed by improving safety equipment and facilities, improving working conditions, promoting a supportive organizational culture, emotion regulation training, and resilience training. Although all the strategies can have a positive impact on the negative outcomes of job stress, sometimes the conditions and resources may not allow for the implementation of all plans. For this reason, we decided to prioritize the strategies based on key criteria, and since we were dealing with multiple criteria, we chose the AHP method. Given that the weights of the options for crisis planning and management, improving safety equipment and facilities, and improving working conditions were close, it is recommended that if feasible, all three options be prioritized for implementation.
Keywords: Occupational stress, firefighting, Analytical Hierarchy Process, AHP.

## Introduction:

Stress at work is a common reaction to the demands of the job. Physical, emotional, and behavioral symptoms can be expressed through this reaction. To put it differently, work-related stress is a normal response to the difficulties and expectations of the workplace, and it may impact the wellbeing of workers both physically and mentally. As stress is a natural component of human existence, it is crucial to educate both the general public and employees extensively in order to decrease and prevent stress. Stress and psychological pressure are significant concerns in modern organizations, posing a threat to employees' physical and mental health and incurring substantial costs for the organizations, as pointed out by Akram Mohammadzadeh in 2015.

There are various reasons for workplace stress, such as too much work, lack of balance between work and personal life, inappropriate work conditions, lack of control over one's job, lack of interesting job tasks, fear of losing one's job, low wages, job insecurity, workplace conflicts, and personal

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issues. Feeling anxious and overwhelmed at work can lower your self-assurance, causing you to feel upset, annoyed, or isolated. While certain indicators of job-related stress may vanish by the end of the day, others may result in lasting consequences. Occupational stress has various physical, psychological, behavioral, and organizational consequences (Kamali Ardakani and colleagues, 2013):

- Physical: (cardiovascular diseases, digestive issues, musculoskeletal disorders, immune system dysfunctions, various cancers, increased accidents and injuries).
- Psychological: (loss of appetite, insomnia, nervous twitches, headaches, indigestion, nail-biting, reduced concentration, depression, anxiety disorders, and psychogenic pain).
- Behavioral: (absenteeism, smoking, sleep disturbances, substance abuse, alcoholism, and addiction).
- Organizational: (reduced performance, increased absenteeism, higher resignation rates, decreased job satisfaction, and reduced organizational commitment).

Research has demonstrated that job stress decreases as job satisfaction, age, education level, and work experience increase among employees. Moreover, research shows that smokers face higher levels of job stress compared to non-smokers, and unmarried individuals experience more stress than those who are married (Esfandiar Azad Marzabadi and colleagues, 2011).

Having acquired knowledge on the ideas, significance, elements, and outcomes of job-related stress, we will now explore this personal and communal concern within the field of firefighting. Firefighting is indeed one of the crucial and significant roles in society which guarantees the safety and well-being of the public. Firefighters have the duty to put out fires, save people who are trapped, and handle emergencies. This job demands extensive skill, knowledge, and both physical and mental preparedness. Being a firefighter is considered a risky job with potential dangers; individuals in this profession need to be well-trained and experienced in handling fires and emergencies. Firefighters' primary responsibilities consist of utilizing different tools, educating the public on fire warnings, and enhancing community knowledge on fire safety and prevention. Firefighting presents difficult working conditions such as severe cold, intense heat, elevated areas, potential electric shock, radiation threats, harmful chemicals, explosives, risk of bites, and more. A firefighter's job duties include tasks like balancing, climbing, crawling, bending/squatting, driving fast, kneeling, fixing heavy equipment, pulling, pushing, swimming, and more. Specialized training and educational courses are crucial for acquiring the skills and abilities needed to handle fires and emergencies. Intervention programs are suggested to enhance work conditions, decrease workload, and manage stress among firefighters, due to the widespread presence of stress, poor work life quality, and high mental workload, as well as the strong correlation between these factors (Somayeh Bolghan Abadi, 2018). The objective of this study is to recognize the sources of stress in firefighting, examine ways to manage them, and apply the Analytical Hierarchy Process (AHP) to rank them, aiming to develop effective solutions for mitigating the adverse impacts of occupational stress in firefighting.

