

Determination of Occupational Stress Factors of Firefighters in Kuwait

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Abstract

Firefighters can be considered one of the most stressful occupations as they are often responding to emergencies in a time-constrained environment while frequently performing hazardous activities, and may even get complaints from the public when they are not satisfied. Firefighters' missions are very sensitive and critical as their work is related to saving people and the environment from fire hazards. The nature of firefighters' operation, which includes saving people, offering medical assistance, going through debris, etc. made "attention" to be an essential component in their work. If attention is lost while performing their decisions, this would lead to severe consequences for both people and property. One of the reasons of attention loss is to be under occupational stress. This paper explores the key factors of occupational stress among firefighters in Kuwait. The work is based on a series of interviews, which are engaged from the perspective of psychological contract, as a mean to explore the different areas that could be related to high stress levels among the firefighters in the region. The interviews use psychological contract as an exploratory tool that partially guides the dialogue among a series of potential factors in their lifestyle and work environment, expectations, etc. The collected data is analyzed on a one by one basis, to categorize and identify which of the topics discussed is more relevant as an occupational stressor for the firefighters. The results show that witnessing and experiencing traumatic events during missions, and fear of injuries are the top stressors among the firefighters in the region, and that perception regarding the presence of stressors is inversely correlated with age.

Keywords

Occupational Stress, Stressors, Cognitive Ergonomics, Psychological Contract.

1. Introduction

Occupational stress could be defined as a harmful mental or physical response from the worker when faced to work demands that exceed or do not match his/her capabilities (NIOSH 1999). It creates an emotional and mental state of increased arousal that can impair the worker's performance and have negative consequences for health (Wickens et al. 2021). Thus, occupational stress becomes a topic of care and study for Industrial Engineering in the area of Human Factors and Cognitive Ergonomics.

Stress level is correlated to sleep duration, the capability of performing vigilant attention, higher workload (Jones et al 2022). Moreover, the incidence of occupational stress is becoming an increasingly recurrent problem in several countries around the globe, as the numbers of employees in a cross-sectional sample encompassing 116 countries world-wide are reporting higher levels of stress in their work environment (Gallup 2021). Additionally, regarding the Middle East and North Africa (MENA) region, it has been reported as containing the second highest percentage of daily anger conveyed by employees and the second highest percentage of daily sadness, just below the South Asia region. These values call for the attention of industrial engineers to investigate the problem: its potential sources and solutions.

It is believed that human performance follows the pattern of an inverted U-shape when analyzed against stress level as postulated by the Yerkes Dodson Law presented in 1908 which is considered one of the oldest laws in behavioral research. This relationship has been extensively studied by many scientists and later updated for human performance in different styles, such as by Hancock and Ganey in 2003 when they proposed the extended U-shape. This generally accepted relationship-pattern followed between stress and performance is consistent with the affirmation of Wickens in 2021, that not all stress is always negative, because in low levels can serve as an invigorating source of motivation for the workers, but in larger amounts turns out to be harmful and deteriorates the worker's performance, causing long

term negative effects. It is at these high levels that stress poses the problems stated above: at these high levels stress becomes occupational stress.

The concept of stress has been widely studied by various scientific disciplines such as in psychology, social sciences and biology (Cohen et al. 1997), and one of the common approaches in the field of human factors has been to isolate particular environmental variables like noise level, and measure the performance of the workers at different magnitudes of such parameter. These variables are then called stressors once a correlation between the variable and stress has been established. Additionally, a popular way to measure the correlation between a stressor and the stress level has been to measure the subject's physiological activity such as hearth rate, pupil dilatation or any other physical parameter that is considered evidence of stress, along with the presence of the stressor at different levels when performing an activity or task, such as the work done by Junker et al in 2021, where the hearth rate was utilized as an indicator of stress level, for investigating potential stressors.

