

David Havia (2100867, NAKT21KY)

**The Occurrence and Severity of  
Musculoskeletal Disorders among the  
Swedish Career Firefighters:  
A cross-sectional study**

Master's thesis

Master's Programme in Naprapathy

2023



**South-Eastern Finland  
University of Applied Sciences**

Author (authors)	Degree title	Time
David Havia	<a href="#">Master Programme in Naprapathy</a>	2023
<b>Thesis title</b>		
The Occurrence and Severity of Musculoskeletal Disorders among the Swedish Career Firefighters: A cross-sectional study	49 pages 6 pages of appendices	
<b>Commissioned by</b>		
Nätverket Kvinnor inom Räddningstjänsten (The Swedish Network for Female Firefighters) Brandmännens Riksförbund (National Association of Swedish Firefighters)		
<b>Supervisor</b>		
Anita Näslindh-Ylispangar Petteri Koski		
<b>Abstract</b>		
<p>Firefighters are prone to injury because of physically and mentally demanding working tasks. In the long run, this may lead to musculoskeletal disorders (MSDs) and chronicity. To the best of the thesis writer's knowledge, no studies have investigated the occurrence of chronic MSD among career firefighters in Sweden. Hence, the study aimed to determine the occurrence, severity, and variance of chronic MSD among career firefighters.</p>		
<p>In this cross-sectional study, 255 career firefighters, 227 males and 28 females, answered an online survey between February and March 2023. Outcome measurement was a modification of the Chronic Pain Questionnaire (CPQ). The results were presented with proportions, means with standard deviation (SD), and confidence intervals (CI). Analysis of variance was performed with <math>\chi^2</math>-test and ANOVA.</p>		
<p>The results showed that 75% experience any chronic MSD, with the lumbar spine [43% (95% CI = 37-49)] being the most bothersome, followed by the shoulder [33% (95% CI = 27-39)] and knees [23% (95% CI = 18-28)]. Male firefighters reported higher rates of MSD compared to females (<math>\chi^2 = 4.995</math>, <math>p = 0.025</math>). However, females displayed higher reports from the hand and wrist (<math>\chi^2 = 6.338</math>, <math>p = 0.012</math>). Further analysis showed that non-smoke divers had significantly higher pain grades (III–IV) than smoke divers. Lastly, the most common pain grade was grade II (high intensity/low disability).</p>		
<p>This is the first study to investigate chronic MSD in Swedish career firefighters and highlights the importance of further longitudinal studies and preventing chronicity.</p>		
<b>Keywords</b>		
firefighters, musculoskeletal diseases, occupational health		

# CONTENTS

1	INTRODUCTION.....	5
2	LITERATURE REVIEW.....	7
2.1	Gender aspects.....	8
2.2	Risk factors.....	8
2.3	Literature Search.....	9
3	AIMS OF THE STUDY AND RESEARCH QUESTIONS .....	13
4	METHOD.....	14
4.1	Data collection.....	14
4.2	Descriptive measurement.....	15
4.3	Outcome measurement.....	15
4.4	Study population .....	16
4.5	Statistical analysis.....	17
4.6	Ethical consideration .....	17
4.7	Demographic characteristics.....	18
5	RESULT .....	21
5.1	Outcome measurement.....	21
6	DISCUSSION.....	25
6.1	Validity, reliability, and study limitations .....	29
7	CONCLUSION .....	30
8	ACKNOWLEDGEMENT.....	30
	REFERENCES.....	32

## LIST OF TABLES

## APPENDICES

Appendix 1. Survey

## ABBREVIATIONS

Body mass index (BMI)

Chronic Pain Questionnaire (CPQ)

Musculoskeletal disorders (MSD)

Low back pain (LBP)

Personal protective equipment (PPE)

Work-related MSD (WMSD)

## 1 INTRODUCTION

*A focus on musculoskeletal disorders in firefighters is the result of conversations with my partner who works as a firefighter and previous professional experience that includes performing annual health screening on firefighters as an assistant nurse and working as a Doctor of Naprapathy with patients.*