**Research Methods and Tools**

Expert opinions, articles, and secondary information were utilized to compile the factors, solutions, and tailored information for each solution. A questionnaire was used to evaluate the significance of different stress factors for firefighters. It was distributed to 32 firefighters from three fire stations in Ahvaz. Because of limitations in resources and funding, it may not be possible to carry out all strategies at the same time. Hence, the

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tactics were ranked in order to identify the most successful ones. The purpose was achieved by using the AHP method, with assistance from the Expert Choice software.

**Evaluation Using the Analytical Hierarchy Process (AHP):**

From a managerial point of view, it is crucial to rank the solutions according to their significance and efficiency in decreasing job stress among firefighters, ensuring the best utilization of resources. In this study, choosing the right strategy involves solving a decision-making problem with multiple criteria, which is why the AHP method was utilized for assessment. Figure 1 displays the hierarchical arrangement, with criteria located at level 2 and solutions at level 3. Once scores were given and the matrix was created using Expert Choice, the criteria's weight was determined by considering their importance in achieving the main objective of choosing the most effective solution for handling occupational stress in firefighting. Table 2 demonstrates the pairwise comparison of the criteria, with preferences rated on a 9-point scale per Table 1, while Figure 2 displays the relative weights of the criteria. Consistency analysis was carried out during the pairwise comparison using the software. The consistency ratio needs to be less than 0.1. The evaluation of the strategies based on the criteria involves giving higher scores to strategies that have a greater influence on the particular stress factor. It should be emphasized that the outcomes of the suggested decision-making approach may not be completely precise and mistake-free due to AHP's hierarchical layout, with linear and one-way connections between the goal, criteria, and options. In this model, comparisons are made between criteria in pairs, rather than in a network structure. Moreover, certain aspects of this approach hinge upon expert views, potentially leading to subjective interpretations and prejudice in the outcomes. However, utilizing the suggested model as a tool for decision-making is greatly beneficial and will enhance trust in the precision of the decisions taken (Pooneh Ghaemi et al., 2016).

**Findings**

**The Most Important Factors of Occupational Stress in Firefighting:**

One source of stress in the firefighting field is the ongoing chance of an unforeseeable incident happening, causing firefighters to lose sleep. Furthermore, the high workload in this field results in reduced focus, more muscle strain, coordination issues with coworkers, limited time for rest, and extended hours, all of which contribute to elevated levels of stress (Somayeh Bolghan Abadi team, 2018). Firefighting involves every aspect of a challenging profession, leading to a high level of job-related stress. These are the key factors that contribute to work-related stress in this profession with high risks and pressures:

- Confronting risk: Firefighters face numerous hazards, such as fires, explosions, collapsing structures, and hazardous chemicals. These dangers can result in injuries, disabilities, and even fatalities.

- Watching heartbreaking Scenes: Firefighters often encounter scenes of accidents, crimes, and other traumatic events. Witnessing death and injury can be extremely stressful.

- Irregular Work Shifts: Firefighters typically work in shifts that can disrupt their sleep and daily routines, contributing to stress.

- Heavy Responsibility: Firefighters bear the responsibility of saving lives and property, which can create significant stress due to the weight of this obligation.

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- Lack of Control: Firefighters frequently work in situations beyond their control, which can lead to feelings of helplessness and increased stress.

In addition to these factors, firefighters may also be exposed to chronic stressors such as noise, heat, and smoke.

**Strategies for Coping with Occupational Stress in Firefighting**

Given the high prevalence of stress, poor quality of work life, and the significant cognitive workload among firefighters, there is a need for intervention programs aimed at improving working conditions, reducing workload, and managing stress to enhance the quality of life at work (Somayeh Bolghan-Abadi, 2018). Below are some strategies for coping with occupational stress in firefighting:

- Improving Safety Equipment and Facilities: Updating equipment, conducting regular maintenance, training personnel on the use of new equipment, providing advanced protective gear, implementing modern technologies, increasing resources and support, and enhancing safety facilities at fire stations are key strategies. By implementing these improvements, we can significantly enhance the safety and effectiveness of our firefighting teams and help reduce job-related tension and stress.
- Improving Working Conditions: Better shift planning, increasing human resources, enhancing welfare facilities, providing psychological and social support, encouraging professional training and development, upgrading communication systems, recognizing and rewarding staff, and promoting work-life balance are essential strategies. By addressing these areas, we can improve firefighters' working conditions, leading to increased satisfaction and reduced occupational stress.
- Promoting a Supportive Organizational Culture: Fostering a supportive organizational culture within a fire department can have a very positive impact on employee satisfaction and performance. This culture helps create a safe and supportive work environment where firefighters feel valued and supported. Here are some strategies for promoting a supportive organizational culture:

- Create open communication channels.
- Encourage collaboration and teamwork.
- Provide psychological support.
- Regularly acknowledge and reward staff efforts.
- Implement training and professional development programs.
- Promote respect and fairness.
- Offer support during crisis situations.
- Foster a culture of continuous learning and improvement.
- Strengthen accountability and trust.