An alternative approach for determining stress levels, that is particularly useful when considering the longer-term effects has been via standardized surveys such as the Perceived Stress Scale (PSS10) developed by Cohen et al in 1983, which has been utilized and analyzed extensively in several stress related studies, such as in the recent work of Lo M.T. et al in 2022, where it is intended to measure the mental condition of young freshmen at the State University of New York, from the perspective of long term effects of stress related matters.

Once a method to measure/categorize the stress level of the worker has been decided, the next step is to decide which potential stressors to investigate, with the intention to facilitate a clear identification of the source of the problem (the problem being the high stress level at work - occupational stress), and to provide recommendations aiming to address the particular stressors, hence improving the working conditions and providing a healthier environment. This healthier environment would in turn translate into optimal levels of stress, which consequently allows for a better worker's performance due to the inverted U-shape nature of the relationship between stress and human performance discussed above.

Depending on the activity and duties of the worker, each person will be subjected to different stressors, since the environment and working conditions can be very diverse for different professions and occupations: some jobs may share similar working conditions but others may be radically different. A categorization of the different types of jobs and occupations is necessary to facilitate the potential re-utilization and knowledge sharing regarding different stressors that could span across several occupations and/or professions. And some attempts have been done in this matter such as in the work presented by Dedele A. et al. (2019), where a cross sectional study of 571 workers in Lithuania from several occupations were analyzed for their perceived stress level, finding sedentarism as an important factor although only 2 categories of jobs were created: blue-collar and white-collar workers. In another similar study 179 workers of different occupations were investigated for stress and burnout in a COVID-19 dedicated hospital which covered a wider range of occupations, and found that anxiety of COVID-19 infection was a primary stressor. Unfortunately, it could be argued that the study constrained the sample to medical related jobs mostly and that the COVID-19 environment may not be representative of a more 'standard' working time (Yamada et al. 2021).

Some occupations pose higher dangers due to their inherent nature and in such cases, most possibly higher stress levels may be experienced by their workers. Hence an argument for the categorization of different jobs could be made by considering the intrinsic occupational risks associated with performing the activity, the exposure to chemicals and/or other hazards found at the job. Occupational risk can then be understood as the probability of injury and illness due to the nature of an activity performed and/or due to exposure to different hazards in the workplace (NIOSH 2020). This means that several methodologies and approaches for job categorization can exist, thus making the categorization task more difficult.

Considering the aforementioned, and since the act of identifying stressors is mostly a managerial task, while each different job and profession can vary from one another, it makes sense to consider an approach that could be implemented across a wide variety of occupations, regardless of the different particularities. Following this reasoning our work proposes the utilization of the concept of psychological contract, as a means to provoke a dialogue with the workers as in the setting of an interview, to go across several points encompassing the topics that are mostly pertinent to the worker's perception of his/her duties to the company/employer, and vice versa. This type of discussion could potentially be (at least initially) sufficiently similar when discussing with workers of different backgrounds and occupations, since the relationship between a worker and employer is based on similar terms for most cases: a service

is provided in exchange of a reward (salary), and both parties' responsibilities, rights and duties are outlined in a legal contract. The psychological contract however, opens the discussion to the actual daily practices between the worker and employer, which occur in the workplace sometimes regardless of what is stated in the legal contract: this means that the psychological contract encompasses the actual perceptions, expectations and true practices of both parties regarding their duties and obligations, hence a more realistic representation of the daily job related activities (Hansen et al. 2015).

Considering the aforementioned, and considering job categorization from the perspective of occupational risk, one can recognize that a dangerous occupation is firefighter, which most possibly also poses high stress levels. An argument could be made that firefighters can be considered as a highly stressful occupation, as they are often responding to emergencies in a time-constrained environment, and they are frequently performing hazardous activities. Another factor to be considered is that firefighters may even get complaints from the public if they are not satisfied. Moreover, many firefighters' missions are sensitive and critical as their work is related to saving people, and often present high proximity to fire hazards. The nature of firefighters' operation, which includes saving people, offering medical assistance, going through debris, etc. makes "attention" to be an essential component of their work. If attention is lost while performing their decisions, it could easily lead to severe consequences for the firefighters, the public and the property. One of the reasons of attention loss is to be under occupational stress (Baldwin. 2012).