Musculoskeletal disorders (MSDs), such as low back pain and neck pain, are highly prevalent nowadays and are the leading cause of years lived with disability worldwide. With increasing numbers across the globe, mainly due to population growth and aging, health systems will need to urgently address these rising numbers. (Vos et al. 2012)

In Europe, according to Kok et al. (2019), MSDs have been seen as the most common health problem among workers in the European Union, where three out of five people reported MSD complaints and one out of five reported chronic neck or back disorders over the past year. Prevalence of self-reported MSD differed between working sectors, demographics, and member states, where sectors like construction and human health reported above-average figures. Women had higher rates for all types of MSDs. Finland had the highest percentage of reported MSDs (79%) and Ireland had the lowest (46%) during 2015 ( $n = 31,612$ ).

The definition of MSDs has been used as a specific diagnosis of periarticular soft tissue diseases of the spine or limbs, such as tendonitis, radicular pain, and herniated disc, whereas a 'non-specific' MSD would be symptomatic pain in one or multiple body areas that cause limiting function (Roquelaure 2018, 8–9). At the same time, a work-related MSD (WMSD) is mainly caused or aggravated by the occupation (Kok et al. 2019, 11). Accordingly, measuring exposure to risk factors at work was not perceived during this study. In the present study, chronic MSD describes a painful body area or areas that have been resistant or recurring for  $\geq 3$  months (Scholz et al. 2019, 55). To clarify the meaning of pain, the International

Association for the Study of Pain recently defined pain as, “An unpleasant sensory and emotional experience associated with, or resembling that associated with actual or potential tissue damage” (Raja et al. 2020, 2–3).

Career firefighters worldwide have a physically and mentally demanding profession where heavy lifts, hazardous working situations, and first responders in accidents are part of their work description. Demands are unlikely to decrease for firefighters, with an increasing trend of wildfires (Dennison et al. 2014, Chapter 3: Results and Discussion). With these increasing demands and firefighters' work descriptions, they are at higher risk of sustaining MSD compared to other professions (Dworsky et al. 2021). The National Fire Protection Agency in the USA, reported sprains, strains or muscular pain accounted for approximately 2 out of 5 injuries on the fire ground and almost half of the non-fire ground injuries (Campbell & Hall 2022, 2–3). With the risk of sustaining MSDs, injuries such as sprains, strains, or overexertion may in the long run lead to chronicity (Plat et al. 2011). Despite this, sparingly research exists about Swedish career firefighters MSD. One study revealed that most injuries occurred during physical activity (51%) and that soccer and floorball was the main contributor to these injuries (Bylund & Björnstig 1999). More recently, attention to firefighters' health and well-being has been highlighted in operational tasks (Jacobsson et al. 2015; Jacobsson et al. 2020). To conclude, MSD is still common among firefighters worldwide although the subject has rarely been researched in Sweden.

In Sweden, there are according to the Swedish Civil Contingencies Agency (2019) approximately 5000 employed career firefighters of which 6% are females. These employed firefighters work at fire rescue services that are run and organized by municipalities; therefore, it is essential to identify eventual MSD both for the cost and suffering individually and for society.

## 2 LITERATURE REVIEW

Firefighters are put in emergencies, with high physical loads and psychological challenges (Yunus et al. 2022). Not surprisingly, these exposures come with increased risk factors where MSD is one contributor (Ras et al. 2022, 15–16). MSD has been shown as common among firefighters with a prevalence between 54% and 64%, and diagnoses include sprains of the back, lower, and upper extremities (Frost et al. 2015; Nazari et al. 2020; Quinn et al. 2023). Frost et al. (2015) showed that lower back injuries and other MSDs were usually common in fire departments across Canada during five years. Injuries were not only a problem during fire ground operations since almost two-thirds (65%) of the 1,311 injuries were sustained at the fire station or during physical-related activities. In contrast to the event of injury, Quinn et al. (2023) described workers' compensation claims between 2001–2017 in Ohio resulted in 33,069 of which overexertion (31%) was the primary event of injury during firefighting or patient care while physical fitness/exercise only accounted for 4%. However, 46% of the claims could not be categorized as a specific event.

