

## Article

# Knowledge of and attitudes toward health and cardiovascular disease risk factors among firefighters in Cape Town, South Africa

Jaron Ras, Duncan Mosie, Matthew Strauss, Lloyd Leach

Department of Sport, Recreation and Exercise Science, University of the Western Cape, Cape Town, South Africa

## Abstract

**Background:** Firefighting is a hazardous occupation, and the firefighters' fitness for duty is affected by their knowledge of and attitudes toward their health and their relationship in the development of cardiovascular disease (CVD). The aim of this study was to assess knowledge and attitude toward health and CVD risk factors among firefighters in South Africa.

**Design and Methods:** The study used a cross-sectional research design. A sample of 110 firefighters, males and females, aged 18 to 65 years were conveniently sampled from the City of Cape Town Fire and Rescue Service. A researcher-generated self-administered questionnaire was completed online to obtain data from firefighters. A p-value of less than 0.05 indicated statistical significance.

**Results:** The results showed that 52.8% of firefighters had a poor knowledge of health, and 47.2% had a good knowledge of health, while 10% reported a negative attitude towards health and 90.0% had a positive attitude towards health. There was a significant difference between firefighters' knowledge of health and their attitudes toward health ( $P < 0.05$ ), particularly related to marital status, age, years of experience and in those with CVD risk factors ( $P < 0.05$ ). Significant correlations were found between knowledge of CVD and knowledge of health-risk behaviours ( $P < 0.05$ ).

**Conclusion:** Significant differences in health knowledge and attitudes toward health were present in married, aged and hypertensive firefighters. Overall health knowledge and health-risk behaviours were significant predictors of attitudes toward health.

## Introduction

The emergency services provided by firefighters place high physiological demands on their bodies.<sup>1</sup> Firefighters are individuals who generally tend to live unhealthy lifestyles, which negatively impact their overall well-being.<sup>2</sup> Many firefighters do not possess sufficient knowledge on health, while many of them have developed poor attitudes toward their health, which places a tremendous burden on their fitness for duty.<sup>3,4</sup> There is a high prevalence of overweight and obesity among firefighters, which is indicative of a lack of appropriate knowledge or a poor attitude towards health.<sup>3,4</sup>

There are specific requirements that firefighters need to meet,

such as being physically fit and healthy in order to perform their work safely and effectively.<sup>2</sup> However, current literature has indicated that many firefighters are not fit for duty, and this could be as a result of having either poor knowledge of health or poor attitudes toward health.<sup>2,5-7</sup>

The health of firefighters and their attitudes toward living a healthy lifestyle are vital to the community they serve.<sup>8,9</sup> With healthier and more adept firefighters, they will be able to attend to emergencies with greater vigour and speed, leading to less damage to property, possible prevention of loss of life, and less injuries to themselves while on duty.<sup>10</sup> With healthier firefighters, their families will not have to endure the potential loss of family members in the fire service, due to cardiovascular disease, which is largely preventable.<sup>11-13</sup>

When compared to other public safety personnel, firefighters reported the lowest health knowledge, the highest stigma, and the lowest willingness to seek professional help.<sup>14,15</sup> Even though professional services were made available to offer support, many firefighters opted to speak to close family members or friends rather than a healthcare professional.<sup>14</sup> The lack of assessing support by firefighters has resulted in an increase in their mental stress, with many showing signs of suicidal ideation.<sup>15</sup> The mental and physical health of firefighters are not seen as matters of extreme urgency globally, and there is little research in a South African context with regard to understanding and managing the health burdens of firefighters.

Firefighters have differing attitudes toward health, in which both positive and negative attitudes impact on their lifestyle choices.<sup>6</sup> Torre *et al.*<sup>7</sup> suggested that firefighters' attitudes toward their health, specifically toward their eating patterns, were poor. Furthermore, the barriers to healthy eating were a lack of motivation, a lack in prioritization of the diet, and/or a lack of time to prepare proper meals.<sup>7</sup> The study further stated that many firefighters had either heard or read about cardiovascular disease risk factors, such as obesity, diabetes and hypertension, but they still preferred to indulge in poor food choices.<sup>7</sup> Firefighters opt for unhealthier dietary choices, due to the perception that this behaviour does not negatively affect their health and work performance.<sup>5</sup> Some firefighters do have sound knowledge of good dietary practices but, due to peer pressure, opt for unhealthy food choices.<sup>2</sup> Even though many firefighters are at risk of cardiovascular disease, many are not well-informed about the importance of healthy lifestyles.<sup>6</sup> This study, therefore, aimed to assess knowledge and attitude toward

### Significance for public health

*This paper provides valuable information into the health knowledge and attitude toward health of firefighters in the City of Cape Town Fire and Rescue Service, particularly related to their knowledge on cardiovascular disease (CVD) risk factors, knowledge of health-risk behaviours and attitudes toward diet and physical activity. This paper also provides information on the relationship between demographic information, such as age, years of experience, marital status and gender and health knowledge and their attitudes toward health. This paper provides new knowledge in understanding the reason for firefighters' high prevalence for CVD and CVD risk factors and the measures needed to reduce these risk factors, particularly related to increasing firefighters' attitudes toward health.*

health and cardiovascular disease (CVD) risk factors among firefighters in South Africa.

## Design and Methods

### Study design

The study used a web-based cross-sectional, descriptive and correlational research design.