In the USA, it is estimated that in 2018 around 58,250 firefighters suffered injuries while in their line of duty, additionally, they were exposed 6,175 times to infectious diseases and suffered from 47,150 exposures to hazardous substances. Moving on, a firefighter's duty can be categorized by action classes: heading to the location of the incident, the setup, the fire ground, and emergencies not including fires. From these, the fire ground is where firefighters typically get injured: in 2018, 22,975 traumas occurred at the fire grounds (Campbell 2019).

There are 41 fire stations in Kuwait. Considering that Kuwait is an oil productive country, one of the most important stations is the Burgan Fire Station, which is located near the Burgan Oil Field as this is a crucial location for the country's financial support and, if a fire would occur at the location, the financial and environmental impact of such disaster could be too high if not controlled on time. The firefighters work a 24-hour shift, 3 days a week, and have a 48-hour rest in between each shift. The Kuwait Fire Service Directorate is an independent public organization; on top of that it is affiliated with the municipality of Kuwait. Kuwait firefighting officers have several rankings, such as: firefighter team, fire brigade, fire brigadier general, firefighter colonel, fire extender, firefighter, fire captain, first lieutenant, and firefighter lieutenant. The salary is awarded according to their experience measured in the numbers of years providing service in the field. Additionally, education level is considered, where high school graduates receive an amount, Diploma graduates a higher amount and Bachelor's degree graduates a higher.

1.1 Objectives

The objective of this research is to determine the potential occupational stressors for Firefighters in Kuwait, by means of a series of interviews inspired in the concept of psychological contract, in order to systematically discuss several topics that could be considered stressors when considering the personal perception of duties, rights and relationships with their employer and their colleagues.

2. Literature Review

An article written by Mi-Suk et al. in 2012 revealed that in Korean firefighters' occupational stress was correlated with decreased job satisfaction, fatigue, age and exercise levels. Their work was done by implementing a series of questionnaires using the Korean Occupational Stress-Scale Form (KOSS-SF) to assess the stress level, together with a series of structured questions to check for diverse potential factors in their life-balance categorized by areas such as job-related factors, health-related factors, fatigue, job satisfaction and social support. Their recommendation to combat occupational stress was the creation of a job satisfaction promotion program and the promotion of firefighter's health. These findings are consistent with other similar studies, such as the one presented more recently by Angleman et al. in 2021, where stress was studied among firefighters in Florida USA, by considering the correlation between stress level and factors associated with cardiovascular disease, years of service, smoking habits and triglyceride levels. Their findings suggest a correlation between stress level and the factors associated with cardiovascular disease. Their recommendation was to create and promote Peer Support programs, Proactive Wellness programs and Self-Care Training programs such as the Behavioral Health presented by Van Hasselt et al in 2020. More matching results are found in the work presented by Sianturi et al. in 2021 for firefighters in Indonesia, where it was found that 80% of them show high to medium-high stress levels, and where the factors that are most correlated to stress level are age,

interpersonal relationships, and mental workload. This study was done with a sample of 105 firefighters from diverse fire stations across the West Jakarta region.

A generalized literature review regarding firefighters and other emergency respondents involving 3415 studies that focused on stress of workers in the public safety sector (Law Enforcement Officers, Corrections Officer, Firefighters, Wildland Firefighting and Emergency Medical Services) searched for common outcomes regarding working hours, sleep and fatigue, finding 202 articles that showed 6 common related outcomes: these are sleep, fatigue, work performance, injury, psychosocial stress and chronic disease (Allison et al. 2022). Hence it makes sense to keep track of these 6 potential stress factors in our present study.

Other studies related to occupational stress in firefighters focus on finding alternative mechanisms for measuring stress levels, such as by measuring a particular stressor instead that is believed to be closely correlated to stress level. An example of such is the work of Chin et al. in 2022, where the utilization of the Effort-Reward Imbalance (ERI) questionnaire is explored for this goal, concluding that the short form ERI (S-ERI) is a reliable and valid measure to assess occupational stress.