Despite MSD of the lower back being highly prevalent among firefighters, there have to date only been a few studies investigating low back pain (LBP) among them. These studies have investigated, how field working firefighters compared to office work may influence disc degeneration in the lower back and, thus, the probability of LBP. For example, Kim and Ahn (2021) reported that LBP was more prevalent in male firefighters (85%) compared to hospital office workers (55%), in a sample of 297 firefighters and 77 hospital workers. In addition, Jang et al. (2016) reported that increased degeneration measured with Pfirrmann grade, especially in level L4-5 (OR = 3.498, 95% CI = 1.241-9.860) was significant for the field working firefighters compared to the administrative group. Age was also associated with disc degeneration in all subjects on all levels (L1-S1), but only significant in L4-5 in the administrative group. In support, firefighters carry additional weight as a self-contained breathing apparatus and personal protective equipment (PPE). According to Wang and Wang (2022), this highly impacts muscle and joint forces, especially with newly recruited firefighters. They

analyzed compression forces and showed that when carrying the additional weight there was an increase from 29.13% (3400 N) to 37.6-48% in the level L4-L5 compared to a controlled condition, indicating a higher risk of injury in the area by 8.48-18.89%.

Another important aspect is the categorization of MSD as mentioned in the introduction of this paper. None of the recent studies have addressed chronic MSD. Lusa et al. (2015), on the other hand, showed that LBP in firefighters, both radiating (16% to 29%) and local (28 to 40%) increased after the 13-year follow-up period. In total 18% belonged to the trajectory group; chronic. The same authors also highlighted that high musculoskeletal pain among firefighters increased during the follow-up period (Airila et al. 2014, 1428).

## **2.1 Gender aspects**

The understanding of gender differences with MSDs is sparse among firefighters mostly due to the underrepresentation of females. There have been some reported data from Canada of MSD in a sample of 390 firefighters (272 males and 118 females), including volunteer firefighters. Female firefighters reported a point prevalence of 53% with some type of MSD. They also had a 1.4–1.6 greater likelihood of reporting more than two body areas of MSDs than their male counterpart (Nazari et al. 2020). A qualitative study discovered the emotional and physical stressors of female firefighters and that certain risk factors were identified to sustain MSDs, such as physical demands and differences between genders, PPE mal-adaption, social inclusion, and earning respect among male FF (Sinden et al. 2013).

## **2.2 Risk factors**

When reviewing other factors, such, as higher age, rank, tenure, and physical fitness, it has been considered as an increased risk for workplace injury. However, it was highlighted that these factors need more research to make conclusions (Jenkins et al. 2016). In the same way, Ras et al. (2022) indicated that increasing age, obesity, and physical inactivity were related to poor



musculoskeletal health. Recommendations were made that further studies are warranted about MSD and firefighters' work performance.

Regarding obesity, Ras et al. (2022, Chapter 5: Conclusion) and the following authors have supported increased risk of injury and sustaining MSDs. For example, Jahnke et al.'s (2013) longitudinal data showed that BMI and waist circumference were predictors of musculoskeletal injury categorized as sprain, strains, and dislocations (OR = 2.8, 95% CI = 1.2-6.4). However, no other demographic factors, such as age or ethnicity, increased the risk for overall injury. Females were excluded due to underrepresentation in the sample at baseline ( $n = 21$ , 4.4%). Similarly, in the general population Gu et al. (2016) highlighted overweight workers (BMI > 25) were at higher risk of experiencing injuries compared to normal-weight workers. They studied a national sample of U.S workers from the National Health Interview Survey (NHIS) between 2004–2012, indicating that higher self-reported BMI increased the prevalence of occupational injury. For every BMI unit, the risk of injury increased by 4% regarding falls and overexertion/strenuous movement. Also, obese (BMI > 30) workers displayed higher prevalence ratios with back and buttocks as well as lower extremity injuries compared to normal weight.