### Participants and study setting

Convenience sampling was used to recruit 110 firefighters, males and females, aged 18 to 65 years from the City of Cape Town Fire and Rescue Service who voluntarily consented to participate in the study. The study took place in the metropolitan area of the City of Cape Town in the Western Cape Province, South Africa.

### Data collection, instrument and procedures

The researchers distributed information about the study via email to the firefighters in the City of Cape Town using the web-based platform Google Forms, and firefighters who consented to participate in the study were sent the weblink to the online questionnaire. Participants filled out an online researcher-generated, self-administered questionnaire, which was used to obtain data on the firefighters' knowledge of health and their attitudes toward health. The questionnaire was divided into five sections (sections A to E). The first section (section A) entailed obtaining personal information, such as gender, age, years of experience, and current medical history of the participants. The following two sections, namely, sections B and C were on the firefighters' knowledge of CVD risk factors and their knowledge of health-risk behaviours, respectively, and the last two sections, namely, sections D and E, were on the firefighters' attitudes toward physical activity and their attitudes toward diet, respectively. The questionnaire was structured according to the 5-point Likert scale (Supplement). By way of validating the questionnaire in the current study, questionnaires from previous studies were adapted for the current study, and consensus was reached in an iterative process by the four researchers (JR, MS, DM and LL).

### Questionnaire scoring

The health knowledge section of the questionnaire comprised 24 questions (Sections B and C), with a score of five-points per question, ranging from strongly agree (1), to strongly disagree (5) (Appendix A), and gave a total score of 120 points (24×5). The attitudes toward health section comprised 25 questions (Sections D and E), and was structured the same as the previous section, with a total score of 125 points (25×5). Health knowledge was graded as "Good" ≥80% and "Poor" <80%. Firefighters' attitudes toward health were graded as "positive" ≥60% and "negative" <60%.

### Statistical analysis

Descriptive statistics, such as means, standard deviations, and frequencies, were used to report the firefighters' knowledge of health and their attitudes toward health. A Shapiro-Wilk test was used to test for normality, and indicated that the data was not normally distributed. Inferential statistics, such as the Mann-Whitney-U test was used to compare firefighters' health knowledge, their attitudes toward health, and their sociodemographic data. Spearman's correlation was used to determine the relationship between the firefighters' health knowledge and their attitudes toward health. Chi-squared

was used to test the relationship between categorical demographic variables and CVD risk factors. Linear regression was used to predict firefighter health knowledge. A p-value of less than 0.05 was used to indicate statistical significance.

### Ethical considerations

Ethical approval for the study was obtained from the Humanities and Social Sciences Research Ethics Committee (HSSREC) at the University of the Western Cape (Ethics reference: HS20/4/27). A letter of permission to conduct the study was sent to the Chief Fire Officer, as well as the City of Cape Town, to obtain approval for the study. Information about the study was provided to the participants online, and consent was also obtained online.

## Results

The mean age of the firefighters was 42.4±10.3 years, with a minimum age of 21 years and a maximum age of 65 years. The mean ages were 43.0±10.6 and 40.0±7.9 years for males and females, respectively. The majority of firefighters were male (89.1%), and 10.9% were female (Table 1). The majority of firefighters (62.7%) had more than 16 years' experience in the fire service, 10.9% had 11-15 years' experience, 11.8% had 6-10 years' experience, and 14.6 had less than 5 years' experience. Based on age-group categories, the age-group 20-29 years represented the smallest group of participants comprising 15% of the participants in the study, the age-group 30-39 years comprised 24%, the age-group 40-49 years comprised the largest with 34%, and the age-group 50-65 years comprised 27%. The majority of firefighters (70.7%) were married, 19.15% were single, and 10.0% were divorced.

With regard to the firefighters presenting with CVD risk factors, age as a risk factor was present in 39.6% (males, only), 24.5% had hypertension, 19.1% had dyslipidemia, 18.2% were cigarette smokers, 14.5% had a family history of CVD, and 10.9% had diabetes. In addition, 35% of firefighters indicated they were light smokers who smoked between one and nine cigarettes per day, 35% indicated they were moderate smokers who smoked between ten and nineteen cigarettes per day, and 30% indicated they were heavy smokers who smoked over twenty cigarettes a day.

### Association between sociodemographic factors and knowledge/attitude toward health

A total of 52.8% of firefighters reported a poor knowledge of health, and 47.2% reported a good knowledge of health. A total of 10% of firefighters reported a negative attitude towards health and 90% reported positive attitudes toward health (Table 1). According to gender, 52.0% of males and 58.3% of females reported having a poor health knowledge, and 48.0% of males and 41.7% of females reported having a good health knowledge. A negative attitude toward health was reported in 9.2% of males and 19.7% of females, and a positive attitude toward health was reported in 90.8% of males and 83.3% of females, respectively. Based on age-group, a poor knowledge of health was reported in 60.0% of firefighters aged 20-29 years, 37.5% of firefighters aged 30-39 years, 50.0% of firefighters aged 40-49 years, and 60.7% of firefighters aged 50-65 years. Furthermore, 40.0%, 62.5%, 50.0% and 39.3% of firefighters had a good knowledge of health for the age groups 20-29 years, 30-39 years, 40-49 years and 50-65 years, respectively. Specifically, 55% of firefighters over the age of 40 years had a poor health knowledge compared to younger firefighters, however,

53.8% of firefighters under 40 years had a good health knowledge compared to older firefighters. Furthermore, there were no firefighters aged 20-29 years which had a negative attitude towards health, 20.8% of firefighters aged 30-39 years reported negative attitude towards health, 5.9% of firefighters aged 40-49 years, and in 14.3% of firefighters aged 50-65 years. Furthermore, in the age groups 20-29 years, 30-39 years, 40-49 years and 50-65 years, 100%, 79.2%, 94.1% and 85.7% of firefighters had positive attitudes toward health, respectively.