By implementing these strategies, fire departments can enhance the well-being of their personnel and effectively manage occupational stress.

**Strategies for Stress Management in Firefighting**

- Crisis Planning and Management: Effective crisis planning and management are critical for a fire department. This not only enhances the efficiency and responsiveness of teams in emergency situations but can also lead to reduced casualties and damages. Here are

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several strategies to improve crisis planning and management in a fire department:

- Develop comprehensive crisis management plans.
- Conduct regular training and drills.
- Ensure appropriate equipment and resources are available.
- Form specialized crisis management teams.
- Establish effective communication systems.
- Evaluate and analyze past crises.
- Coordinate with other organizations and agencies.
- Raise public awareness about fire safety and emergency procedures.
- Utilize advanced technologies.
- Develop standardized protocols for crisis response.

- Resilience Training (Niloufar Sharifi et al., 2020): Resilience training in firefighting can help reduce stress, increase coping abilities, and improve firefighters' performance in critical situations. Resilience refers to the ability to bounce back after facing hardships and crises, enabling firefighters to better handle job pressures and difficult circumstances. Here are some strategies for resilience training in firefighting:

- Teach stress management skills.
- Promote physical activity and exercise.
- Train effective communication skills.
- Foster supportive networks among firefighters.
- Provide problem-solving and decision-making training.
- Ensure access to counselors and psychologists.
- Teach acceptance and adaptability.
- Promote a culture of positive thinking.
- Organize experience-sharing sessions.
- Provide ongoing evaluation and feedback.

- Emotion Regulation Training (Niloufar Sharifi et al., 2020): This involves reducing and controlling negative emotions and learning to use emotions positively. The ability to cope with emotions allows individuals to recognize their own and others' emotions and understand how emotions affect behaviors, enabling appropriate responses to those emotions. Here are several strategies for emotion regulation training in firefighting:

- Teach emotional self-awareness.
- Provide stress management techniques.
- Implement cognitive-behavioral techniques.
- Train mindfulness practices.
- Teach anger management strategies.
- Provide muscle relaxation techniques.
- Focus on concentration and attention skills.
- Promote effective communication.
- Train problem-solving and decision-making in crisis situations.
- Offer feedback and support.

Implementing these strategies can help firefighters manage their emotions more effectively and perform optimally in critical situations. This not only enhances their mental health but also increases job satisfaction.

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**Tables and charts**

**Table 1. Comparison of preferences between two elements for pairwise comparisons**

| Explanations | Definition | Numerical value |
|---|---|---|
| Two activities have the same contribution towards the goal | Equal preference | ۱ |
| Experience and judgment mildly prefer one activity over others | Moderate preference | ۳ |
| Judgment strongly or specifically favors one activity over others. | Strong preference | ۵ |
| One activity strongly prefers another activity over others. | very strong preference | ۷ |
| The preference for one activity over other activities Is at the maximum possible degree. | Infinite preference | ۹ |
| The vote expresses preferences between high values. | intermediate values | ۲،۴،۶،۸ |
| The Inverse of each Is used to express Inverse comparisons. | | Reverse |

**Figure 1**. Hierarchical structure for evaluating coping strategies against occupational stress in firefighting.

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**Table 2. Pairwise comparison of the indices relative to each other**

| Lack of control | Heavy burden of responsibility | Irregular work shifts | Watching a heartbreaking scene | Confronting risk | |
|---|---|---|---|---|---|
| ٤ | ٣ | ٥ | ٥ | | Confronting risk |
| (٤) | (٥) | ١ | | | Watching a heartbreaking scene |
| (٣) | (٤) | | | | Irregular work shifts |
| ٤ | | | | | Heavy burden of responsibility |
| | | | | Incompatibility: ٠,٠٧ | Lack of control |

Note: The numbers in parentheses indicate the inverse of the score.

