ORIGINAL ARTICLE

ASSOCIATION BETWEEN WORKLOAD AND PSYCHOLOGICAL WELL-BEING IN MALAYSIA ELITE FIREFIGHTER

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ABSTRACT

Emergency responders frequently exposed to life-threatening risks when attending to critical incident events causing an increasing number of psychological health issues among emergency responders. However, few studies are related to workload and its association with Malaysian emergency responders' mental health problems. Hence, the study objective is to identify the level of workload, determine the level of psychological well-being and their association in Malaysian firefighters. A cross-sectional study was conducted among Grade A and B stations firefighters in Kota Bharu Kelantan using a validated NASA-TLX and DASS-21 questionnaire through a purposive sampling method. Respondents were divided into standard operations teams and elite teams such as Emergency Medical Rescue Services (EMRS). Results show that although EMRS, the medical team has the highest overall workload demand, firefighters deemed performance and effort demand a significant workload demand comparing to others. It is also found that most firefighters have higher anxiety issues comparing to depression and stress, where 30% to 61% of respondents develop a certain level of anxiety corresponding to only 15% to 39% for depression and 13% to 28% for stress. Hence, it is suggested that further research should be conducted in investigating and understanding the contributing factors towards Malaysian firefighters' psychological health problems so that they can be managed or even prevented.

***Keywords**: Workload, psychological well-being, firefighter, NASA-TLX, DASS-21*

INTRODUCTION

Working for different agencies and assigned to various tasks, police officers, firefighters, and emergency medical service (EMS) collectively referred to as emergency first responders (EFR) [1]. Firefighters frequently exposed to life-threatening risks when attending critical incident events, which required them to search and rescue the casualties [2]. Thus, such exposure has caused firefighters to suffer trauma-related disorders, such as post-traumatic stress disorder (PTSD), stress, and even suicidal ideation [3]. Previous research reported that stress and exhaustion caused deaths for over 50% of firefighters [4]. Besides, a previous study among hospital emergency department personnel resulted in a high incidence of PTSD for about 94% [5].

According to Malaysia National Security Council (MNSC), the lead responding agencies involved during disaster and relief are the Royal Malaysia Police Force (PDRM), Fire and Rescue Department Malaysia (FRDM), Emergency Medical Department (EMD), Malaysian Armed Forces (ATM) and other supported agencies [6,7]. Hence, they are the agencies who most faced hazardous situations and experienced perceived stress due to frequent exposure to traumatic events. MNSC stated that the Royal Malaysia Police Force (PDRM) acts as the primary agency to lead incidents and disaster; however, Fire and Rescue Department Malaysia (FRDM) is the forward incident command for any search and rescue operations [8,9].

Firefighters, especially the rescue operation team, are most likely to be related to mental and physical work interaction as they faced high psychological demands in operative tasks [10]. The firefighter's profession has been ranked as the most stressful and dangerous occupation as firefighters consistently exposed to, among others, heat exhaustion, burns, physical and mental stress [11,12]. According to the data by fire departments in National Fire Experience Survey 2016, in the USA alone, 62,085 firefighters were estimated to suffer from injuries in the line of duty, while 9,275 more we're exposed to infectious disease [13]. The occupational exposures such as shift work, physical or mental demands have become why firefighting has been claimed as dangerous work [14]. Thus, it is discovered that firefighters also suffered from occupational stress due to workload, career, and other organizational issues as similar to other less risky occupations [15].

Through a comprehensive literature search, it could be summarized that there are no studies found that focus on workload and its influence on the mental health or psychological well-being of

emergency responder groups in Malaysia. However, other countries have shown a significant number of researches in the said area. This study may open up various new research and understanding of the country's emergency responders' welfares through workloads and psychological health studies. This paper aims to identify the level of workload faced by the Malaysian firefighters, especially the elite team, determine the level of psychological well-being among these firefighters and finally, associate the workload with depression, anxiety, and stress.

METHODS

A cross-sectional study was conducted involving 82 personnel from Grade A and B station firefighters in Kota Bharu Kelantan via the purposive sampling method. Fire station grade is based on the teams available at the stations and the incident complexity covered by the stations in the specific area. Hence, Grade A and B station has all the specialized teams vailable in the FRDM. All personnel was classified according to their corresponding teams; operation team, RIMS (Rapid response team), EMRS (Emergency Medical Rescue Services), HAZMAT (Hazardous Material), and PPDA (Waster Rescue Team). A self-administrative questionnaire was used, combining two (2) tools, which were NASA-TLX and DASS-21.