According to years of experience, poor knowledge of health was reported in 56.2% of the 0-6 years' group, 38.5% in the 6-10 years group, 41.7% in the 11-15 years group and 56.5% in the 16 or more years group. Good knowledge of health was reported in 43.8%, 61.5%, 58.3% and 43.5% in the 0-5 years, 6-10 years, 11-15 years and 16 or more years' experience groups, respectively. Attitudes toward health in firefighters for the service experience categories of 0-5 years, 6-10 years, 11-15 years and 16+ years was recorded, in which 6.2%, 15.4%, 16.7% and 8.7% of firefighters had negative attitudes toward health, respectively. Furthermore, positive attitudes toward health for the service experience categories of 0-5 years, 6-10 years, 11-15 years and 16+ years were recorded as follows, 93.8%, 84.6%, 83.3%, and 91.3%, respectively.

According to marital status, 38.1%, 48.7% and 54.5% of single, married and divorced firefighters reported having a good health knowledge, and 61.9%, 51.3% and 45.5% of single, married and divorced firefighters reported having a poor health knowledge, respectively. According to attitudes toward health, a negative attitude toward health was reported in 9.5% and 24.4% in the single

and married firefighter groups, respectively. Single, married and divorced firefighters reported a positive attitude toward health in 90.5%, 75.6% and 100%, respectively.

### Knowledge of firefighters health

All firefighters were asked to subjectively rate their own health knowledge at the outset of the questionnaire. The minority of 15.5% had reported an excellent health knowledge, 34.5% had reported a very good health knowledge, 37.3% had reported a good health knowledge, 10.9% had reported a moderate health knowledge, 0.9% had reported a poor health knowledge, and 0.9% of firefighters had reported that they did not know how to rate their health knowledge (Figure 1). A total of 57.2% of firefighters reported to have one or more CVD risk factors, such as hypertension, diabetes and/or hypercholesterolemia (dyslipidemia). Specifically, 2.7% of firefighters reported to have all three CVD risk factors, namely, hypertension, diabetes and hypercholesterolemia, while 24.5% had hypertension only, 10.9% had diabetes only, and 19.1% had hypercholesterolemia only.

### Differences in health knowledge and attitudes toward health

There was a significant difference in the firefighters' overall knowledge of health and their attitudes toward health ( $U=4504.5$ ;  $P=0.001$ ) (Table 2). There was a significant difference in the firefighters' health knowledge and attitudes toward health in the age-group 40-49 years ( $U=1915$ ;  $p=0.046$ ). There was a significant difference in the firefighters' health knowledge and attitudes toward

**Table 1. Health knowledge and attitudes of firefighters based on gender, age-group and years of experience in the fire service.**

Number of firefighters	N.	%	Knowledge of health (%)		Attitudes toward health (%)	
			Good	Poor	Positive	Negative
Total firefighters	110	100	47.2	52.8	90.0	10.0
Gender						
Male	98	89.1	48.0	52.0	90.8	9.2
Female	12	10.9	41.7	58.3	83.3	16.7
Age groups						
20-29 years	15	14.9	40.0	60.0	100	-
30-39 years	24	23.8	62.5	37.5	79.2	20.8
40-49 years	34	33.7	50.0	50.0	94.1	5.9
50-65 years	27	27.7	39.3	60.7	85.7	14.3
Years of experience						
0-5 years	16	14.5	43.8	56.2	93.8	6.2
6-10 years	13	11.8	61.5	38.5	84.6	15.4
11-15 years	12	10.9	58.3	41.7	83.3	16.7
16+ years	69	62.7	43.5	56.5	91.3	8.7
Marital status						
Single	21	19.1	38.1	61.9	90.5	9.5
Married	78	70.9	48.7	51.3	75.6	24.4
Divorced	11	10.0	54.5	45.5	100	-
CVD risk factors						
Age	40	39.6	35.0	65.0	87.5	12.5
Hypertension	27	24.5	48.1	51.9	88.9	11.1
Diabetes	12	10.9	41.7	58.3	91.7	8.3
Dyslipidemia	21	19.1	38.1	61.9	90.5	9.5
Cigarette smoking	20	18.2	50.0	50.0	85	15.0
1-9 per day	-	35.0				
10-19 per day	-	35.0				
≥20 per day	-	30.0				
Family history	16	14.5	37.5	62.5	87.5	12.5

9 firefighters were excluded from the age-group category, because they did not disclose their ages. - indicates no participants.

health in male ( $U=3707.5$ ;  $P=0.006$ ) and female ( $U=34.0$ ;  $P=0.028$ ) firefighters. There was a significant difference in the health knowledge and attitudes toward health in firefighters with 16 or more years of experience ( $U=1673$ ;  $P=0.003$ ). There was a significant difference in health knowledge and attitudes toward health in married firefighters ( $U=1860.0$ ;  $P<0.001$ ). According to firefighters who had CVD risk factors, there was a significant difference in the health knowledge and attitudes toward health in hypertensive firefighters ( $U=211.5$ ;  $P=0.008$ ) and in aged firefighters ( $U=3856.5$ ;  $P=0.003$ ).