### **2.3 Literature Search**

The following section describes how the chosen studies were included in the literature review. Table 1 describes the database search with keywords. From the 258 titles withdrawn from the search, 14 studies were included.

Table 1. Literature search table

Database	Keywords			Results	Chosen by the title	Chosen by the abstract	Chosen by full-text
Pubmed	Firefighters (Mesh)	AND	Musculoskeletal Diseases (Mesh)	31	24	18	8
Cinahl	firefighters or fire fighters or fire service or firefighting	AND	musculoskeletal disorders or muskulokseletal pain or musculoskeletal injuries	27	11 After the removal of duplicates -> 10	10	3
Science Direkt	firefighters	AND	("Musculoskeletal Diseases" OR "musculoskeletal disorders")	200	13 After the removal of duplicates -> 12	9	3
A manual search was carried out on 258 titles. From these studies were included: 14.							

Table 2 shows a summary of the included articles, highlighting: the purpose, participants, data collection, and main results.

Table 2. Research table

Study	Study authors, place of study, year	Purpose of the study	Participants	Data collection and analysis method	Main results
Obesity and Incident Injury Among Career Firefighters in the Central United States	Jahnke, Poston, Haddock & Jitnarin,	To examine predictors of musculoskeletal (MS) injuries in firefighters.	N = 301	Longitudinal data were extracted from a prospective cohort of 347 firefighters from the central U.S. Analysis was performed with logistic models.	BMI and waist circumference were prospective predictors of MS injury incidence.
Firefighter injuries are not just a fireground problem	Frost, Beach, Crosby & McGill, Ontario, Canada. 2015	To characterize the injuries sustained by members of a large Canadian metropolitan fire department over a 5-year span.	N = 1363	Data were taken from injury reports filed by Calgary Fire Department personnel between 2007 and 2011 and presented with frequencies.	MSD composed almost two-thirds of the 1311 injuries. Back injuries were the most common, followed by the knee, ankle, and shoulders.
A qualitative study on the experiences of female firefighters	Sinden, MacDermida, Buckmana, Davis, Matthews & Viola, Hamilton, Canada. 2013	To qualitatively investigate and understand women's work-health and job-satisfaction in a male dominant workplace.	N = 4	Recorded telephone interviews was transcribed and analyzed.	The study observed that women were exposed to increased physical and psychological stressors, thus

					increasing the risk of injury.
Cardiovascular Disease Risk Factors, Musculoskeletal Health, Physical Fitness, and Occupational Performance in Firefighters: A Narrative Review	Ras, Smith, Kengne, Soteriades & Leach, Cape Town, South Africa. 2022	To determine the relationship between cardiovascular disease (CVD) risk factors, musculoskeletal health, physical fitness, and occupational performance in firefighters.	46 articles included in the review	Database search: PubMed, SCOPUS, and Web of Science between 2001-2021 and Bibliometric analysis of database search results	Physical fitness highly impacts occupational performance. CVD and musculoskeletal health is less clear and understudied.
Workers' compensation injury claims among firefighters in Ohio, 2001–2017	Quinn, Marsh, Oldham, Wurzelbacher, Naber, Morgantown, USA. 2023	Providing a descriptive analysis of workers' compensation injury claims in the state of Ohio.	N = 33,069 firefighter claims were included in the final analyses	The claims from career and volunteer firefighters between 2001–2017 was reviewed and analyzed with various methods.	The leading claim was due to overexertion. Sprains of the back, lower extremity, and upper extremity were frequently reported diagnosis.
Musculoskeletal Model for Assessing Firefighters' Internal Forces and Occupational Musculoskeletal Disorders During Self-Contained Breathing Apparatus Carriage (SCBA).	Wang & Wang, Shanghai, China. 2022.	To assess the newly recruited firefighters' joint forces and possible MSD when carrying SCBA. How this affected with strap length.	N = 12	Joint reaction forces were measured and analyzed with SCBA and under control condition.	The knee was exposed to the highest internal force when carrying SCBA, followed by the rectus femoris and hip. Adjusting SCBA Strap length influenced forces around knee, hip, and spine.
Lumbar intervertebral disc degeneration and related factors in Korean firefighters	Jang, Ahn, Byun, Lee, Kim K-H., Kim Y., Song, Lee, Kwon, Yoon, Jeong. Korea. 2016.	Identify association between age and lumbar disc degeneration and if any difference between field working firefighters and administrative firefighters.	N = 392	25 fire station randomly sampled. Questionnaire and MRI where performed. Four radiologist used Pfirrmann grade to determine disc degeneration.	Disc degeneration was associated with age and type of work on level L4-5.
Sleep disturbances predict long-term changes in low back pain among Finnish firefighters: 13-year follow-up study	Lusa, Miranda, Luukkonen, Punakallio. Finland. 2015.	Investigate prevalence of low back pain among Finnish firefighters and if sleep disturbance predict membership of such trajectory.	N = 360	Working firefighters responded to questionnaire 1996, 1999 and 2009. Outcome variables, radiation or local low back pain. Logistic regression models were used	Low back pain was common and persistent among firefighters. Sleep disturbance predict membership of a radiation pain trajectory.