Regarding different methodologies to assess occupational stress level, psychological contract has been another approach studied in the literature, with overall favorable conclusions as a helpful tool in the exploration of topics such as occupational stress, as it provides a somewhat structured framework to discuss the potential mental effects that ensue in a person when breaches/violations of what is considered a duty and/or expected responsibility of the employer or co-worker relationship occurs (Coyle-Shapiro et al. 2019). Within the same line of discussion and involving emergency responders, more specifically firefighters, the work of Duran et al.(2019) shows the utilization of psychological contract (PC) with firefighters, as a tool to explore the negative emotions resulting from breaches and violations of their perceived work-related agreements.

Their findings remark a positive correlation between occupational stress, to the perceptions of psychological contract (PC) violations. They reported that the firefighter's self-efficacy as well as job-environment fairness perception, also showed to be important factors that closely related to feelings of job-related depression and occupational stress. This would imply that discussions about job fairness as well as about self-evaluation, should be included when utilizing psychological contract to investigate occupational stress (Duran et al. 2019). Duran's previous work could be considered pioneer in regards of the utilization of psychological contract when it comes to measure occupational stress in firefighters (Duran et al. 2018). Duran's work regarding the use of psychological contract to investigate occupational stressors can also be extended to analyze other types of emergency respondents, such as with police officers where it showed similar type of conclusions (Duran 2019).

2.1 Value Added

The value of this study is that it allows to test the prevalence of previous findings in the use of psychological contract when investigating stressors in firefighters, since Kuwait is a middle eastern country with a population background and culture significantly different from the previously subjected to this type of studies: previous studies are mainly in the UK, and USA. Therefore, the expected results can show a light for potential generalization of approach to investigating stressors among emergency respondents such as with firefighters.

3. Methods

This work implements a series of interviews in a cross-sectional sample of 10 firefighters total, across 5 different fire stations located in Kuwait, each with a sample of 2 firefighters interviewed. All respondents are male between the ages 28 to 56, with status as active duty at the moment of the interview.

The interviews' structure is inspired by the concept of psychological contract, as utilized by Duran et al in their works from 2018 and 2019, but additionally incorporating 6 stressors for analysis, which were identified as prevalent in the literature review performed by Allison et al in 2022. These stressors are sleep, fatigue, perception of self-efficacy, likelihood of injury, psychosocial stress and chronic disease. These are shown in the topics 1, 6, 7, 8, 15 and 18 of the structure list shown below.

The interviews are arranged in a one-to-one environment, with voluntary participation by the firefighters and confidentiality agreement. The approximate time of each interview ranged from 30 minutes to 1 hour, and ended when

the interviewee agreed that there was nothing else to add, or if the interview session was interrupted by an emergency and more than 14 questions (80%) have been answered. In case the interview is interrupted with less than 14 questions answered, the data was discarded and a different firefighter was interviewed.

The interviews were semi-directed to discuss the topics of interest, however if the firefighter wishes to mention something else, he would not be interrupted. The interviews are recorded and then transcribed verbatim to extract the information with maximum fidelity to what was communicated during the sessions. The language employed was Arabic, as it is the native tongue of the local firefighters. The verbatim transcription was then translated into English to facilitate the analysis.

The topics discussed in each interview with their corresponding explanation/justification are the following:

Topic 1: Relationship with the public – This explores the psycho-social stress associated with the perception that the firefighter has, regarding how the public perceives them. This stressor was explored because it has been prevalent in previous studies. The interviewer asked the firefighter to describe their feelings and impressions related to the daily interactions with the public, and how they believed they are viewed by the public, the emotions and stress level felt because of these interactions, both when on duty and off duty and people find out that they are a firefighter.