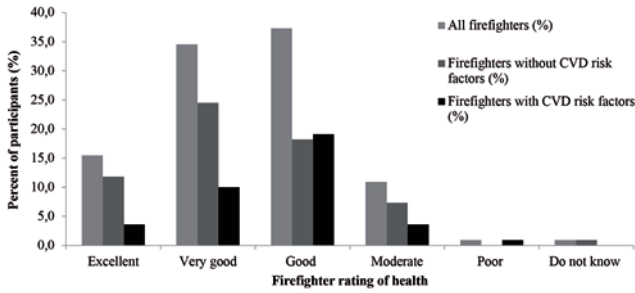


Figure 1. Self-reported rating of health by firefighters.

### Health-risk behaviours toward physical activity and diet

In Figure 2, the mean scores were represented as a percentage for each section of the questionnaire, i.e., health knowledge of CVD risk factors, health knowledge of health-risk behaviours, attitudes toward physical activity, and attitudes toward diet. The mean score for health knowledge of CVD risk factors was 78.7% for all firefighters, with a mean score of 80.2% for firefighters with CVD risk factors, and a mean score of 77.8% for firefighters without CVD risk factors. The mean score for health knowledge of health-

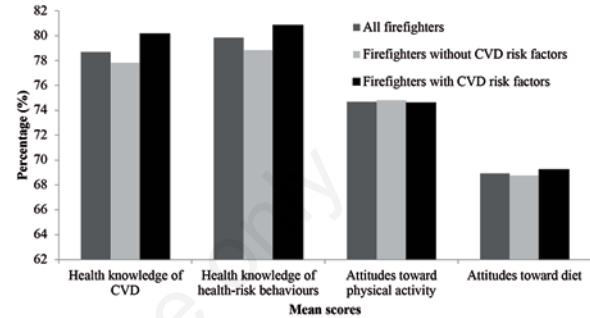


Figure 2. Self-reported rating of firefighter's knowledge of and attitudes toward health.

Table 2. Firefighters' personal and demographic information.

Variables	Health knowledge (point score) $\bar{x} \pm SD$	Attitudes toward health (point score) $\bar{x} \pm SD$	P
Total firefighters	95.1±9.8	89.6±10.3	0.001**
Age (n=101) <sup>#</sup>			
20-29 years (n=15) <sup>§</sup>	90.3±8.4	91.1±8.2	0.539
30-39 years (n=24)	95.6±8.5	88.5±10.9	0.046*
40-49 years (n=34)	97.2±10.9	90.1±10.8	0.052
50-65 years (n=27)	95.1±10.3	88.0±11.2	0.146
Gender			
Male (n=98)	94.9±9.9	89.9±10.1	0.006**
Female (n=12)	96.4±8.9	86.9±11.3	0.028*
Years of experience			
0-5 years (n=16)	90.4±8.8	90.9±8.5	0.897
6-10 years (n=13)	95.2±10.8	90.5±12.2	0.336
11-15 years (n=12)	98.3±7.9	90.5±10.1	0.114
≥16 years (n=69)	95.6±9.9	88.9±10.4	0.003**
Marital status			
Single	90.6±9.9	92.9±10.9	0.365
Married	95.6±9.3	87.9±9.9	<0.001**
Divorced	100.1±10.4	95.3±7.7	0.438
CVD risk factors			
Age <sup>Δ</sup>	94.6±10.9	87.1±11.1	0.003**
Hypertension	97.1±9.9	88.2±11.8	0.008**
Diabetes	97.0±10.4	87.8±11.3	0.128
Dyslipidemia	94.5±10.4	89.2±10.2	0.186
Cigarette smoking	94.2±11.9	89.4±11.4	0.355
1-9 p/d	-	-	-
10-19 p/d	-	-	-
≥20 p/d	-	-	-
Family history	95.9±11.7	89.3±11.8	0.445

\*Indicates significance <0.05; \*\*indicates significance <0.01. #Indicates 9 firefighters were excluded from the age-group category, because they did not disclose their ages. §Indicates which age group did not give their ages. ΔIndicates only male firefighters had age as a risk factor.



risk behaviours was 79.8% for all firefighters, with a mean score of 80.8% for firefighters with CVD risk factors, and a mean score of 78.8% for firefighters without CVD risk factors. A total of 78.4% of firefighters correctly identified the major risk factors that cause CVD. A total of 85.5% of firefighters agreed that reduced sleep caused CVD, and poor dietary choices, as a cause of CVD, was correctly identified in 82.7% of firefighters.

The mean score for attitudes toward physical activity was 74.7% for all firefighters, with a mean score of 73.5% for firefighters with CVD risk factors, and a mean score of 73.3% for firefighters without CVD risk factors. The mean score for attitudes toward diet was 68.9% for all firefighters, with a mean score of 69.2% for firefighters with CVD risk factors, and a mean of 68.77% for firefighters without CVD risk factors. A total of 63.3% of firefighters agreed that they enjoyed exercise and understood the health benefits thereof. A total of 46.1% of firefighters reported that they preferred unhealthy food choices.