Developmental trajectories of multisite musculoskeletal pain and depressive symptoms: The effects of job demands and resources and individual factors	Airila, Hakanen, Luukkonen, Lusa, Punakallio, Leino-Arjas. Finland. 2014.	How job demands, job resources, optimism and health related lifestyle effect multisite musculoskeletal pain and depressive symptom. Different development paths were expected.	N = 360	Working firefighters responded to questionnaire 1996, 1999 and 2009. Measurement with various questionnaires.	Pain and depression did develop partly different. Sleeping problems predicted both high depression and high pain.
Prevalence of work-site injuries and relationship between obesity and injury among U.S. workers: NHIS 2004–2012	Gu, Charles, Andrew, Ma, Hartley, Violanti, Burchfiel. USA. 2016.	Estimate prevalence of work-related injury and if association between obesity and injury.	N = 141,235	Data from the National Health Interview Survey. Statistical models and adjustment for confounders were made.	78 workers per 10'000 experienced a work-related injury. Obese and overweight workers reported a higher risk of injury compared to normal weight workers.
Pre-employment physical capacity testing as a predictor for musculoskeletal injury in paramedics: A review of the literature	Jenkins, Smith, Stewart, Kamphuis. Australia. 2016.	To review work-place musculoskeletal injury and if any association with pre-employment physical capacity testing in paramedics.	30 articles included.	Database search: Ovid Medline, Cochrane Database of Systematic Reviews, NIOSHTIC2, RILOSH, CISDOC and HSELINE. A scoping review.	physical fitness, gender, age, equipment, and demographic variables were factors related to high rates of work-related injuries in paramedics. Little evidence of pre-employment physical testing and musculoskeletal injury was found.
Prevalence of musculoskeletal symptoms among Canadian firefighters	Nazari, MacDermid, Sinden, D'Amico. Canada. 2020.	To assess point prevalence of musculoskeletal symptoms (MSS) if demographics and work experience predict occurrence.	N = 390	Self-reported data from the FIREWELL study. Statistical methods were used.	54% experienced MSS within the last week. Lumbar spine was the most prevalent body area. Women were more likely to report > 2 body areas of MSS compared to males.
Associations between lower back pain and job types in South Korean male firefighters	Kim, Ahn. South Korea. 2021.	To compare low back pain (LBP) in firefighters and job type.	N = 297 male FF, 77 hospital office workers.	Questionnaire and MRI. Statistical methods were used.	LBP, insomnia, herniated disc and spinal stenosis was more prevalent among firefighters compared to controls.
Biomechanics Analysis of the Firefighters' Thorax	Yunus, Jaafar, Mohamed, Azraai, Amil, Zein.	Asses biomechanical movement of firefighters.	N = 19	Questionnaire and kinematic movement were analyzed	Personal protective equipment significantly

Movement on Personal Protective Equipment during Lifting Task Using Inertial Measurement Unit Motion Capture	Malaysia. 2022.	Identify musculoskeletal pain.		with various methods	restricts movement and mobility. Low back pain was reported by 63%.
--	-----------------	--------------------------------	--	----------------------	---

Finally, the search for relevant articles was carried out between February and June 2023.