**Figure 2.** Comparison of the relative weights of the indicators relative to each other.


| |
|---|
| Confronting risk |
| Watching a heartbreaking scene |
| Irregular work shifts |
| Heavy burden of responsibility |
| Lack of control |
| Inconsistency =0.07 |

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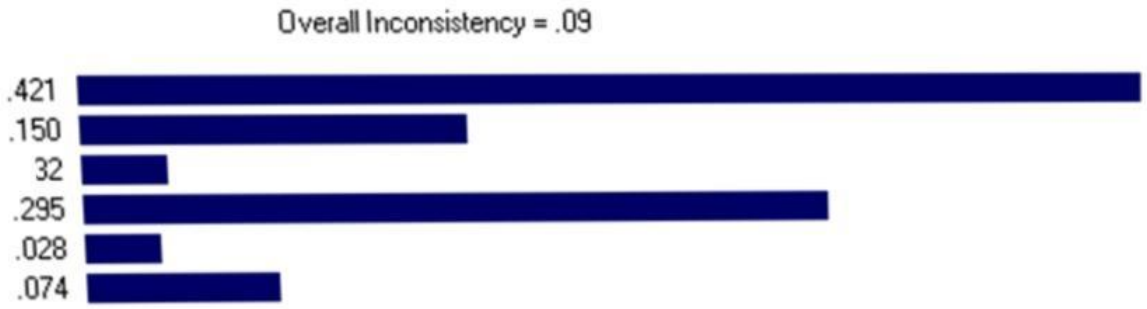
In order to evaluate the options, a pairwise comparison matrix was formed for each criterion, and by controlling the inconsistency rate and ensuring the acceptability of each pairwise comparison, the relative weight of each criterion for the various options was assessed using the Expert Choice software.

**Figure 3**. Options for coping strategies against occupational stress in firefighting concerning the indicator of facing danger and risk.




| |
|---|
| Improving safety equipment. |
| Improving work conditions. |
| Promoting a supportive organizational culture. |
| Crisis planning and management. |
| Resilience training. |
| Emotion regulation training. |

In this indicator, the strategy of improving safety equipment and facilities has a higher priority compared to the other options, meaning that improving facilities and equipment has a greater impact on the negative outcomes of the indicator of facing danger than the other options.

**Figure 4**. Options for coping strategies against occupational stress in firefighting concerning the indicator of watching heartbreaking scenes.

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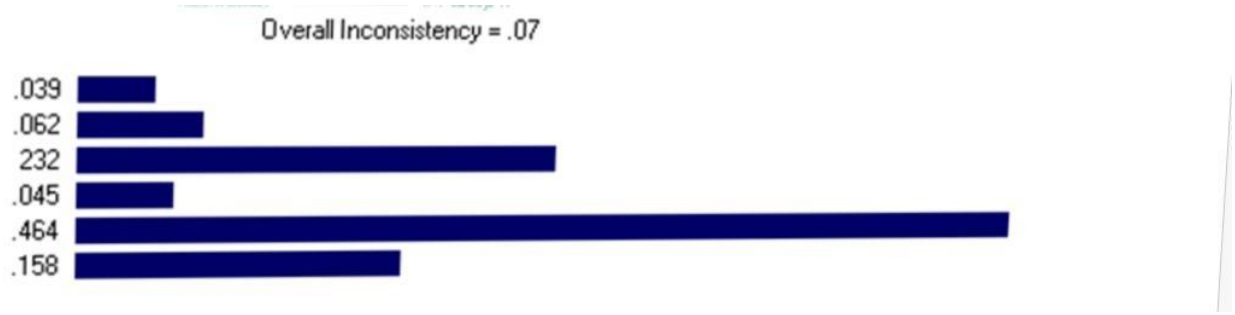


| |
|---|
| Improving safety equipment. |
| Improving work conditions. |
| Promoting a supportive organizational culture. |
| Crisis planning and management. |
| Resilience training. |
| Emotion regulation training. |

In this indicator, the strategy of resilience training has a higher priority compared to the other options, meaning that resilience training has a greater impact on the negative outcomes of the indicator of watching heartbreaking scenes than the other options."

**Figure 5**. Options for coping strategies against occupational stress in firefighting concerning the indicator of irregular shifts.