### Association between CVD risk factors and sociodemographic characteristics

In firefighters, there was a significant association between age (45 and older) and hypertension ( $\chi^2=7.0$ ;  $df=1$ ;  $P=0.011$ ), age and diabetes ( $\chi^2=9.2$ ;  $df=1$ ;  $P=0.006$ ), and age and dyslipidemia ( $\chi^2=7.0$ ;  $df=1$ ;  $P=0.001$ ) (Table 3). This indicated that hypertension, diabetes and dyslipidemia were all dependent on age, and as age increased so did the prevalence of these risk factors. There was a significant association between firefighter years of experience and hypertension ( $\chi^2=11.1$ ;  $df=3$ ;  $P=0.011$ ), and years of experience and diabetes ( $\chi^2=8.0$ ;  $df=3$ ;  $P=0.046$ ). This indicated that hypertension and diabetes were dependent on years of experience, so as years of experience increased, so too did hypertension, diabetes and dyslipidemia. In addition, there was a significant association between marital status and hypertension ( $\chi^2=6.3$ ;  $df=1$ ;  $P=0.043$ ) and marital status and dyslipidaemia ( $\chi^2=6.4$ ;  $df=1$ ;  $P=0.042$ ). Hypertension and dyslipidemia were dependent on mar-

ital status, so these risk factors were more prevalent among married firefighters, than unmarried and divorced firefighters.

### Correlation between years of experience, age, overall health knowledge and overall attitudes toward health

There was a strong positive correlation between firefighters' age and years of experience ( $r=0.765$ ;  $P<0.001$ ), overall health knowledge and knowledge of CVD risk factors ( $r=0.908$ ;  $P<0.001$ ), overall health knowledge and knowledge of health-risk behaviors ( $r=0.868$ ;  $P<0.001$ ), overall attitudes toward health and attitudes toward physical activity ( $r=0.782$ ;  $P<0.001$ ), and between overall attitudes toward health and attitudes toward diet ( $r=0.777$ ;  $P<0.001$ ) (Table 4). There was a moderate positive correlation between knowledge of CVD risk factors and knowledge of health-risk behaviours ( $r=0.603$ ;  $P<0.001$ ). There was a weak positive correlation between overall health knowledge and overall attitudes toward physical activity ( $r=0.270$ ;  $P=0.004$ ), knowledge of health-risk behaviours and attitudes toward physical activity ( $r=0.323$ ;  $P=0.001$ ), and between attitudes toward diet and attitudes toward physical activity ( $r=0.270$ ;  $P=0.004$ ). There was a weak negative correlation between age and attitudes toward physical activity ( $r=-0.262$ ;  $P=0.008$ ), and between the years of experience and attitudes toward physical activity ( $r=-0.226$ ;  $P=0.018$ ). In addition, there was a moderate positive correlation between firefighters' age and the number of cigarettes smoked per day ( $r=0.598$ ;  $P=0.009$ ), and between years of experience and number of cigarettes smoked per day ( $r=0.473$ ;  $P=0.035$ ).

In Table 5, the variables that were significantly correlated were incorporated into a general linear regression model to predict attitudes toward physical activity in firefighters. Age was a significant predictor of firefighter attitudes toward physical activity ( $F=7.6$ ,  $R^2=0.07$ ,  $P=0.007$ ). The model predicted 7% of the variance in firefighter attitudes toward physical activity. The beta coefficient was negative indicating that as firefighters' age increased, their attitudes toward physical activity decreased. Firefighter health

**Table 3. Association between sociodemographic characteristics and CVD risk factors in firefighters.**

Variable	Hypertension			Diabetes			Dyslipidemia			Cigarette smoking			Family history		
	$\chi^2$	df	P	$\chi^2$	df	P	$\chi^2$	df	P	$\chi^2$	df	P	$\chi^2$	df	P
Age <sup>Δ</sup>	7.0	1	0.011*	9.2	1	0.006**	11.4	1	0.001**	0.9	1	0.426	2.8	1	0.151
Gender	0.6	1	0.454	0.1	1	0.762	0.3	1	0.581	0.9	1	0.691	0.1	2	0.973
Years of experience	11.1	3	0.011*	8.0	3	0.046*	7.1	3	0.069	0.1	3	0.991	8.7	6	0.188
Marital status	6.3	2	0.043*	5.5	2	0.063	6.4	2	0.042**	0.6	2	0.753	1.5	2	0.822

\*Indicates significance <0.05; \*\*indicates significance <0.01. <sup>Δ</sup>Indicates only male firefighters had age as a risk factor.

**Table 4. Correlation between years of experience, age, overall health knowledge and overall attitudes toward health.**

Variables	Age	Years of experience	Overall health knowledge	Knowledge of CVD risk factors	Knowledge of health-risk behaviours	Overall attitudes toward health	Attitudes toward physical activity
Experience	0.765**						
Overall health knowledge	-0.003	0.077					
Health knowledge of CVD risk factors	0.020	0.149	0.908**				
Health knowledge of health-risk behaviours	0.025	0.017	0.868**	0.603**			
Overall attitudes toward health	-0.097	-0.078	0.147	0.037	0.245**		
Attitudes toward physical activity	-0.262**	-0.226*	0.270**	0.182	0.323**	0.782**	
Attitudes toward diet	0.093	0.111	-0.057	-0.139	0.055	0.777**	0.270**

\*Indicates significance <0.05; \*\*indicates significance <0.01.

knowledge was a significant predictor of attitudes toward physical activity ( $F=4.7$ ,  $R^2=0.042$ ,  $P=0.032$ ) (Table 5). The model predicted 4% of the variance in overall health knowledge of firefighters. Health knowledge of health-risk behaviour was a significant predictor of attitudes toward physical activity ( $F=7.1$ ,  $R^2=0.06$ ,  $P=0.009$ ). The model predicted 6% of the variance in firefighters' attitudes toward physical activity. Attitudes toward diet was a significant predictor of attitudes toward physical activity in firefighters ( $F=11.2$ ,  $R^2=0.09$ ,  $P=0.001$ ). The model predicted 9% of the variance in firefighters' attitudes toward physical activity.

