

# Firefighter satisfaction and happiness at work: how big is the effect?

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## ABSTRACT

**Introduction:** Firefighter satisfaction plays a crucial role in overall workplace happiness. We seek to quantify the effect size of firefighters' satisfaction with happiness at work after adjusting for socio-demographic attributes.

**Materials and Methods:** This study used data from an online cross-sectional survey that was conducted from 24 June to 24 July 2021 in the Fire and Rescue Department of Malaysia. Firefighters were approached using the saturation sampling technique. They received online surveys via email through the Director of State and follow-up reminders through the Assistant Director of State Operations. A total of two filter questionnaires were employed i.e. type and duration of service. Firefighters stating that they were volunteer/auxiliary firefighters or had been in service for 2 years or less were excluded. In this study, data from 6041 out of 8581 firefighters were included for further analysis. The survey utilised the validated staff satisfaction index (SSI) and the happy career (HC) scale for in-service firefighters. SSI was a dual-dimension index consisting of welfare and protection against hazards at work, with 16 subdimensions. The HC is a five multi-dimensional items scale. Then, we used multiple linear regression to obtain the coefficient of determination while adjusting for age groups, gender, marital status, job grade, years of service and region of service.

**Results:** A total of 6041 eligible data points were analysed in the study. The mean ( $\pm$ SD) age was 38.70 (8.97) years, of which 95.9% were male. The firefighters were in service for a median of 14 years (Q1, Q3: 8, 21). The firefighter reported higher life satisfaction (mean [SD] = 78.30 [9.15]) than happiness at work (mean [SD] = 77.22 [0.20]). The mean happiness scores differed significantly between years of service groups ( $p < 0.001$ ), region of service ( $p < 0.001$ ), marital status ( $p = 0.029$ ) and grade ( $p < 0.001$ ). Firefighters' satisfaction contributed 42.7% of workplace happiness ( $\beta_{adj} = 1.096$  [95% CI: 1.064, 1.128];  $p < 0.001$ ) after adjusting for frontline, married, the central region of service and male gender as control variables.

**Conclusion:** Firefighter satisfaction had a large effect size on happiness at work (42.7%). However, the interpretation of this effect size should be done with caution because

happiness at work is inseparable from other life dimensions such as stability in matrimonial relationships and finances, involvement in leisure and religious activities and being mentally healthy.

## KEYWORDS:

*Firefighters, satisfaction, happiness, workplace, effect size*

## INTRODUCTION

Satisfaction at work is the integrated set of psychological, physiological and environmental conditions that encourage employees to state that they are satisfied or happy with their jobs.<sup>1</sup> Happiness is a fundamental, transient positive emotion in human hedonic experience, which may largely be influenced by a job and juggling with other life domains such as stability in a matrimonial relationship and finances, involvement in leisure activities and religious community, and being mentally healthy.<sup>2</sup> Although job satisfaction and positive emotion while working are viewed as happiness-related constructs in the workplace, positive emotion while working and job satisfaction are not similar.<sup>3</sup> Often job satisfaction has a predominant focus on the cognitive evaluations of job features rather than feelings about the job or emotional experiences while working. A prior study has noted the importance of higher cognitive job function mediates emotional feelings for the intention to act efficaciously.<sup>4</sup> A study showed that firefighters who had positive emotion, i.e. meaning of work, positively related to in- and extra-role job performance.<sup>5</sup> Positive emotion such as being happy signifies that things are working as predicted,<sup>6</sup> a mediator between job demands and organisational outcomes<sup>7</sup> and boosting health.<sup>8</sup>

Previous studies on the job or employee satisfaction used generic assessment items that were not reflective of the nature of firefighting and the hazardous dynamic environments encountered. Firefighting is a high-risk job susceptible to physical and mental injuries from carrying out duties. In addition to hazards encountered at the scene of a fire, firefighters also perform search and rescue and respond to natural as well as man-made disasters. Approximately 23 to 25 firefighters are injured per 1,000 fires, while about seven injuries per 10,000 occur in non-fire emergencies.<sup>9</sup> Although organisational commitment may be an antecedent to

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firefighters' health, wellness, and fitness, existing job resources for protecting firefighters against various hazards to prevent injury and disease as well as safeguarding their welfare should be evaluated promptly. Welfare is repeatedly mentioned as a factor able to magnetise firefighters' feelings of happiness as they conduct heroic actions.<sup>10</sup> It is worth studying how much welfare and protection against hazards affect firefighters as some factors including being married, serving in a less hectic region, and stepping up the career ladder have been mentioned as contributing to firefighters' happiness.

Although happiness at work is the main focal outcome in psychological studies compared to the occupational field,<sup>10-12</sup> happiness at work has reached the attention of the managerial level in the Fire and Rescue Department of Malaysia (FRDM). Firefighter satisfaction and its relation to workplace happiness were recently documented using customised Staff Satisfaction Index (SSI) and happy career (HC) scales. These scales represent promising tools to identify which areas of hazard protection and welfare issues are crucial to improving and enhancing satisfaction and happiness at work. This targeted outcome is parallel to a range of studies stating that some aspects of organisational practices and qualities (e.g. supervision, camaraderie with teammates about workload, security, career pathways and rewards) and how they are perceived by the organisation's members, consistently predicts happiness-related attitudes.<sup>13,14</sup> In this study, happiness at work was viewed as a firefighter's feelings of happiness related to their job regarding meaning, personality fit, work environment and skill utilisation.<sup>15</sup> We seek to quantify the effect size of firefighters' satisfaction with happiness at work after adjusting for socio-demographic attributes. It is hoped that managerial personnel can prioritise the demands of professional and personal lives for the betterment of planning.