Topic 2: Perception of own mental health state – This explores the perception of the firefighter regarding his own mental state, and the perceived mental stability when it comes to performing his duties in the long run. This is considering that they routinely face strong events associated with the profession: Witnessing impressive accidents, burns and mutilations, deaths, suicide attempts, smells, etc. The interviewer asked if the firefighter believed it was necessary to have a routine psychologist on board to deal with traumatic events and what mechanisms were taken by the firefighters. Often the discussion evolved into the high correlation of mental state resiliency with age (the older the higher resiliency) they often used the word ‘adaptability’ to describe this phenomenon. Also, in several instances the discussion took a turn to discuss the importance of peer support and network, as well as family support.

Topic 3: Job promotions fairness – This explores the perception of the firefighter regarding his rights as an employee and the duties of the employers. This question looks to measure if there is any perception of contract breach/violation of fairness between the employee and the organization, in a systemic way. Often the discussion took a turn of the firefighter simply explaining the mechanism utilized by the government to promote firefighters based on experience and other technical details. The interviewer noticed that the firefighters discussed mostly in terms of the system being clear or not, and no clear indication of a negative sentiment in this area was noted.

Topic 4: Relationship with employers/superiors – This topic explores the perception of the work environment considering the vertical component of the firefighter organization and their daily interactions. The interviewer asked about the confidence that exists among firefighters and their superiors and the way the complaints are handled within the fire station, for which in case a problem is perceived, would create stress or could be easily resolved. This factor was used to measure if there is any breach in the psychological contract regarding the perceived duties of their superiors and if these duties and obligations are met or not, according to their own personal interpretation of how it should be.

Topic 5: Horizontal relations with other departments – This topic explores the perception of fairness regarding the treatment of other departments outside the fire department such as emergency medical respondents, police officers, etc. To look for indications that preferences or differences among them may exist in the eyes of the firefighters, and thus be an origin of negative emotions, becoming a potential stressor.

Topic 6: Physical health requirements and Fatigue – This topic discusses the perception of the physical level required to successfully overcome a routine day, including all the associated emergency calls that can happen during a work-shift. This stressor was selected due to its prevalence in several studies. The firefighter was asked to describe if he felt that physical fitness was mandatory to have a successful work shift and the likelihood to get tired and/or fatigued during a work day or at the middle of an emergency.

Topic 7: Perception of self-efficacy and needed skill at work – This topic discusses how a firefighter perceives himself in the matter of being capable of performing his duties, as well as to having the sufficient skills to successfully perform in a routine day as well as during an emergency. This stressor was selected from the literature as it was found to be

relevant in previous studies. The interviewer asks the firefighter if he believes to have all necessary skills and knowledge to react in an emergency such as fast reactions, hazard knowledge, medical knowledge, ergonomic knowledge for lifting heavy objects, etc. As well as a self-perception of having skills needed for other non-emergency tasks such as orderliness, industriousness, cleanliness, etc. These are perceptions of self-efficacy and self-sufficiency at work.

Topic 8: Perception of likelihood of injury – This topic explores the awareness and perceptions that a firefighter has regarding the physical dangers when performing his duties and daily obligations, and identifies if this factor can be considered a stressor or not. This stressor was taken from the literature review as it was found to be a stressor identified recurrently in several previous studies. As expected, many firefighters perceived a high probability of injury and dangers inherent to the activities performed. Many times, the discussions in this topic extended to the firefighters telling stories about when they got injured or a colleague/friends got injured in a certain mission. These discussions often took a turn to notice a hyper-alert state which can last for a long time, especially when someone close has been recently injured. In many instances, the conversation regarding this topic lead to discussions on how clear the legal contract is in dealing with chronic disabilities, funerals and other situations.

Topic 9: Job Security – This topic is introduced to follow the perspective of psychological contract, as a potential stressor in case the firefighters perceive instability on their job due to layoffs or other problems that may lead to a **dismissal**/discharge or early retirement.

Topic 10: Perception of work-life balance & family satisfaction – This topic explores the perceived balance that the firefighter can achieve between his profession and his family and external relationships other than work, and if these relationships are in the eyes of the firefighter, supportive and/or harmonizing creating a healthy lifestyle, or if there is a perceived imbalance that can be considered a source of mental stress for the firefighter.