## Discussion

Currently, firefighters face increasing risks outside the profession, which are related to activities of daily living and chronic diseases of lifestyle, resulting in escalating morbidity and mortality.<sup>16</sup> Firefighters' knowledge of the health risks associated with their occupation has not been studied extensively.<sup>16</sup> Torre *et al.*<sup>7</sup> suggests that firefighters' attitudes toward health, specifically their eating patterns, are poor. The study further states that the firefighters have heard or read about cardiovascular disease risk factors, such as obesity, diabetes and hypertension, but prefer to indulge in poor food choices, because they perceive this behaviour as positively affecting their mental health.<sup>7</sup> Fire departments have made it public knowledge that the health and physical fitness of firefighters is important, but limited progress has been made to design programmes that meet the physical demands of the occupation.<sup>9</sup>

A total of 52.8% of firefighters reported a poor knowledge of health, and 47.2% reported a good knowledge of health. This is contrary to McNeff,<sup>17</sup> who reported that 67.1% of firefighters had poor health knowledge. In the current study, a total of 78.4% of firefighters agreed that CVD risk factors caused CVD. Furthermore, more than 90% of firefighters agreed that obesity, hypertension and hypercholesterolemia increased the risk of CVD, which were significantly associated with firefighter age, years of experience and marital status. Dobson *et al.*<sup>6</sup> identified that even though many firefighters were at risk of CVD, many did not see the need to change their lifestyles. Baur *et al.*<sup>18</sup> reported that many firefighters underestimated their weight groups, and this underestimation increased with every 1-unit increase in BMI. According to Smith *et al.*<sup>4</sup> many firefighters did not possess sufficient knowledge on health, which could lead to poor attitudes toward their health. Similarly, Palmer and Yoos<sup>19</sup> reported that volunteer firefighters had a poor health knowledge of cardiovascular disease. This is contrary to the present study in which firefighters possessed a good knowledge of health, as well as positive attitudes toward health, with significant relationships found between the majority of health knowledge questions and overall health knowledge. Oosthuizen and Koortzen<sup>20</sup> reported firefighters who were married were under more stress related to financial obligations and the general economic situation of the country, which can account for the

increase in CVD risk factor prevalence and general disregard to implementing healthier lifestyles.

The present study reported that firefighters' knowledge of health and their attitudes toward health were statistically different, indicating that, although, firefighters had a good health knowledge, this didn't relate to positive attitudes toward health, particularly in the 30-39 years age group, that were experienced, married and hypertensive. This difference in health knowledge and attitude could be related to the increase in knowledge related to age, but due to financial strain, marital obligations and general unhappiness in their careers.<sup>2,3,7,20,21</sup> Contrary to Smith,<sup>3</sup> who's study suggested that firefighters had poor knowledge of health, which could lead to poor attitudes towards health, the present study did not report that poor health knowledge subsequently resulted in poor attitudes toward health. However, the present study reported that age and years of experience had a significant negative relationship attitude toward health, with younger firefighters having more positive attitudes toward health. Bucala *et al.*<sup>22</sup> reported that, despite all of the barrier's firefighters faced regarding sleep, diet, and physical activity, their overall health was a personal choice. This finding is similar to the results in the present study, where the health knowledge of firefighters was high, but a significant difference was present in health knowledge and attitudes toward health, especially among older hypertensive firefighters.

In the current study, the majority of firefighters with CVD risk factors rated their health as good-to-excellent, with a minority of firefighters with CVD risk factors rating their health as moderate-to-poor. The majority of firefighters with CVD risk factors, had a good knowledge of health that was possibly related to their age and years of experience in the fire service (>16 years' experience). This is consistent with Bonnell *et al.*<sup>2</sup> and Dobson *et al.*<sup>6</sup> who suggested that more experience resulted in better health knowledge. However, in the present study, this increased health knowledge did not translate to an increase in attitude toward health, rather the opposite occurring, which could be related to depression and an increase in stress related to job dissatisfaction and financial strain.<sup>20,21</sup> Bonnell *et al.*<sup>2</sup> suggested that working night shifts disrupted the circadian rhythm, interrupted the sleep patterns of firefighters, and negatively affected their food choices, while on duty. Which can account for the increase in prevalence and association with CVD risk factors, specifically diabetes, dyslipidemia and hypertension as firefighters aged and their years of service increased. In the present study, firefighters understood the importance of good sleep and eating patterns toward health, with 85.5% of firefighters agreeing that sleep was important for health, and 82.7% of firefighters agreeing that controlling processed the intake foods decreased the risk of CVD.