## MATERIALS AND METHODS

### *Study Design and Population*

This study used data from an online cross-sectional survey that was conducted from 24 June to 24 July 2021 in the Fire and Rescue Department of Malaysia. Firefighters were approached using the saturation sampling technique. Saturation sampling is done where all the members on a particular e-list are invited to participate.<sup>16</sup> This technique minimises non-response bias and ensures that each person can respond only once. Firefighters received online surveys via e-mail through the Director of State and follow-up reminders through the Assistant Director of State Operations. They were filtered by two questionnaires, i.e. type and duration of service. Firefighters stating that they were volunteer/auxiliary firefighters or had been in service for 2 years or less were excluded. In this study, data from 6041 out of 8581 firefighters were included for the further analysis. The data surpassed the expected minimum sample size of 725. The sample size was calculated using G\*Power 3.1.9.7 software. The 'a priori' sample size was calculated for the F test family with multiple linear regression (MLR) (fixed model, R2 deviation from zero) with the settings as follows:  $f^2 = 0.02$  (small effect size),  $\alpha=0.05$ , number of predictors = 7, and power set at 80%.

### *Study Tools*

This study utilised a questionnaire packet consisting of socio-demographic information (i.e., age, marital status, gender, job grade, service region and duration of service), the SSI, and the happy career (HC) scale. The SSI and HC were newly developed and underwent a series of validation procedures, replicating previous suggestions<sup>17</sup> for assessing firefighter satisfaction and happiness levels at work. The SSI had dual dimensions, namely protection against hazards and welfare factors. The protection against hazards consisted of 10 subdimensions measuring engineering and administrative control as well as personal protective devices: (1) personal protective suit, PPS (five items, composite reliability [CR] value = 0.925), (2) workspace WORKSP (three items, CR value = 0.925), (3) facility and equipment, EQUIP (seven items, CR value = 0.934), (4) documentation related to standard operating procedures and work manuals, DOC (four items, CR value = 0.939), (5) addressing occupational safety and health issues, OSH (five items, CR value = 0.920), (6) workload, WORKLOAD (five items, CR value = 0.933), (7) psychological care, PSYCARE (six items, CR value = 0.933), (8) physical fitness, FITNESS (six items, CR value = 0.910), (9) health surveillance, HSURV (four items, CR value = 0.936) and (10) supervision, SV (three items, CR value = 0.923). The welfare factors consisted of six subdimensions measuring (1) salaries, SALARIES (four items, CR value = 0.928), (2) special allowances, SpALLOW (two items, CR value = 0.828), (3) compensation for occupational injury or death, COMPENS (three items, CR value = 0.953), (4) career development, CAREER (four items, CR value = 0.917), (5) Care, CARE (five items CR value = 0.894) and (6) compassion, COMPASSION (four items, CR value = 0.858). All SSI items began 'I am satisfied with . . .'. A higher score indicates higher satisfaction.

The HC scale consists of five multidimensional items and was used to measure the firefighter's feelings of happiness related to their job regarding meaning, personality fit, work environment, and skill utilisation. A total of three HC items started with 'I am happy to work in the Department because . . .'. The other two items omitted the initial wording because they would have made them too lengthy, exceeding 15 words per statement. The firefighters were expected to rate their level of agreement with SSI and HC using a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = slightly agree, 4 = agree and 5 = strongly agree). There was no undecided or neutral response. The firefighters were forced to evaluate their level of agreement rather than sitting on the fence. A higher score indicates higher happiness at work.

In confirmatory factor analysis (CFA), the SSI was regressed on the HC scale using partial least squares structural equation modelling, namely the reflective formative disjoint two-stage approach. The analysis revealed that SSI and HC satisfied all measurements and structural model assessments. Protection against hazards at work ( $\beta=0.370$ ,  $p<0.001$ ) and safeguarding welfare ( $\beta=0.375$ ,  $p<0.001$ ) explained 46.6% of the happiness variance. Both dimensions displayed small to medium effect sizes and relevance to predicting happiness ( $Q^2=0.339$ ). Details can be accessed via previous publications.<sup>18</sup>

**Table I: Socio-demographic profile of respondents**

Profile	Frequency	Percent
Gender		
Male	5794	95.9
Female	247	4.1
Marital Status		
Single	669	11.1
Married	5257	87.0
Widowed	115	1.9
Region of Service		
Northern	1286	21.3
Central	1993	33.0
Southern	1535	25.4
East Coast	880	14.6
East Malaysia	347	5.7
Job Grade		
KB19	3788	62.7
KB22/24/26/28	1670	27.6
KB29/32/38	426	7.1
KB41/44/48	134	2.2
KB52 and above	23	0.4
Education		
Postgraduate (Master/PhD)	74	1.2
Degree/ Professional Certificate	1637	27.1
Secondary	4317	71.5
Primary	13	0.2

Note: Northern – Perlis, Kedah, Penang and Perak; Central – Selangor, Kuala Lumpur and Putrajaya; Southern – Melaka, Negeri Sembilan and Johor; East Cost – Terengganu, Kelantan, Pahang; East Malaysia – Sabah, Sarawak dan Labuan

**Table II: Descriptive data for firefighter satisfaction and happiness at work (n = 6041)**

Variables	Score	Mean ± SD	95%CI for mean
Firefighter satisfaction	0 to 100	78.30 ± 0.12	78.07, 78.53
Protection Against Hazards			
Personal Protective Suit	5 to 25	18.11 ± 0.05	18.02, 18.19
Workspace	3 to 15	11.03 ± 0.03	10.98, 11.08
Equipment	7 to 35	23.51 ± 0.07	23.38, 23.64
Documentation	4 to 20	13.05 ± 0.03	14.99, 15.11
OSH	5 to 25	19.10 ± 0.04	19.03, 19.17
Workload	5 to 25	17.65 ± 0.04	17.57, 17.74
Psychological Care	6 to 30	21.33 ± 0.05	21.34, 21.54
Fitness	6 to 30	21.13 ± 0.05	22.05, 22.23
Health Surveillance	4 to 20	14.37 ± 0.04	14.29, 14.46
Supervisor	3 to 15	11.92 ± 0.02	11.88, 11.97
Staff Welfare			
Salary	4 to 20	11.86 ± 0.05	11.77, 11.96
Special Allowance	2 to 10	7.75 ± 0.02	7.71, 7.79
Compensation	3 to 15	9.65 ± 0.03	9.58, 9.72
Career Development	4 to 20	16.18 ± 0.03	16.12, 16.24
Care	5 to 25	16.58 ± 0.05	16.48, 16.69
Compassion	4 to 20	16.29 ± 0.03	16.24, 16.35
Happiness at work	0 to 100	77.22 ± 0.20	76.83, 77.61

Note: OSH – addressing occupational safety and health.