The NASA-TLX questionnaire consists of six (6) dimensions to assess workload: mental demand, physical demand, temporal demand, performance, effort, and frustration, where respondents will answer 15 pairwise comparison dimensions to determine the weighting of the six (6) subscales [16]. NASA-TLX has been validated by previous studies [17] and used by many researchers across the years to measure workloads, especially among emergency responders and health workers [18,19]. The weighted workload rating is obtained by calculating both weighted subscales and rating scales [18].

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is designed to measure emotional states of depression, anxiety and stress as a self reporting tools. Each of the three sub-scales namely Depression (DASS21-D), Anxiety (DASS21-A), and Stress (DASS21-S) contain 7 items assessing. This items include self-deprecation, lack of interest / involvement, anhedonia and inertia (Depression); autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect (Anxiety); and relaxing, nervous arousal, and being easily upset / agitated, irritable / over-reactive and impatient (Stress) [20]. The differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree, hence the reason for the tool to measure all 3 sub-scale at once [20,21]. Having been used by many researchers, the DASS-21 questionnaire is a validated and reliable tool in measuring depression, anxiety, and stress (22).

Descriptive statistical analysis is used to determine the level of workload and depression, anxiety, and stress among teams. The data for each variable is presented in the graphical composition. An Independent t-test is used to determine the mean differences between teams. The association between workload with depression, anxiety, and stress is determined using Pearson's Correlation test. The p-value of 0.05 ($p<0.05$) was taken as significant level [23,24].

This study is conducted with ethics committee approval (USM/JEPeM/19110740) from the Human Research Ethics Committee of USM.

RESULTS

A total of 82 personnel has participated in this study. All respondents were Malay, and the majority were male (96.3%). The respondents' age ranged from 24 to 60 years old, where half of the respondents range from 41 to 50 years old (50.0%). Most of the respondents were married (95.1%), meanwhile the rest were unmarried (3.7%) and divorced (1.2%). The teams were classified into standard operation team (35.4%) and elite teams comprised of EMRS unit (15.9%), HAZMAT unit (28.0%), PPDA unit (13,4%), and RIMS unit (7.3%).

Figure 1 indicates that physical demand was the highest experienced by RIMS, followed by PPDA and EMRS. Meanwhile, mental demand scored second-lowest ratings among all six (6) components, where HAZMAT is the least.

The standard operation teams recorded the highest members experiencing mild depression (24.1%), moderate depression (17.2), and severe depression (3.4%) comparing to other elite teams (Fig. 2).

30% to 61% of respondents develop a certain level of anxiety, reaching only 15% to 39% for depression, and 13% to 28% for stress (Fig. 3). However, the majority of respondents only experienced a moderate level of severe anxiety and too severe anxiety. The EMRS team shows a high level of anxiety, with several of them experienced moderate anxiety (46.2%), severe anxiety (7.7%), and extremely severe anxiety (7.7%) comparing to the HAZMAT team, which only have 31.4% of respondent shows a certain level of anxiety issues.

In terms of stress, respondents reported having a low level of stress, with only a minority of them perceived moderate stress; operation team (3.4%) and HAZMAT (4.3%) (Fig. 4) and none of the respondents experiencing high levels of stress.

DISCUSSIONS

Workload demand among Malaysian firefighters

Socio-demographic characteristics such as age, marital status, and working history had no significant impact on workload and job satisfaction [18]; hence, this study shall also disregard socio-demographic characteristics correlation with workload level. The overall workload for all teams scored above 50, which is generally imposed toward the mid-to-high range of the NASA-TLX (Fig. 1) [25]. Previous findings found that the declination of firefighters' psychological health was associated with a high workload [26].

As physical demand was the highest experienced by RIMS, followed by PPDA and EMRS, experts believed that firefighting is indeed a physically demanding job, and firefighters need to be physically fit to be capable of responding to emergency calls in no time [27,28]. The findings on mental demand which scored second-lowest contradicted previous research that reported cognitive load is more related to emergency responders' psychological behaviors [18].