Topic 11: Work environment – This topic explores the overall perception of the firefighter regarding the daily mental state achieved during a regular working day, when it pertains to performing the duties and responsibilities as well as socializing with the colleagues in the work station, and with other departments when coinciding on different missions.

Topic 12: Equipment – This topic asked the firefighter to describe his feelings and emotions when considering the state of the equipment and tools they used: if they feel the equipment is appropriate, new and reliable or if they perceive that the status of the utilized equipment is not satisfactory, in which case could become a source of mental stress when performing their duties. Often the discussions regarding the equipment took a turn to how taking care of the equipment is linked with, or represented a sentiment of brotherhood among firefighters and taking care of each other, as if they perceive their individual persona to interact with the people who is not present at the same time (shift) in the fire station, by taking care of the equipment that their friend firefighters will utilize in the next shift when they arrive.

Topic 13: Idealistic virtues of character – This topic asked the firefighters about their perception regarding the virtues or morality expectations when performing their duties such as bravery, courage, well mannered, etc. and about the degree of sacrifice that is expected of them when on a mission, such as giving their own life to save someone else. The interviewer asked the firefighters if these ideals were actually required and clearly described on their contract or other instruction manual for firefighters, or was it coming from their own personal expectations.

Topic 14: Vacation and off-time privacy – This topic asked the firefighters to discuss regarding their perception of receiving enough vacations and off-duty time to relax, and if it is sufficiently away from work to be considered a good quality vacation. The interviewer asked if they were contacted during vacation, or when off duty during a regular working week, as this may represent a potential source for mental stress. This question explored the topic in regards of what the firefighter believes was deserved and needed, versus what is provided, and also about the quality of such said 'off-time'.

Topic 15: Perceived quality and coverage of legal contract in non-standard scenarios such as chronic diseases, death, disabilities, insurance or others – This topic asked the firefighters regarding the perceived clarity and fairness of the most 'legally obscure' topics such as chronic disabilities, diseases, funerals, insurance, and other non-standard scenarios. This topic is selected for analysis since the literature shows it can be a stressor for similar studies. These discussions often evolved into conversations about the perceived clarity of government duties with firefighters,

confidence that they will not be left alone, and discussions about what type of situations may force early retirement and the disadvantages of such cases.

Topic 16: Salary – This topic explored the perception of fairness from the perspective of what is deserved versus what is earned, while considering the perspective of the Effort-Reward Imbalance (ERI) as an indicator of occupational stress.

Topic 17: Age and Adaptability – This topic was explored as it was a relevant stress factor found in the work of Mi-Suk et al in 2012 for Korean firefighters. The age of the firefighter was asked, and then the overall perception if the firefighters believed that age was important or not to handle the daily activities. Then the overall average of all answers obtained from a single firefighter survey was analyzed to check if they statistically differ from firefighters in other age-group.

Topic 18: Shift arrangements and sleep deprivation – The topic of shift arrangement was asked, to see if the firefighter believes it is a fair system and/or is creating problems with sleep or insomnia. Sleep deprivation has proven to be a stressor in previous studies found in the literature.

4. Data Collection

The data collected from the interviews is shown in table 1 below, following 10 firefighters listed (A to J) and their answers encoded as

H, for high – This means the firefighter finds this topic to be a source of concern and/or mental stress.

M, for medium – This means that the firefighter finds this topic to be relevant, but not often coming to mind when performing daily activities and duties.

L, for low – This means the firefighter doesn't recognize this topic as a source of concern.