Table III. Mean differences in firefighter satisfaction and happiness at work scores according to socio-demographic factors (n = 6041)

Socio-demographic	Firefighter satisfaction score					Happiness at work score					p value		
	n	Mean	SD	95%CI for mean		Test	p value	Mean	SD	95%CI for mean		Test	
				LL	UL					LL			UL
<b>Age</b>													
Less than 30 years	1379	79.01	9.88	78.49	79.53	F (3, 6037) = 13.67	<0.001	76.55	16.47	75.68	77.42	F (3, 6037) = 6.97	<0.001
31 to 40 years old	2205	77.48	9.42	77.09	77.87			76.55	15.98	75.89	77.22		
41 to 50 years old	1648	78.20	8.62	77.78	78.62			77.72	14.57	77.02	78.43		
More than 50 years	809	79.53	7.85	78.98	80.07			79.14	13.75	78.19	80.09		
<b>Years of service</b>													
Less than 10 years	2475	78.44	9.84	78.05	78.82	F (3, 6037) = 4.10	0.006	76.34	16.42	75.69	76.98	F (3, 6037) = 6.73	<0.001
11 to 20 years	2023	77.86	8.95	77.47	78.25			77.52	15.13	76.86	78.18		
21 to 30 years	1331	78.46	8.27	78.02	78.91			77.90	14.21	77.14	78.66		
More than 30 years	212	79.91	7.70	78.87	80.95			80.37	14.08	78.46	82.27		
<b>Gender</b>													
Male	5794	78.32	9.15	78.08	78.55	t = 0.71	0.483	77.33	15.46	76.93	77.73	t = 2.75	0.006
Female	247	77.90	9.10	76.76	79.04			74.59	15.31	72.68	76.51		
<b>Marital status</b>													
Single	669	79.59	10.19	78.81	80.36	F (2, 6038) = 7.63	<0.001	75.81	16.67	74.55	77.08	F (2, 6038) = 3.54	0.029
Married	5257	78.15	8.99	77.91	78.39			77.42	15.31	77.01	77.84		
Once Married	115	77.64	9.46	75.90	79.39			76.07	14.75	73.34	78.79		
<b>Job Grade</b>													
KB19	3788	78.21	9.44	77.91	78.51	F (4, 6036) = 0.87	0.479	76.35	15.68	75.85	76.85	F (4, 6036) = 10.96	<0.001
KB22/24/26/28	1670	78.29	8.46	77.89	78.70			78.21	14.77	77.50	78.92		
KB29/32/38	426	78.80	9.33	77.91	79.69			79.30	15.69	77.81	80.79		
KB41/44/48	134	79.19	8.31	77.77	80.61			81.27	15.18	78.68	83.87		
KB52 and more	23	79.72	9.97	75.41	84.03			86.23	13.26	80.50	91.96		
<b>Region</b>													
Northern	1286	77.54	8.89	77.05	78.02	F (4, 6036) = 4.59	0.001	76.64	15.43	75.80	77.49	F (4, 6036) = 7.69	<0.001
Central	1993	78.14	9.64	77.71	78.56			76.30	15.97	75.60	77.00		
Southern	1535	78.90	8.96	78.45	79.34			78.13	15.27	77.36	78.89		
East Coast	880	78.48	8.37	77.93	79.04			77.21	14.02	76.29	78.14		
East Malaysia	347	78.97	9.74	77.94	80.00			80.60	16.36	78.87	82.32		

Table IV Predictors for happiness at work among firefighters (n = 6041)

Variables	Simple linear regression			Multiple linear regression			t	Sig.
	Coefficients β	95% CI for β		Adjusted Coefficients β	95% CI for β			
		LL	UL		LL	UL		
Constant	1.095	1.062	1.127	-11.197	-14.276	-8.117	-7.128	<0.001
Firefighter satisfaction	-2.331	-3.135	-1.526	1.096	1.064	1.128	66.521	<0.001
Frontline	1.571	0.411	2.731	-1.729	-2.352	-1.107	-5.446	<0.001
Married	-1.369	-2.198	-0.540	2.229	1.331	3.126	4.868	<0.001
Serve in central region	2.736	0.767	4.705	-0.903	-1.532	-0.273	-2.811	0.005
Male	-0.084	-0.950	0.781	2.120	0.627	3.613	2.784	0.005
Tertiary education	1.491	0.699	2.283	-	-	-	-	-
Service 10 years and more				-	-	-	-	-

Note: Forward method (r<sup>2</sup> = 0.427; the model fits reasonably well; model assumptions are met; no multi-collinearity problem detected)

**Analysis**

**SSI Scoring**

As the maximum score for the satisfaction index is 100%, we derived the index score based on the weighted value of each dimension from CFA (Figure 1). The mathematical formula for the score involved three steps.