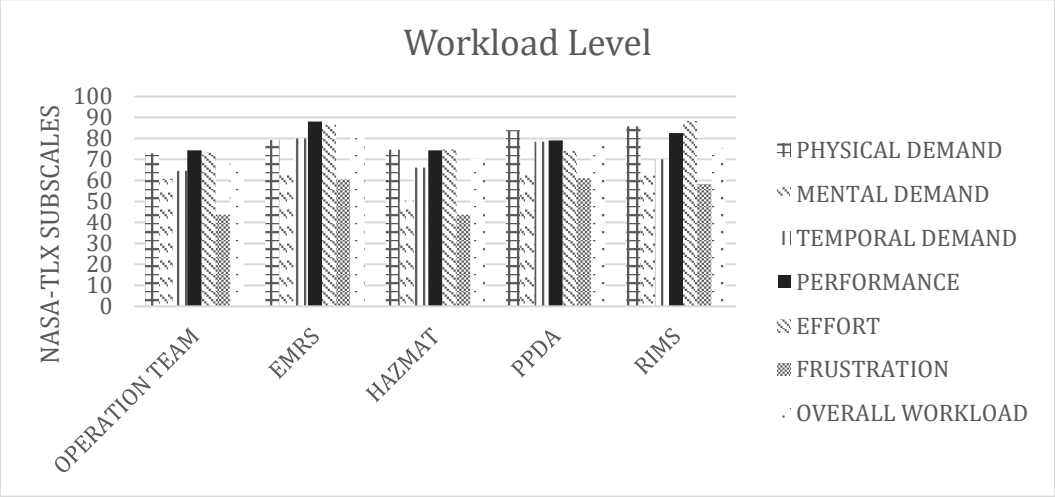

Fig. 1. Level of Workload among Studied Teams.

Emergency responders must reach the scene within a few minutes in emergency callouts, fulfilling highly time-critical tasks [28], which is considered critical, especially toward EMRS and PPDA teams. EMRS and PPDA believed that they perceived temporal demand the most during operation as compared to other groups.

As EMRS has similar roles as paramedics, it is thought that these demands contribute to high material, performance, and effort demands comparing to other teams. In agreement, the previous study also found that moderate relation of workload between autonomous motivation, perceived health, and performance resulted in a positive effect when the workload was low [26]. However, results indicate that RIMS and EMRS efforts lead to high workload perceived during working, which may affect their health.

Consistently, all teams deemed physical, performance, and effort demand as the most critical demands. It is believed that this may be due to the needs of the emergency responders to save lives and is supported earlier, where time is a critical element in ensuring effective emergency management [29]. [30] also found that higher effort was associated with higher openness, as high-open individuals show greater stress resilience than low-open individuals. However, from this study, all teams consider frustration as the least burden felt and eventually do not impact them personally.

Depression, anxiety and stress among Malaysian firefighter

Results indicate that the standard operation teams recorded higher depression. This might be due to the frequent emergency callouts received by standard operation teams compared to select groups, which rarely receive frequent cases. Studies have proven that the rate of depression is high in firefighters compared with the general population ranges from 3.8% to 5.5% among non-US firefighters, with estimates as high as 22% among firefighters in the US [31]. Numerous studies also found that there was an association between depressive symptoms and the development of post-traumatic stress disorder (PTSD) [32].

Through this study, most firefighters have higher anxiety issues comparing to depression and stress. These findings were similar to studies reported that 10.7% of firefighters self-reported an anxiety disorder diagnosis [33].

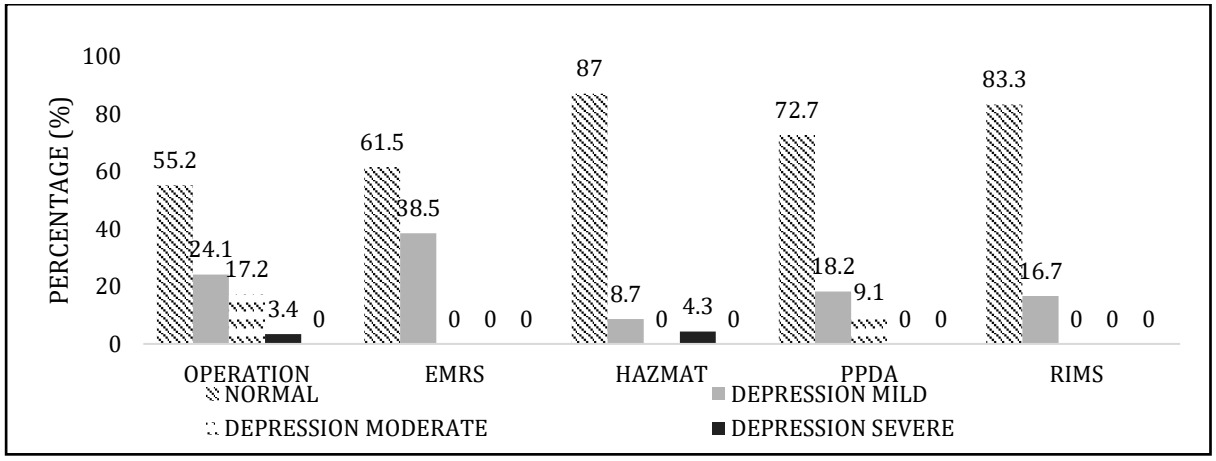

Fig. 2. Level of Depression among Studied Teams.