Dobson *et al.*<sup>6</sup> suggested that firefighters had differing attitudes toward health, in which both positive and negative attitudes impacted their lifestyle choices. In the present study, the average score for firefighters' attitudes towards physical activity and diet was 74.7% and 68.9%, respectively. The present study showed that

**Table 5. Linear regression in the prediction of attitudes toward physical activity in firefighters.**

Variable	Attitudes toward physical activity			
	$\beta$	$R^2$	F	P
Age	-0.174	0.07	7.6	0.007**
Health knowledge	0.305	0.04	4.7	0.032*
Health knowledge of health risk behaviour	0.327	0.06	7.1	0.009**
Attitudes toward diet	0.325	0.09	11.2	0.001**

\*Indicates statistical significance <0.05; \*\*indicates statistical significance <0.01.

there were significant negative relationships between years of experience ( $r=-0.262$ ) and age ( $r=-0.226$ ) and firefighters' preference for physical activity. Additionally, increased age and experience being associated with lifestyle related CVD risk factors. Moreover, there were significant negative correlations between firefighters exercising because of how it made them feel and wanting to be fit for active duty. Age was also a significant predictor of attitudes toward physical activity, with a negative beta coefficient. This suggested that as firefighters aged, their preference for participating in physical activity became increasingly negative, with younger firefighters preferring to be active and fit for active duty. In addition, older firefighters, despite having more years of experience, had a significant relationship with poor dietary practices. This is consistent with Bonnel *et al.*<sup>2</sup> who suggested that some firefighters had a sound knowledge of good dietary practices but, due to peer pressure, opted for unhealthy food choices. In contrast, Stanley *et al.*<sup>23</sup> reported that lower years of firefighter service was significantly associated with increased suicidal thoughts and behaviors. Smith<sup>3</sup> suggested that many firefighters did not possess sufficient knowledge on health, while many of them developed poor attitudes toward their health, which was a tremendous burden on the profession. The present study also found that attitudes toward physical activity was a significant predictor of health knowledge. This suggests firefighters who have a positive attitude toward physical activity have a good health knowledge and see the benefit of regular physical activity. A possible explanation could be that firefighters who had a positive attitude toward physical activity were motivated to increase their overall health knowledge.<sup>3,6</sup>

In the current study, firefighters reported positive attitude toward diet, which were similar in firefighters with and without CVD risk factors (68.8% vs. 69.2%). Presumably, firefighters prefer a healthy diet to improve their health than doing physical activity. It also suggested that firefighters with CVD risk factors also preferred changing their dietary choices in order to manage their health, instead of engaging in physical activity. The willingness to change dietary choices is contrary to the views of Dobson *et al.*<sup>6</sup> who reported that even though many firefighters were at risk of CVD, they did not see the need to change their lifestyles. Overall health knowledge and knowledge of health-risk behaviours were significantly correlated and were significant predictors of attitudes toward physical activity. This indicated that increased health knowledge and knowledge of health-risk behaviours increased firefighters' attitudes toward physical activity. Muegge *et al.*<sup>24</sup> reported that lack of knowledge was the most frequently reported barrier that influenced firefighters weight management. Another important barrier was lack of opportunities to exercise.<sup>24</sup> In contrast, Bucala *et al.*<sup>22</sup> reported that firefighters knew about the benefits of physical activity, but many chose not to exercise, as they believed that it was their personal choice. These authors also stated that the social and environmental factors negatively affected firefighters, as these attitudes and behaviours were historically passed down from generations of firefighters.<sup>22</sup> This can be seen in the present study, where age was a significant predictor of attitudes toward physical activity, where younger firefighters had more positive attitudes toward physical activity compared to older firefighters. Interestingly, increased overall health knowledge and knowledge of health-risk behaviours were not relate to an increase in attitudes toward diet. This could be related to peer pressure and unhealthy behaviours that were generally role-modeled by more senior firefighters.<sup>2,22</sup>

### Strengths and limitations

This study provides valuable research data on firefighters according to their knowledge of health, and attitudes toward health

in a scarcely studied area, especially in South Africa. The study is limited by convenient sampling and a small sample size that negatively impacted the external validity. Females were underrepresented that negatively impacted comparisons in the study based on gender. Because the questionnaire in the current study was not validated and based on previously used questionnaires, it is, therefore, recommended that a valid instrument to measure the health knowledge and attitudes of firefighters be developed.

### Conclusions

A similar percentage of firefighters had a good and poor knowledge of health. However, firefighters that had a poor knowledge of health was most prevalent in the youngest and oldest age and experience groups, and those with CVD risk factors. The majority of firefighters had a positive attitude toward health; however, negative attitudes was most prevalent in married, middle aged female firefighters. There were significant differences in health knowledge and attitudes toward health in firefighters, especially in more experienced firefighters that were aged and hypertensive. In addition, overall health knowledge, knowledge of health-risk behaviours and age were significant predictors of firefighters' attitudes toward physical activity. Health promotion and regular health screening should be implemented to maintain a sound knowledge of health and positive attitudes toward health in firefighters.

**Correspondence:** Jaron Ras, Department of Sport, Recreation and Exercise Science, University of the Western Cape, Robert Sobukwe Road, Bellville, Cape Town, 7535, South Africa.  
E-mail: jaronras@gmail.com

**Key words:** Health knowledge; Health attitudes; Firefighters; Perceptions; Health behaviours.

**Acknowledgments:** We thank the City of Cape Town for granting permission to conduct the study, and to Mr Ian Bell for supporting the study from the start to the end. To each District Head and Station Commander that allowed testing and to every firefighter that voluntarily participated in the study.