Step 1. Score formula for dimension protection against hazards.

$$\frac{(0.422 * SV) + (0.323 * OSH) + (0.109 * DOC) + (0.199 * FITNESS) + (0.022 * HSURV) + (0.081 * WORKLOAD) + (0.124 * PPS) + (0.012 * PSYCARE) - (0.201 * EQUIP) + (0.127 * WORKSP)}{23.35} \times 100\%$$

Step 2. Score formula for the welfare factor dimension.

$$\frac{(0.567 * COMPASSION) + (0.326 * CAREER) + (0.134 * CARE) + (0.143 * SpALLOW) + (0.089 * SALARY) + (0.079 * COMPENS)}{24.94} \times 100\%$$

Step 3. Total score for the staff satisfaction index.

$$50\% \text{ of score protection against hazards} + 50\% \text{ of score welfare factor}$$

**Workplace Happiness Scoring**

In that the five items in HC are multidimensional, the interval score was generated via the Rasch measurement model<sup>19</sup> using the following formula:

$$USCALE = (\text{wanted range}) / (\text{current range}),$$

$$UMEAN = (\text{wanted low}) - (\text{current low} \times USCALE).$$

**Descriptive, Bivariable and Multivariable Analyses**

The collected data were checked for missing values. The online Excel data was submitted in the IBM Statistical Package for Social Science (SPSS) version 26 for data normality and summarisation. A one-way analysis of variance (ANOVA) was used to determine whether there were any statistically significant differences between the means of three or more independent groups, for example, age, years of service, marital status, job grade, and region of service. Pearson correlation coefficients, *r*, were calculated for firefighter satisfaction and happiness at work. The value of *r* <0.2 – very weak, 0.2 to <0.4 – weak, 0.4 to <0.6 – moderate, 0.6 to <0.8 – strong, and *r* ≥0.8 – very strong relationship.<sup>20</sup>

MLR was applied to quantify the effect size between the SSI score and the HC score relationship after controlling for frontline job scope, marital status, service in the central region, male gender, education level and years of service. The effect size was determined by the coefficient of determination, *R*<sup>2</sup>, which is a statistical measure in a regression model that determines the proportion of variance in the dependent variable that can be explained by the independent variable. The *R*<sup>2</sup> categories for the linear regression were <0.02 very

weak, 0.02 to <0.13 weak, 0.13 to <0.26 moderate, and 0.26 and above indicated a substantial effect size.<sup>21</sup> Some socio-demographic variables were regrouped into dichotomous categories as the following: (1) Job grade of KB19 was grouped as frontline whilst grade KB 22 and above was grouped as non-frontline, (2) marital status was grouped as married and single/once married, (3) those reported working in Selangor, Kuala Lumpur and Putrajaya were grouped as the central region of service whilst those reported working in other states were grouped as non-central region, (4) those reported had completed college, university or any form of professional certification were grouped as tertiary whilst those reported had secondary school and below were grouped as non-tertiary and (5) service year was grouped as less than 10 years and 10 years and more.

The MLR replicated analysis steps as described and statistical assumptions were checked.<sup>22</sup> A forward method was chosen to get the parsimonious model. A scatter plot was created between the HC and SSI scores to ensure a linear relationship. Variables with a *p* value up to 0.5 in the simple linear regression were selected if they supported plausibility. Once the preliminary model was obtained, the interaction term between independent variables was checked followed by multicollinearity checking. The independence of residuals was checked using the Durbin–Watson statistic at a range of 0 to 4. Outliers were checked using casewise diagnostics followed by the determination of normality assumptions of the residues.

**Ethical Considerations**

This study was approved by the Research Ethics Committee on 8 December 2020. Project code FF-2020-490.

**RESULTS**

**Socio-Demographic Profile**

A total of 8581 firefighters responded. Only 6041 eligible in-service firefighters who rendered their service across the nation for at least two years were selected. The mean (±SD) age was 38.70 (8.97) years (range: 22 to 61 years). About one-third of the respondents were over 40. The majority of the respondents were male (95.9%), married (87%), had education until secondary school (71.7%), and served in a non-central region of Malaysia (67%; Table I).

**Firefighter Satisfaction and Happiness at Work**

Subdimensions of firefighter satisfaction were generally found to be scored above three per item except for salary (Table II). The majority of the firefighters agreed that they had supportive supervision at work (97%), department compliance with occupational safety and health requirements (95.6%), department provided necessary standard operating procedures, standards of guidelines and manuals (94.4%), physical fitness-related matters (90.6%), career development (97.5%), satisfaction with the special allowance provided (94.6%) and the level of compassion showed by the management and department (98%). Although higher firefighter satisfaction was strongly related to high happiness at work (*r*=0.65, *p*<0.001), only 70.1% and 41.2% of the surveyed firefighters reported satisfaction and happiness of more than 75%, respectively.