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| |
|---|
| Improving safety equipment. |
| Improving work conditions. |
| Promoting a supportive organizational culture. |
| Crisis planning and management. |
| Resilience training. |
| Emotion regulation training. |

In this indicator, the strategy of improving working conditions has a higher priority compared to the other options, meaning that improving working conditions has a greater impact on the negative outcomes of the indicator of irregular shifts than the other options.

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**Figure 6**. Options for coping strategies against occupational stress in firefighting concerning the indicator of heavy burden of responsibility

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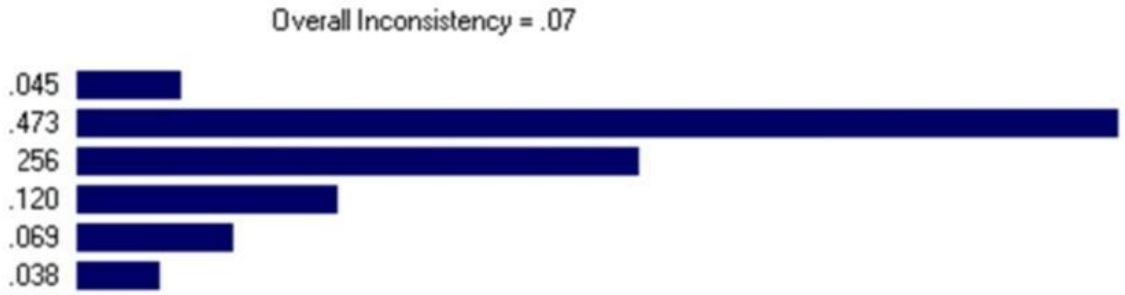


| |
|---|
| Improving safety equipment. |
| Improving work conditions. |
| Promoting a supportive organizational culture. |
| Crisis planning and management. |
| Resilience training. |
| Emotion regulation training. |

In this indicator, the strategy of improving working conditions has a higher priority compared to the other options, meaning that improving working conditions has a greater impact on the negative outcomes of the indicator of the heavy burden of responsibility than the other options.

**Figure 7**. Options for coping strategies against occupational stress in firefighting concerning the indicator of lack of control.

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| |
|---|
| Improving safety equipment. |
| Improving work conditions. |
| Promoting a supportive organizational culture. |
| Crisis planning and management. |
| Resilience training. |
| Emotion regulation training. |

In this indicator, the strategy of planning and crisis management has a higher priority compared to the other options, meaning that planning and crisis management have a greater impact on the negative outcomes of the indicator of lack of control than the other options.

**Figure 8**. Final prioritization of coping strategies against occupational stress in firefighting.


| |
|---|
| Improving safety equipment. |
| Improving work conditions. |

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| |
|---|
| Promoting a supportive organizational culture. |
| Crisis planning and management . |
| Resilience training. |
| Emotion regulation training. |

**Sensitivity Analysis**

The criteria weights significantly influence the options' ranking. The ultimate decision-maker needs to grasp the level of dependability for the ultimate decision. Because of the unpredictability in different phases of multi-criteria decision-making, it is crucial to perform a sensitivity analysis prior to choosing the ultimate choice. Hence, the sensitivity analysis is conducted once the rankings of the options are obtained. This involves recalculating the rankings of the options by adjusting the weight of each criterion. A comprehensive sensitivity analysis is conducted using the Expert Choice software; to carry out this process, while keeping the weights of the other criteria constant, the weight of one criterion is gradually increased or decreased. After conducting the sensitivity analysis, the rankings of the options may change (Pooneh Ghaemi et al., 2016). According to Figure 8, planning and crisis management received the highest rank, with the others placed in subsequent priorities. In the sensitivity analysis shown in Figure 9, the stability of the rankings of the options is examined by changing the weight percentages among the criteria; for example, by changing the weight percentage of the heavy responsibility criterion from 29% to 43%, the option of improving working conditions is prioritized, while the planning and crisis management option, which was previously ranked first, moves to second place.