Experts believed that exposure to traumatic events leads to psychological fallout among emergency services; hence they contend the concept of PTSD and explain it as anxiety that occurred due to experiencing or witnessing life-threatening events, such as natural disasters and serious accidents [34]. From the results the EMRS team shows a high level of anxiety comparing to HAZMAT Team. This is due to the reason that the HAZMAT team's scope of works deals less with casualties comparing to EMRS themselves.

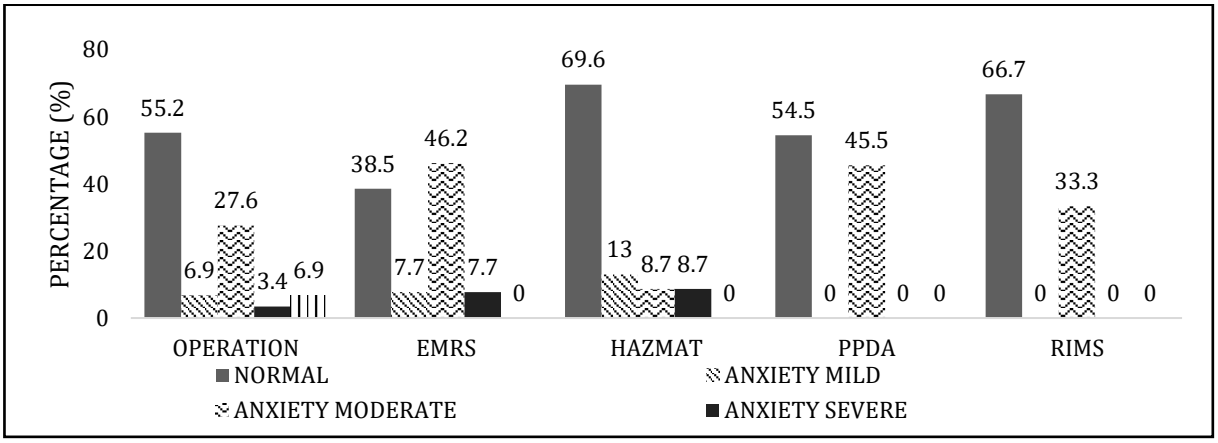

Fig. 3. Level of Anxiety among Studied Teams.

Stress results indicates that generally the firefighters have an adequate level of psychological well-being. A previous study suggested that what is more important than motivation is how the firefighters cope with their stressful work situation [35]. La Rocque *et al*. (2014) have shown depressive symptoms and other adverse emotional responses eventually associated with increasing one's sensitivity to proximal stress due to experiencing frequent trauma [36]. Furthermore, Khairilmizal *et al*. (2016) also stated the importance of emergency responders to be supported by an expert system in reducing stress in managing disasters [37,38]. Hence, most of the stress issues are mostly related to physical stress; however, when firefighters unable to cope with a stressful event, it is when the firefighters develop anxiety issues, as discussed in the previous section.

Association between the workload components with depression, anxiety, and stress

Similar trends for depression, anxiety, and stress with workload demands were also noted (Table 3). Also, there is an inverse association between frustration and stress levels. This indicates that the outcome has a positive impact on the respondents; frustration is essential to overcome stress during operation, as high frustration results in low pressure. NASA-TLX frustration indicates the domain of irritated, stressed, and annoyed versus content, relaxed, and complacent respondent feels during the task [18,39].

Through observation of FRDM personnel, it is believed that respondents stress when they have nothing to do in which they did not receive any emergency calls [38,40,41]. Firefighters always feel frustrated when responding to any emergency, as the urge to save a life was their main priority. Therefore, it could be concluded that the reason for the negative correlation between frustration and stress levels was due to the perceived stress they felt during emergency callout, which cancelled out the tension that they built during the standby period. Simultaneously, they might induce some frustration as they always believed that they could do better in responding to the

emergency than before. These findings were directly contradicting previous studies by other researchers that believed work-related stress such as workload and potentially traumatic events associated with depression and anxiety disorders, including PTSD in the emergency department [2]. It also found that too high a workload could result in higher stress, health effects, and low-performance levels [26].