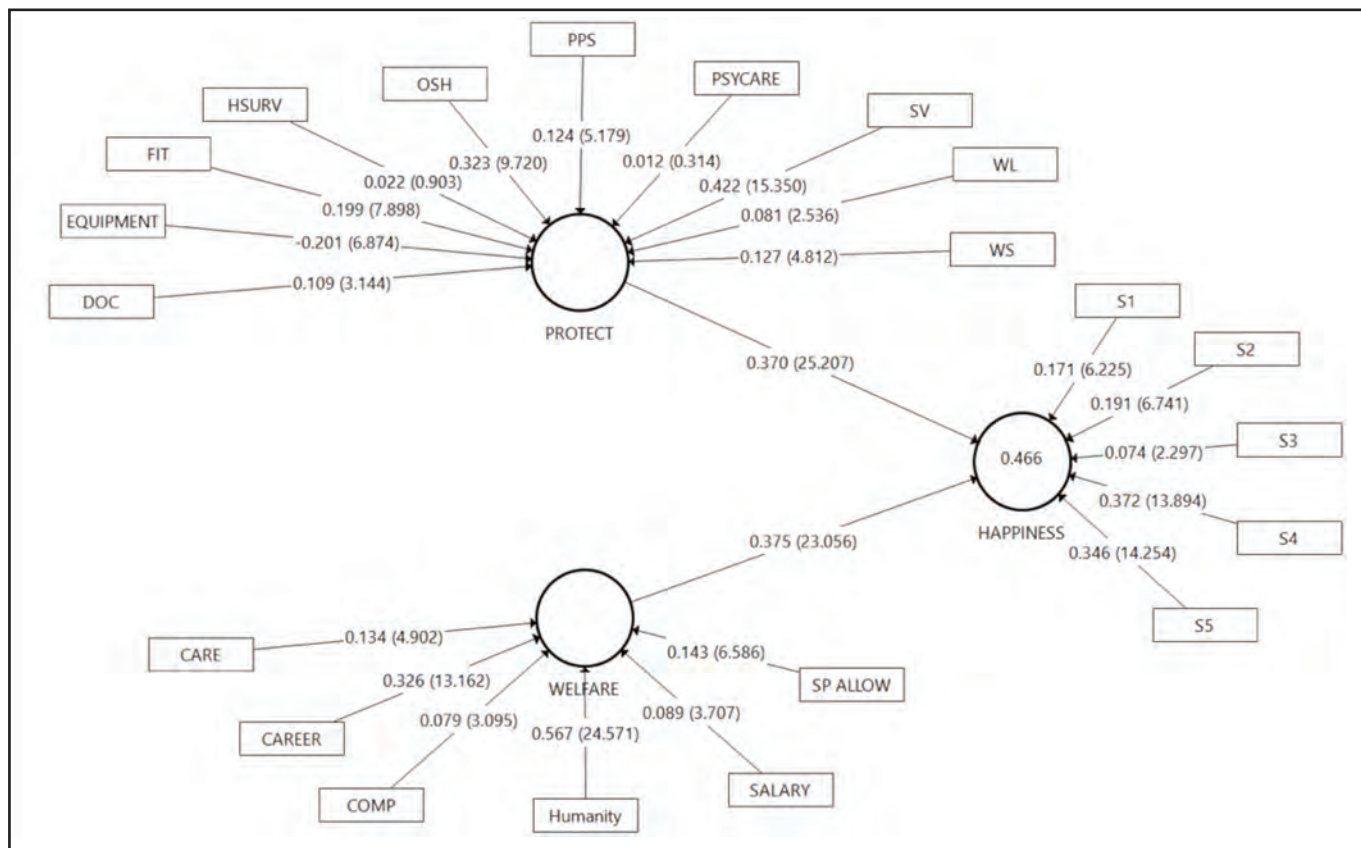


Fig. 1: Staff Satisfaction Index on Happiness Scale: A Reflective-formative disjoint two-stage approach

The mean total satisfaction score of 78.30 (9.15) was higher than the mean total happiness score, of 77.22 (15.46), for all firefighters. The mean total happiness score differed significantly for all socio-demographic attributes. It varies in age groups ( $p < 0.001$ ), years of service ( $p < 0.001$ ), gender ( $p = 0.006$ ), marital status ( $p = 0.029$ ), job grade ( $p < 0.001$ ) and region of service ( $p < 0.001$ ). The highest happiness levels were reported by grade KB52 and above ( $86.23 \pm 13.26$ ), followed by KB41/44/48, KB29/32/38, KB22/24/26/28 and KB19 in descending order. Firefighters who served more than 30 years or serve in East Malaysia reported happiness of more than 80%, i.e.  $80.37 \pm 14.08$  and  $80.60 \pm 16.36$ , respectively (Table III).

This study found that firefighter satisfaction is a significant factor in predicting happiness at work ( $\beta_{adj} = 1.096$  (95% CI: 1.064, 1.128);  $p < 0.001$ ) after adjusting for frontline job scope, male gender, the central region of service and married status. Satisfaction alone contributed to 42.7% of the overall happiness level (Table IV).

**DISCUSSION**

This study aimed to quantify the effect size of satisfaction with happiness at work after adjusting for socio-demographic attributes among in-service firefighters. Firefighter satisfaction and its relation to workplace happiness were recently surveyed using customised tools, namely the SSI and HC scales. In this gender-representative sample, our analysis provides a contemporary benchmark of satisfaction’s effect

size. Firefighters are worth to be studied because their professions are high-risk in nature and unpredictable, with intermittent periods of intense physical and psychological stress. They are expected to execute all 14 essential tasks against the types and levels of emergency services provided to the local community.<sup>23</sup> Responding to sudden emerging incidents, and performing a series of emergency tasks to protect the public from incident-related hazards and possible risks inherent to it necessitates constant physical readiness at any time with the optimum level of protection against various hazards.

We found firefighters’ happiness at work is largely driven by job satisfaction regarding protection against hazards and ensuring welfare factors (42.7%). This result is because firefighters, on average, were satisfied with the positive work state created by the FRDM in protecting their men against various hazards at work and safeguarding their welfare. This finding corroborates the ideas of Pasca and Wagner<sup>24</sup>, who suggested that a positive work state is negatively related to satisfaction and positively related to psychological symptomatology. FRDM creates a positive work state by complying with the hierarchy of control measures at all stages of deployment. Firefighters are equipped with suitable modernised engineering control technology, administrative application at various stages of deployment, and appropriate personal protection equipment (PPE) specification. In addition, FRDM also provides a peaceful mind of securing the welfare matters of the deployed firefighters in any case of injury and death.