Table 1. Collected Results

Topic	Description	A	B	C	D	E	F	G	H	I	J
1	Relationship with the public	L	M	M	L	L	M	M	H	L	M
2	Mental health: Witnessing impressive events	-	-	H	H	H	H	H	H	M	H
3	Job promotions fairness	L	M	-	-	H	L	M	H	L	H
4	Relationship with employers/superiors	L	L	-	-	L	L	L	M	M	-
5	Horizontal relations with other departments	L	L	L	L	M	L	M	H	-	L
6	Physical health requirements and Fatigue	H	L	H	M	M	L	H	M	M	H
7	Perception of self-efficacy and needed skill at work	L	H	M	H	L	M	H	H	H	M
8	Perception of likelihood of injury	H	H	H	H	H	H	H	M	H	M
9	Job Security	L	L	L	L	L	L	M	L	L	L
10	Perception of work-life balance & family satisfaction	L	L	H	M	H	M	H	H	M	L
11	Work environment	L	L	L	L	L	L	M	M	M	M
12	Equipment	L	L	M	L	L	L	L	L	L	L
13	Idealistic virtues of character: Doing things for the public, sacrifice, bravery, courage, etc.	M	M	L	M	H	M	H	H	M	M
14	Vacation and off-time privacy	L	L	M	M	L	L	L	L	M	L
15	Perceived quality and coverage of legal contract in non-standard scenarios such as chronic diseases, death, disabilities, insurance or others	L	L	-	L	L	M	L	M	L	L

16	Salary	L	H	H	M	H	M	M	H	M	M
17	Age and Adaptability	H	H	M	M	M	M	M	M	M	M
		56	44	36	30	46	39	34	28	43	40
18	Shift arrangements and sleep deprivation	L	L	H	M	L	H	M	H	-	-

The answers in table 1 were encoded to represent the degree of the corresponding factor being perceived as a concern of the mental state for the daily working activities of firefighters.

L – Low value of concern = 0 (zero)

M – Medium value concern = 1 (one)

H – High value of concern = 2 (two)

As such, then the average value of each of the stressor was obtained, and interpreted as being perceived by the firefighters to be related to higher or lower degrees to the stress level experienced by the firefighters. This means the maximum value is 2 and the lowest value is 0.

Additionally, the average of all factors was calculated for each individual respondent, to visualize the differences in perception among the different firefighters. These values are then compared by age-group to denote if potential differences are found or not.

5. Results and Discussion

The list of factors ranked from highest to lowest is shown in the following table 2, where the data is also categorized per quartiles.

Quartile 1: Factors with lowest (no) consideration by firefighters – values from [0 to 0.49]

Quartile 2: Factors with low consideration by firefighters – values from [0.50 to 0.99]

Quartile 3: Factors with medium consideration by firefighters – values from [1.0 to 1.49]

Quartile 4: Factors with high consideration by firefighters – values from [1.49 to 2]

Table 2. Topics Ranked from Highest Consideration by Firefighters to Lowest

Quartile	Topic	Description	Average	Rank
4	2	Mental health: Witnessing impressive events	1.88	1
4	8	Perception of likelihood of injury	1.80	2
3	7	Perception of self-efficacy and needed skill at work	1.30	3.5
3	16	Salary	1.30	3.5
3	6	Physical health requirements and Fatigue	1.20	6
3	13	Idealistic virtues of character: Doing things for the public, sacrifice, bravery, courage, etc.	1.20	6
3	17	Age and Adaptability	1.20	6
3	10	Perception of Life Balance & family satisfaction	1.10	8
3	3	Job promotions fairness	1.00	9.5
3	18	Shift arrangements and sleep deprivation	1.00	9.5
2	1	Relationship with the public	0.70	11
4	5	Horizontal relations with other departments	0.44	12
4	11	Work Environment	0.40	13
4	14	Vacation and off-time privacy	0.30	14
4	4	Relationship with employer/superiors	0.29	15
4	15	Perceived quality and coverage of legal contract in non-standard scenarios such as chronic diseases, death, insurance or others.	0.22	16

4	9	Job Security	0.10	17.5
4	12	Equipment	0.10	17.5

Then, the stressors found are the top 2 from table 2 above:

- Witnessing and experiencing traumatic events during missions (from topic 2, rank 1).
- Dangers inherent to missions (from topic 8, rank 2).