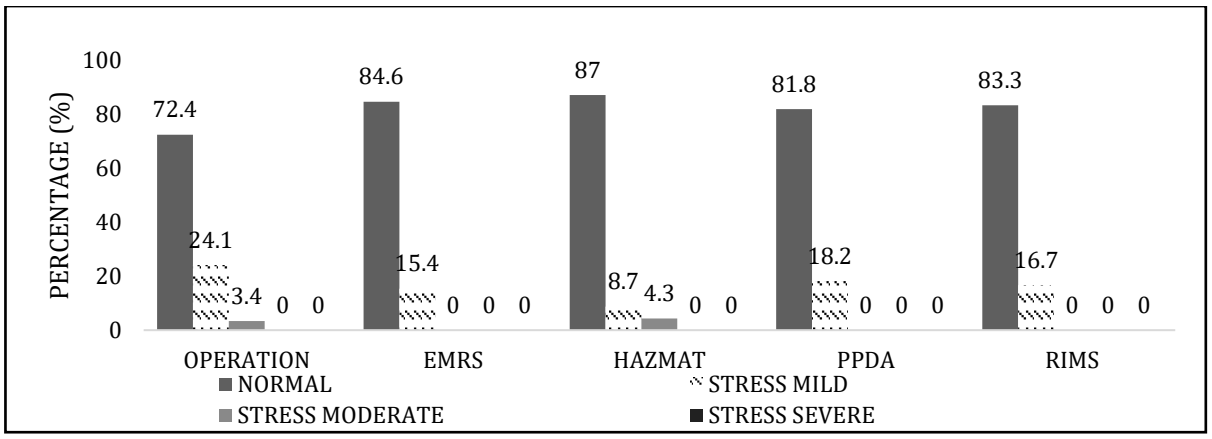

Fig. 4. Level of Stress among Studied Teams.

Through this study, it could be concluded that the workload was not correlated to depression, anxiety, and stress and vice versa. This reason is supported by research. It is suggested that a high quantitative workload was significantly related to job dissatisfaction but not significantly associated with depressive symptoms, and moderate workload shall lead to job satisfaction [42]. It is also found that excessive workloads might impact, as suggested by Yet Hobfoll [26], where excessive workload triggered workers to use their physical, cognitive and emotional resources to cope with the demand and lead to higher stress. However, the study population is not related to emergency responders.

Table 1. The Association between the Psychological Well-being and Studied Team

	Normal Operation Team (n = 29)						Elite Teams (n = 53)					
	Depression		Anxiety		Stress		Depression		Anxiety		Stress	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Physical Demands	-0.11	0.59	-0.26	0.18	-0.25	0.21	0.04	0.77	-0.13	0.36	-0.11	0.42
Mental Demands	-0.32	0.10	-0.20	0.30	-0.33	0.09	-0.01	0.97	-0.05	0.74	-0.21	0.14
Temporal Demands	-0.08	0.68	-0.24	0.22	-0.20	0.31	0.04	0.76	-0.05	0.74	0.02	0.88
Performance	-0.20	0.30	-0.22	0.26	-0.29	0.13	-0.12	0.42	-0.22	0.11	-0.15	0.29
Effort	-0.13	0.50	-0.19	0.32	-0.28	0.14	-0.06	0.66	-0.16	0.24	-0.17	0.24
Frustration	-0.28	0.15	0.07	0.74	-0.40	0.04	-0.20	0.16	-0.19	0.17	-0.26	0.07
Overall Workload	-0.15	0.44	-0.23	0.24	-0.29	0.14	-0.04	0.80	-0.17	0.24	-0.18	0.21

Note: Correlation is significant when p≤0.05

CONCLUSION

It could be concluded that through this study, the emergency responders deemed performance and effort demand is essential compared to other workload demands. The study also found that the number of personnel experienced depression and anxiety is relatively high, which could be due to their inability to cope with the significant emotional events which resulted in adverse mental health problem. However, studies have also proven that these workloads were not correlated with depression, anxiety, and stress. Additionally, secondary (new) findings were discovered where frustrations provide a positive impact on respondents' stress. Hence, in overcoming significant numbers of anxiety and depression numbers among emergency responders, it is suggested that further research could be conducted in investigating and understanding the contributing factors towards depression and anxiety so that the psychological health of emergency responders can be managed or even prevented. There are still few studies related to workload and its correlation to mental health problems among firefighters conducted in Malaysia to date; hence, this study might be a good starting point for further research to be conducted among the emergency responders in Malaysia.

Conflict of interest
The authors declare no potential conflict of interest.

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