### 3 AIMS OF THE STUDY AND RESEARCH QUESTIONS

To the best of the author's knowledge, there have been no studies conducted on chronic MSD in Swedish career firefighters. Therefore, the purpose of this study is to describe the occurrence of chronic MSDs among career firefighters during 2022 and to analyze differences in such disorders.

Specifically, it assesses the occurrence and severity of musculoskeletal disorders among career firefighters in Sweden for one year by answering the following questions:

1. How common are chronic musculoskeletal disorders in career firefighters in Sweden?
2. What is the most common body area to experience pain and disability?
3. How much pain and disability have they experienced from such a disorder?
4. Does musculoskeletal disorder with regards to body area and severity of pain differ regarding demographic variables, such as gender, body mass index, and age?
5. Are musculoskeletal disorders common with higher working experience as a firefighter?
6. Do pain and disability differ between those who are eligible for smoke-diving or not?

## 4 METHOD

Chapter 4 explores the process of the study: data collection methods evaluating their reliability and validity and ethical considerations as well as statistical analysis methods.

The present study uses a quantitative approach in which a cross-sectional design is relevant for assessing the prevalence of diseases. The benefits of this approach are the cost and time effectiveness of collecting data. It is, however, important to clarify that the causality of outcome and exposure cannot be established with this method (Ebert et al. 2018; Kesmodel 2018). Consequently, whether the profession of a firefighter affects chronic MSD will not be established in the present study.

### 4.1 Data collection

As a retrospective cross-sectional study, data was collected through an open online link to a survey (Webropol, v.3) that was distributed through a firefighter union Brandmännens Riksförbund (the National Association of Swedish Firefighters 2023) and a non-profit organization Nätverket Kvinnor inom Räddningstjänsten (the Swedish Network for Female Firefighters n.d) via email, a work-related magazine (*Swedish Firefighters magazine, SSF*) and their social media groups, to their members. *Swedish Firefighters magazine (2023)* is printed six times yearly (count 13,000) and distributed for free to all union members, politicians, and officials. In the magazine and at fire stations where union representatives worked, a QR code linking to the survey was available. The survey was available between February and March 2023 and contained two parts with twenty-five closed-ended, open-ended, and multiple-choice questions (appendix). Participation took no longer than ten minutes and before starting the survey, information was shared, and consent was collected from all participants. A reminder to participate was sent out after one month and it was only possible to answer the survey once.

## 4.2 Descriptive measurement

The first part of the survey contained demographic questions about age, gender, weight, and height. For calculating body mass index (BMI), the formula  $\text{kg}/(\text{m}^2)$  was applied and then dichotomized into normal  $< 24,9$ , or overweight  $> 24,9$  (WHO 2010). Further, variables for describing the cohort included years worked as a firefighter (i.e., working experience), geographic location (i.e., federation), and eligibility for smoke diving (yes or no). Smoke divers are required to search, rescue, and extinguish fires when needed. No other categorization of working tasks was made, due to the variations of tasks between federations.

After completing the descriptive part, self-rated health perception and physical activity during 2022 were measured. First, two subscale questions adapted from the SF-36 questionnaire assessed (1) how participants perceived their health: very good, good, fair, or poor; (2) compared to one year ago, the perception is that my health is: much better now compared to one year ago, somewhat better, about the same, somewhat worse, much worse (Ware & Sherbourne 1992). Next, to describe participants' physical activity levels a modification of the International Physical Activity Questionnaire (IPAQ), how frequently they conducted resistance training, and what kind of physical activity was the most common were asked (Ainsworth et al. 2000). Finally, the analysis of physical activity was estimated if participants reached the WHO recommendation of 150-300 minutes of moderate-intensity or 75-150 minutes of high-intensity per week and two days a week of muscle-strengthening exercise.