The modernised technology of engineering controls builds in what firefighters need to reduce the risk of hazards and increase safety parameters to assure the risk associated with the essential tasks is worth taking. For example, the HAZMAT vehicle is designed to be resilient against toxic fumes of on-site hazardous material. Thermal imaging is used to detect infrared energy emitted by people, objects and materials to facilitate firefighters in search and rescue, and non-contact laser thermometers are used to monitor the risk of a boiling liquid expanding vapor explosion (BLEVE). In addition, the design of passive fire protection and the installation of active fire protection systems (25) enable firefighters to go into a building for fire suppression and come out alive. A failure in these systems whether mechanical in nature of an active fire protection system or a breach of passive fire protection could lead to unsafe conditions and firefighter injury or death. Therefore, the engineering control requires regular checks and maintenance to ensure it remains in favour over administrative and personal protective equipment.

Administrative controls application such as standard operating procedures, compliance inspections, industrial code of practice and best practices guide how firefighters manage their own risk of hazards. Risk management is a process initiated by identifying what risks are inherent in fire suppression, rescue activities and managing hazardous material, followed by a risk assessment and analysis. Risks are assessed in terms of how often and how bad the consequences could be. Thus, risk control can be chosen appropriately using engineering controls and administrative and personal protection equipment to minimise the risks. Firefighters undergo regular training and simulations to equip them with this knowledge and inculcate relevant skills so that it becomes their second nature to do automated series of actions in responding to real case scenarios. In addition, training and simulations also allow firefighters to test PPE suitability and integrity during pre-operations. Three major issues about PPE can be highlighted, e.g. suitability concerning the variation of human factors, dexterity, and mobility challenges due to oversizing and integrity of protection in the interface between protective equipment and full gear.<sup>26</sup> These issues are important as it may negatively effecting firefighters' work efficiency and safety in a hazardous environment.

In any standard textbook of occupational health, PPE is the last hierarchy of control measures,<sup>27</sup> albeit the most critical lifeline to firefighters in an emergency. If the administrative and engineering controls are adequate, the need for PPE lessens yet matches the inherent hazards. Generally, PPE is provided for major tasking to protect against thermal threats and toxic gas inhalation during fire suppression and to protect against physical injuries (e.g., cuts, punctures, slips, trips, and falls) during rescue operations. During fire suppression, firefighters are equipped with heavy, fire-resistant full gear including a breathing apparatus. In other dangerous rescue situations, such as crashed vehicles, structural collapses and industrial accidents, or high-angle rescue, firefighters require different sets and types of equipment to protect them against hazards during cutting, breaking, shoring, searching, and lifting. Those PPE sets are at par or above specifications with optimum cost efficiency to

enhance task-related abilities to cope with task-specific demands. The specialised PPE must undergo regular field testing to ensure it fits for performance, which is affected by a wearer's body physique. Those with skinny body types might experience back strain, which triggers rapid fatigue or fall injuries due to the shifting of the body mass centre while carrying a heavy self-contained breathing apparatus on their back. Therefore, the physical fitness of the wearer is another element that must be surveyed.

In the world of firefighters, there are eight definitive standards of firefighter physical fitness<sup>28</sup> that firefighters should be able to maintain throughout their career to make them safe before saving others. The eight definitive sets of physical fitness measures include (i) optimising core strength, (ii) cardiovascular capacity, and (iii) flexibility, as well as muscular strength, endurance, and power for (iv) pulling, (v) pushing, (vi) carrying, (vii) lifting and (viii) dragging functional movements. All elements of physical fitness are important for shaping the body's physique to keep performing under strenuous activity for lengthy periods<sup>29</sup> while wearing or carrying heavy full gear or equipment. In Malaysia, this physical fitness is assessed by the standard individual physical proficiency test (IPPT) at every 6 months.<sup>30</sup> The IPPT consists of (i) a 2.4-km run to test cardiovascular capacity, (ii) a bent-knee sit-up to test endurance of the abdominal core and hip flexor muscles, (iii) a standing broad jump to test explosive muscular power of the lower body, (iv) pull-up (for males)/inclined pull-up (females) to test upper-body muscular strength and endurance, and (v) 4 × 10-m shuttle run to test the speed of movements, agility, and coordination.

Of all the physical standards, the 2.4-km run to test cardiovascular capacity is mandatory. If the firefighter fails the run, the other IPPT components also fail. As a firefighter, optimum cardiovascular capacity is a weapon to maintain job performance for a long time without being lethargic. Cardiovascular capacity concerns the transportation of oxygen to working muscles for effective energy production and the efficiency of this muscle exchange and oxygen use.<sup>28</sup> Firefighters are required to have a minimum aerobic capacity of 42 ml/kg/min<sup>23</sup> to tolerate various types of physical activities while wearing a self-contained breathing apparatus. Based on contemporary values, aerobic capacity ranges from 37.45 to 58.21 ml/kg/min for responding to various incidents, for instance, interventions in traffic accidents, extinguishing fires, incidents with hazardous materials, rescues and forest fires.<sup>28,31</sup>

Safeguarding welfare is another positive element that magnetises firefighters' feelings of happiness at work. A possible explanation for this might be that well-guarded welfare while on duty is a good motivator of work meaning i.e. dimension of happiness at work.<sup>15</sup> This hypothetical explanation accords with earlier observation,<sup>5</sup> which showed that work meaning played an important role in firefighter's work engagement level. Firefighters are engaged to focus on the task and absorbed with the strategies and tactics to accomplish missions. The engagement is rather non-emotional and unconscious at the moment, leading to firefighters' positive psychology.<sup>32</sup> Examples of positive

psychology leading to happiness at work include feelings of confidence, bravery and sincerity.<sup>33</sup> The dimension of special allowance as part of welfare factors also contributed to happiness at work because it was perceived as a reward for their specialised hard work.<sup>34</sup> Special allowance is given to subject-matter experts or specialised teams such as special tactical operation and rescue (STORM), hazardous materials (HAZMAT) and multi-skilled teams (MUST). The other dimensions such as compensation for injury, permanent disability and death, career development, caring and compassion provide peace of mind while deployed. As expected, the salary dimension was recorded as the lowest mean score in the welfare dimension. This is because salary and some allowances set by another public entity may need a lengthier time for passing any monetary increment demands. Although the salary is not an attractive incentive, many young adults try their luck to be recruited because they perceive firefighting as a prestigious job locally<sup>35</sup> and internationally.<sup>36</sup>