**Conflict of interest:** The authors declare that no conflict of interest.

**Funding:** None.

**Availability of data and materials:** All data generated or analysed during this study are included in this published article.

**Ethics approval and consent to participate:** Ethical approval for the study was obtained from the Humanities and Social Sciences Research Ethics Committee (HSSREC) at the University of the Western Cape (Ethics reference: HS20/4/27).

**Informed consent:** Information about the study was provided to the participants online, and after, consent was obtained online for voluntary participation in the study.

Received for publication: 4 April 2021.

Accepted for publication: 4 July 2021.

©Copyright: the Author(s), 2021

Licensee PAGEPress, Italy

Journal of Public Health Research 2022;11:2307

doi:10.4081/jphr.2021.2307

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).



## References

1. Taylor NAS, Lewis MC, Notley SR, Peoples GE. A fractionation of the physiological burden of the personal protective equipment worn by firefighters. *Eur J Appl Physiol* 2012;112:2913-21.
2. Bonnell E, Huggins C, Huggins C, et al. Influences on dietary choices during day versus night shift in shift workers: A mixed methods study. *Nutrients* 2017;9:193.
3. Smith DL. Firefighter fitness: Improving performance and preventing injuries and fatalities. *Curr Sports Med Rep* 2011;10:167-72.
4. Smith DL, Fehling PC, Frisch A, et al. The prevalence of cardiovascular disease risk factors and obesity in firefighters. *J Obes* 2012;2012. doi:10.1155/2012/908267
5. de Ridder D, Kroese F, Evers C, et al. Healthy diet: Health impact, prevalence, correlates, and interventions. *Psychol Health* 2017;32:907-41.
6. Dobson M, Choi B, Schnall PL, et al. Exploring occupational and health behavioral causes of firefighter obesity: A qualitative study. *Am J Ind Med* 2013;56:776-90.
7. della Torre SB, Wild P, Dorribo V, et al. Eating habits of professional firefighters: Comparison with national guidelines and impact healthy eating promotion program. *J Occup Environ Med* 2019;61:e183-90.
8. Jahnke SA, Poston WSC, Jitnarin N, Haddock CK. Health concerns of the U.S. fire service: Perspectives from the firehouse. *Am J Health Promot* 2012;27:111-8.
9. Poston WSC, Haddock CK, Jahnke SA, et al. An examination of the benefits of health promotion programs for the national fire service. *BMC Public Health* 2013;13:805.
10. Kong PW, Suyama J, Hostler D. A review of risk factors of accidental slips, trips, and falls among firefighters. *Safety Sci* 2013;60:203-9.
11. Barquera S, Pedroza-Tobías A, Medina C, et al. Global overview of the epidemiology of atherosclerotic cardiovascular disease. *Arch Med Res* 2015;46:328-38.
12. Fisher M, Moores L, Alsharif MN, Paganini-Hill A. Definition and implications of the preventable stroke. *JAMA Neurol* 2016;73:186-9.
13. Packer M. Heart failure: The most important, preventable, and treatable cardiovascular complication of type 2 diabetes. *Diabetes Care* 2018;41:11-3.
14. Carleton RN, Afifi TO, Turner S, et al. Mental health training, attitudes toward support, and screening positive for mental disorders. *Cogn Behav Ther* 2020;49:55-73.
15. Stanley IH, Hom MA, Joiner TE. A systematic review of suicidal thoughts and behaviors among police officers, firefighters, EMTs, and paramedics. *Clin Psychol Rev* 2016;44:25-44.
16. Schaefer Solle N, Caban-Martinez AJ, Levy RA, et al. Perceptions of health and cancer risk among newly recruited firefighters in South Florida. *Am J Ind Med* 2018;61:77-84.
17. McNeff MS. Dietary intake, body composition, and heart health knowledge of firefighters. ProQuest Dissertations Publishing 2010;1480728.
18. Baur DM, Christophi CA, Tsismenakis AJ, et al. Weight-perception in male career firefighters and its association with cardiovascular risk factors. *BMC Public Health* 2012;12:480.
19. Palmer AS, Yoos JL. Health promotion in volunteer firefighters: Assessing knowledge of risk for developing cardiovascular disease. *Workplace Health Saf* 2019;67:579-83.
20. Oosthuizen. RM, Koortzen. P. An empirical investigation of job and family stressors amongst firefighters in the south African context. *SA J Ind Psychol* 2007;33:a252.
21. Carpenter GSJ, Carpenter TP, Kimbrel NA, et al. Social support, stress, and suicidal ideation in professional firefighters. *Am J Health Behav* 2015;39:191-6.
22. Bucala M, Sweet E. Obesity in the fire service: An inside look at the perceptions of firefighters towards obesity and other health issues. ResearchSquare 2019. Available from: <https://www.researchsquare.com/article/rs-6182/v1>
23. Stanley IH, Hom MA, Hagan CR, Joiner TE. Career prevalence and correlates of suicidal thoughts and behaviors among firefighters. *J Affect Disord* 2015;187:163-71.
24. Muegge CM, Zollinger TW, Song Y, et al. Barriers to weight management among overweight and obese firefighters. *J Occup Environ Med* 2020;62:37-45.