**Figure 9. Sensitivity analysis of the objective**

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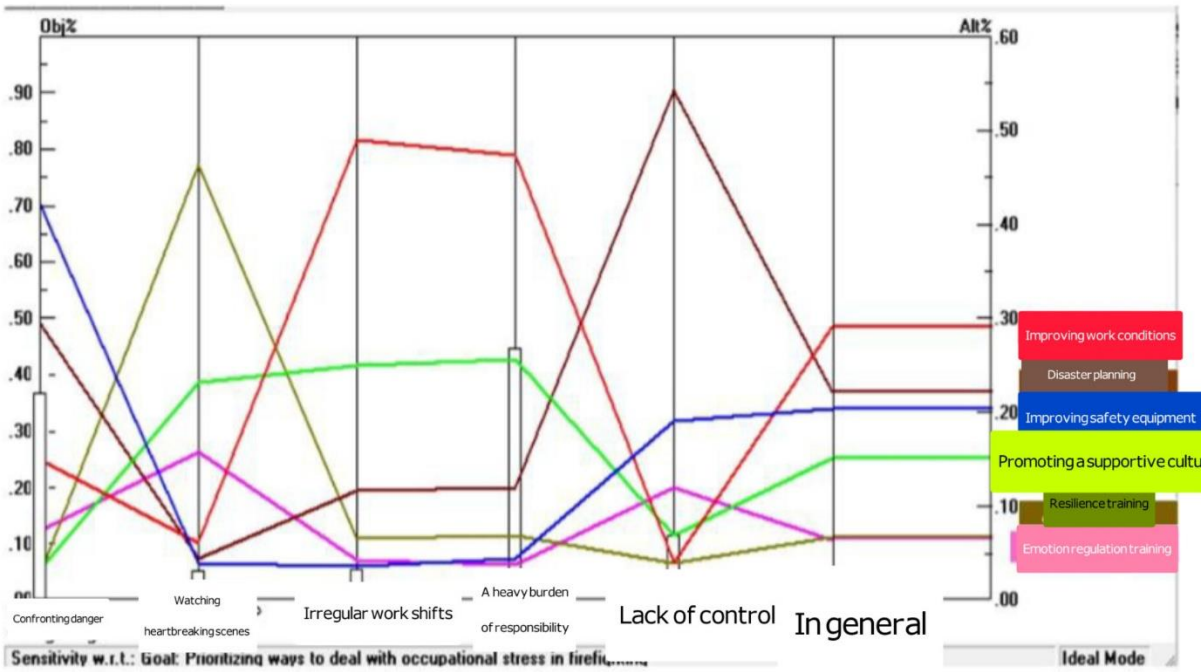

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## Discussion and Conclusion

Occupational stress is a common reaction to the difficulties and requirements of the workplace that can impact the overall well-being of workers. Because stress is a natural part of being human, it is crucial to provide extensive training for both community members and workers within organizations with the goal of minimizing and avoiding stress. Being a firefighter is a crucial and essential occupation that plays a significant role in ensuring the safety and well-being of the community. Firefighting includes all the elements of a challenging occupation and therefore involves a considerable level of job-related stress. Due to the widespread stress and low quality of work life among firefighters, as well as the strong relationship between these factors and mental workload, intervention programs are necessary to enhance their work life by improving working conditions, reducing mental workload, and managing stress. In this research, we investigated the key factors of job-related stress and outlined methods to address them through surveys, written pieces, experts' views, and additional sources of information. The findings are as follows: the factors identified include (Confronting risk, watching heartbreaking scenes, irregular work shifts, heavy responsibility, and lack of control); and the strategies proposed include (improving safety equipment and facilities, enhancing working conditions, promoting a supportive organizational culture, crisis planning and management, resilience training, and emotion regulation training). To determine the best and most effective strategies, we prioritized them using the Analytical Hierarchy Process (AHP). The research results, considering all criteria, indicated that crisis planning and management ranked highest, followed by improving safety equipment and facilities in second place, enhancing working conditions in third place, promoting a supportive organizational culture in fourth, emotion regulation training in fifth, and resilience training ranked last. Aside from the prioritization discussion, all strategies can positively impact the negative consequences of occupational stress; however, sometimes conditions and resources may not be available to implement all the proposals. Therefore, we decided to prioritize these strategies based on important criteria, and since we faced multiple criteria, we chose the AHP method. As the weights of the options for crisis planning and management, improving safety equipment and facilities, and enhancing working conditions are close to each other, and the sensitivity analysis showed that changing the weights of the criteria could lead to a shift in the ranking of these three strategies, it is suggested that, if feasible, all three options should be prioritized for implementation.

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4. اعظم؛ ،دکتر رضا؛ ملکی ،مریم؛ غلامنیا ،بحرینی

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