Firefighting is perceived as a prestigious job because it provides the opportunity to serve the local community among people with specific types of traits in a manner greater than themselves. Generally, firefighters have complementary personality traits. The frequently observed personality traits of those who are attracted to the fire services are extroversion and conscientiousness.<sup>39,38</sup> Extroversion means they feel excited by external stimuli such as interacting with people or receiving calls to thrilling emergencies and scenarios.<sup>39</sup> The conscientiousness trait is positively correlated with psychological skills.<sup>38</sup> These personality traits can predict an individual's habitual way of reacting to work-related challenges and stressors. Those traits explain why firefighters are systematic, dependable and generally plan matters even in adrenaline-fuelled situations. Harmonising between these inner selves and daily living by the nature of the fire service leads to happiness.<sup>40</sup>

However, our study found that firefighters reported high satisfaction scores and low happiness at work, similar to previous findings.<sup>41</sup> These findings further support the idea that they remain resilient while suppressing their own emotions.<sup>14</sup> There are always chances of line-of-duty death while saving the public from incident/disaster and willing to make the ultimate sacrifice, if necessary. In a prolonged emergency, they look out for the interests of others before theirs. Sometimes firefighters experience the loss of close buddy in an incident. Certainly, they want to survive in this prestigious career with their courage, wellness, health and sanity intact. This is because the majority of firefighters cannot simply walk away and pursue another inviting dream job.

This is the first study describing the effect size of firefighters' satisfaction on happiness at work recorded among a gender-representative sample of firefighters nationwide in Malaysia. This work offers a comprehensive depiction of the relationship between firefighter satisfaction and happiness consistent with the culturally adapted measures of firefighters' interest. Therefore, the results of the current study provide valuable data that reinforces the 16 factors of minimising hazards and ensuring welfare as antecedents for

being happy at work. Moreover, areas for continual improvement specifically identified the prevention of essential tasks effects during service years for example equipment for essential tasks and administrative controls. Although the current study was observational, the generalisation of the effect size to the hypothesised model yields a meaningful value. Hence, SSI and HC are promising tools for annual monitoring at the FRDM level in safeguarding satisfaction and happiness among their men.

Happiness at work has not been able to separate from the other life dimensions such as matrimonial relationships, stability in finances, involvement in leisure activities and religious community, and being mentally healthy. These life dimensions should be measured as adjusted predictors in future studies. In the future longitudinal study, it is worth conducting happiness at work as a specific mediating factor between satisfaction and safety job performance among firefighters in Malaysia.

This online survey was not feasible for accessing the entire firefighters. The survey was limited to those with formal email and internet access as well as the swiftness of email distributions from top management (KB41/44/48 or KB52) to operation crews (KB19) who resided at various fire stations throughout Malaysia. In addition, computer literacy to respond to online surveys may be a significant challenge for older firefighters. However, this inherent coverage bias is considered a minor disadvantage because Table I showed that the sample was representative of gender and job grade. However, generalisation of the data to other volunteer/auxiliary firefighters should be done cautiously.

## CONCLUSION

Firefighter satisfaction had a large effect size on happiness at work (42.7%). Enhancing protection against hazards and ensuring welfare factors are critical, as they empower firefighters to carry out their essential tasks against the types and levels of emergency services provided to the local community safely and soundly. However, the interpretation of this effect size should be done with caution because happiness at work is inseparable from other life dimensions such as stability in matrimonial relationships and finances, involvement in leisure and religious activities, and being mentally healthy.

## AUTHOR CONTRIBUTIONS

ARA and RI contributed to the conception and design of the study. MM and MNA organised the data and conducted the statistical analyses as well as the preliminary discussion. MM, MNA, and RI drafted sections of the manuscript. NHM and IAG were the key informants and provided experiential learning for RI. All the authors engaged in revising, reading, and approving the submitted version of the manuscript.

## REFERENCES

1. Hoppok R, Spielgler S. Job satisfaction. *Occupations* 1938; 16(7): 636-43.
2. VanderWeele TJ. On the promotion of human flourishing. *Proc Natl Acad Sci* 2017; 114(31): 8148-56.