The differences in perceptions between respondents are found by finding the average responses regarding perceived factors of stress for each individual respondent as shown in table 3:

Table 3. Average overall values by Respondent

Respondent	A	B	C	D	E	F	G	H	I	J
Average	0.31	0.56	1.14	0.80	0.82	0.71	1.12	1.35	0.80	0.80
Age	56	44	36	30	46	39	34	28	43	40

A line can be plotted as shown in figure 1, to visualize a potential pattern in responses of firefighters about perceiving or noticing the presence of stressors, according to the different ages:

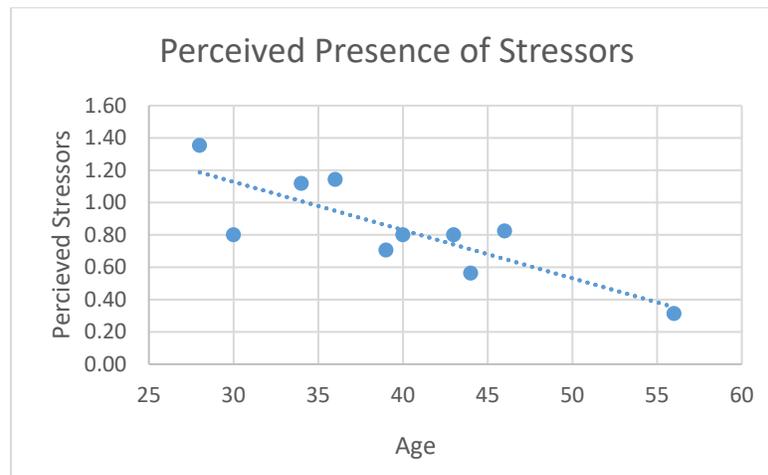


Figure 1. Individual response averages regarding the perceived presence of stressors

A linear model can be developed showing a negative slope when the variable in x axis increases (age), and the response in y axis (perception of the presence of stressors) decreases. This is consistent with the conversations obtained in the interviews, as the younger firefighters had a slight tendency to notice more details regarding accidents and traumatic events, and some comments made by the older firefighters developed around the concept of adaptability and ‘resiliency’, which in their own words, is formed after a couple of years in service. The line in figure 1 above is:

$$\text{Stressor Perception} = -0.03(\text{age}) + 2.02 \quad (\text{Eq. 1})$$

With total error of 0.27, hence a correlation between stressor perception and age exists as mentioned in the literature by Mi-Suk et al in 2012.

6. Conclusions and Validations

The following two stressors are identified in firefighters in Kuwait, as shown in the top 2 of table 2:

Stressor 1: Witnessing and experiencing traumatic events during missions (from topic 2, rank 1).

Stressor 2: Dangers inherent to missions and likelihood of injury (from topic 8, rank 2).

The factors with least consideration by firefighters in Kuwait (the perceived to be least likely to produce occupational stress) are the bottom 2 of table 2:

Equipment (from topic 12, rank 17.5)

Job Security (from topic 9, rank 17.5)

Regarding the 6 stressors reported in the literature by Allison et al in 2022, which were contained in our interviews in topics 1, 6, 7, 8, 15 and 18, we found that 5 were reported with high consideration (Quartile 1) or medium consideration (Quartile 2) by Kuwaiti firefighters, with the exception of 'psychosocial stress', which was analogous to topic 1 in our interviews: relation with the public, which was found with low consideration (Quartile 3). This shows consistent findings and proves that the cultural differences between firefighters to what is considered a stressor and what is not, is not an important factor to make a distinction. This supports the idea that findings from other studies performed for samples of firefighters could be utilized too in the Middle East, regardless of the cultural differences.

As a final conclusion, there is a slight inverse correlation between firefighter's age and their perceptions about the presence of stress factors as shown in figure 1 and equation 1. Also, in our interviews the older firefighters discussed more about adaptability and resiliency being formed during the first couple of years of service, and these findings are consistent with Mi-Suk et al in 2012, which are also well documented by others. It appears that the correlation remains true in Kuwait regardless of the cultural differences between Korean firefighters and Kuwait firefighters.

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