3. Fisher CD. Happiness at work. *Int J Manag Rev.* 2010; 12(4): 384-412.
4. Tyng CM, Amin HU, Saad MNM, Malik AS. The influences of emotion on learning and memory. *Front Psychol.* 2017; 8.
5. Dan C-I, Roşca AC, Mateizer A. Job crafting and performance in firefighters: the role of work meaning and work engagement. *Front Psychol.* 2020; 11.
6. Ekman P. Are there basic emotions? *Psychol Rev.* 1992; 99(3): 550-3.
7. Thompson A, Bruk-Lee V. Employee happiness: why we should care. *Appl Res Qual Life.* 2021; 16(4): 1419-37.
8. Ong AD. Pathways linking positive emotion and health in later life. *Curr Dir Psychol Sci.* 2010; 19(6): 358-62.
9. Karter MJ MJL. U.S. firefighter injuries in 2009. *NFPA J.* 2010; 4:70.
10. Fisher CD. Happiness at work. *Int J Manag Rev.* 2010; 12: 384-412.
11. Ryan RM, Deci EL. On happiness and human potentials: a review of research on hedonic and eudaimonic well-being. *Annu Rev Psychol* 2001; 52: 141-66.
12. Oswald AJ. Happiness and economic performance. *Econ J* 1997; 107: 1815-31.
13. Duran F, Woodhams J, Bishopp D. An Interview Study of the Experiences of Firefighters in Regard to Psychological Contract and Stressors. *Empl Responsib Rights J.* 2018; 30(3): 203-26.
14. Heydari A, Ostadtaghizadeh A, Ardalan A, Ebadi A, Mohammadfam I, Khorasani-Zavareh D. Exploring the criteria and factors affecting firefighters' resilience: A qualitative study. *Chinese J Traumatol.* 2022; 25(2): 107-14.
15. Steger MF, Dik BJ, Duffy RD. Measuring meaningful work. *J Career Assess.* 2012; 20(3): 322-37.
16. Sue V, Ritter L. Sampling. In: *Conducting online surveys* [Internet]. 2455 Teller Road, Thousand Oaks California 91320 United States of America: SAGE Publications, Inc.; 2007.
17. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Front Public Heal.* 2018; 6: 1-18.
18. Ismail R, Mohammad NH, Asbar AR, Ghani IA, Ramayah T. Validating the staff satisfaction index and the happy career for in-service firefighters. *Adv Public Heal* 2022; 14.
19. Bond TG, Fox CM. *Applying the Rasch Model: fundamental measurement in the human sciences.* 3rd edn. New York: Routledge.; Francis & Taylor; 2015. 1-383 p.
20. Evans JD. *Straightforward statistics for the behavioral sciences.* Thomson Brooks/Cole Publishing Co; 1996.
21. Cohen J. *Statistical power analysis for the behavioural sciences.* 2nd ed. USA: Lawrence Erlbaum Associates; 1988. 579 p.
22. *Leard Statistics. How to perform a Multiple Regression Analysis in SPSS Statistics* [Internet]. Lund Research Ltd. 2018 [cited 2022 Apr 5]. Available from: <https://statistics.laerd.com/spss-tutorials/multiple-regression-using-spss-statistics.php>
23. NFPA. NFPA code 1582: Standard on Comprehensive Occupational Medical Program for Fire Departments. US; 2018. Available from: <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1582>
24. Pasca R, Wagner SL. Modeling firefighter work state, satisfaction and well-being. *J Loss Trauma.* 2022; 27(6): 516–29.
25. *Uniform Building By-Laws.* Malaysia; 1984.
26. Park H, Park J, Lin SH, Boorady LM. Assessment of Firefighters' needs for personal protective equipment. *Fash Text.* 2014; 1(8): 1-13. Available from: <https://fashionandtextiles.springeropen.com/articles/10.1186/s40691-014-0008-3>
27. US NIOSH. Hierarchy of Controls [Internet]. US CDC. 2015 [cited 2022 Apr 12]. Available from: <https://www.cdc.gov/niosh/topics/hierarchy/default.html>
28. Kerrigan D, Moss J. *Firefighter Functional Fitness: The Essential Guide to Optimal Firefighter Performance and Longevity* [Internet]. Murphy P, editor. USA: Firefighter Toolbox LLC; 2016 [cited 2022 Apr 7]. 319 p. Available from: <https://www.goodreads.com/book/show/31184557-firefighter-functional-fitness>
29. Xu D, Song Y, Meng Y, István B, Gu Y. Relationship between firefighter physical fitness and special ability performance: predictive research based on machine learning algorithms. *Int J Environ Res Public Health.* 2020; 17(20): 1-10.
30. *Perintah Tetap Ketua Pengarah. Pelaksanaan Ujian Individual Physical Proficiency Test.* Vol. Bil 2, Fire and Rescue Department of Malaysia. 2014. p. 22.
31. Quirós JR. Maximum oxygen consumption (vo2max) in firefighters: systematic review of studies. *MHS.* 2013; 10(1). Available from: <https://core.ac.uk/display/143179381>
32. Tandler N, Krauss A, Proyer RT. Authentic happiness at work: self- and peer-rated orientations to happiness, work satisfaction, and stress coping. *Front Psychol.* 2020; 11: 1931.
33. Harzer C. *Positive psychology at work: the role of character strengths for positive behavior and positive experiences at the workplace.* University of Zurich; 2012.
34. Hernandez Lallement J, Kuss K, Trautner P, Weber B, Falk A, Fliessbach K. Effort increases sensitivity to reward and loss magnitude in the human brain. *Soc Cogn Affect Neurosci.* 2014; 9(3): 342-9
35. Nik Amirulmumin Nik Min. 120,000 mohon jawatan pegawai bomba gred KB19. *Sinar Harian.* 2021; Available from: <https://www.sinarharian.com.my/article/170068/BERITA/Nasional/120000-mohon-jawatan-pegawai-bomba-gred-KB19>
36. Lorenz K. Do Americans think your job is prestigious?. *CNN.* 2007 [cited 2022 Apr 12]. Available from: <https://edition.cnn.com/2007/LIVING/worklife/11/23/prestige/index.html>
37. Wagner S, Fraess-Phillips A, Mikkelson K. Recruit firefighters: personality and mental health. *Int J Emerg Serv.* 2016; 5(2): 199-211.
38. Gnacinski SL, Meyer BB, Courtney W, Cornell DJ, Mims J, Zamzow A, et al. The psychology of firefighting: an examination of psychological skills use among firefighters. *J Perform Psychol.* 2015; (9): 24.
39. Fannin N, Dabbs JM. Testosterone and the work of firefighters: Fighting fires and delivering medical care. *J Res Pers.* 2003; 37(2): 107-15.
40. Tandler N, Krauss A, Proyer RT. Authentic Happiness at Work: Self- and Peer-Rated Orientations to Happiness, Work Satisfaction, and Stress Coping. *Front Psychol.* 2020; 11: 1931.
41. Hofmann J, Gander F, Ruch W. Exploring differences in well-being across occupation type and skill. *Transl Issues Psychol Sci* 2018; 4(3): 290-303.