## 4.3 Outcome measurement

The second part of the survey contained questions regarding chronic MSD to identify occurrence, body area, pain intensity, and disability. The first question was designed to identify if any of the following area(s) have been bothersome for more than 3 months in the last year (2022): neck/head, lower back, upper back, shoulder, elbow, wrist/hands, one or both hips/thigh, one or both knee, ankle, other areas, or nothing bothersome. If questions were blank, this was indicated as "no bothersome MSDs". The second question indicated if the onset of MSD

was gradual, acute, or both, and lastly if their MSD could be caused by their occupation (“Yes, big impact” or “No, small impact”).

For pain intensity and disability measurement, the Chronic Pain Questionnaire (CPQ) was used, and the timeframe changed from six months to one year (2022). It has been suggested to measure chronic pain during a set timeframe and for longer periods due to recurrent bothersome MSDs (Von Korff & Saunders 1996). Traditionally, the CPQ scale was developed for research and assessing chronic pain in the general population (Smith et al. 1997; Von Korff et al. 1992). It has been widely used in epidemiological studies and tested as a validated and reliable tool for measuring chronic MSD (Dixon et al. 2007, 6-8). The questionnaire was available for free from the authors.

Grading with CPQ according to Von Korff et al. (1992, Appendix: 147) works as follows:

- The characteristics of pain intensity are a 0–100 score derived from the mean of questions 1-3 with an NRS scale of 0-10, pain right now, the worst pain, and average pain multiplied by ten.
- The disability score is a 0–100 score derived from the mean of the questions of daily activities, social activities, and work activities multiplied by ten.
- The question about disability days was changed into, “Have you been on sick leave because of the pain” and if so, “How many days?”.
- Days of sick leave were asked with closed-ended questions: 0-6, 7-14, 15-30, or  $\geq 31$  days.
- Points are then added to the disability score. Grading is between 0–IV, where 0 is pain-free and IV is high pain intensity and severely limiting.

#### **4.4 Study population**

The participants in the present study were consenting career firefighters working for more than one year and aged between 20 and 60 years. Part-time firefighters



were excluded due to exposure to other professions. To establish statistical power, the formula by Daniel and Cross (2019, 189-193) was used and the sample size was calculated to be  $n = 357$ . However, as the survey was distributed through a work-related magazine and social media, the exact response rate was difficult to determine. After consultations with Berg (2023), the President of BRF, it was estimated that the number of firefighters reached out to was 2500.

#### **4.5 Statistical analysis**

Demographic data are displayed with mean  $\pm$  standard deviation (SD) for quantitative data and with percentages and proportions for categorical occurrence. Outcomes measurements are presented with frequencies and 95% confidence intervals (CI). For analyzing the variance of categorical variables  $\chi^2$ -test was performed, and for scale-level data one-way ANOVA and student t-test were used. Cramer's V and Phi-coefficient for calculating the effect size. Finally, analysis was performed using JASP (v.0.16.4, Amsterdam, Netherlands), an open-source software and free to download, supported by the University of Amsterdam.

#### **4.6 Ethical consideration**

Prior to the present study, a research permit has been approved by the involved organizations, BRF and KIRtj, and by the South-Eastern Finland University of Applied Science (date: 20230124). During the study, participation was voluntary, and the collected data was anonymous. Hence, no ethical approval was required. The author conducted ethical guidelines in the present study, as constituted by the Swedish Research Council (2017), and The Finnish National Board on Research Integrity (2023). Lastly, privacy notice was available for all participants after the completion of the survey (Data Protection Act 2018/1050; EU General Data Protection Regulation 2016/679).

#### 4.7 Demographic characteristics

In total, 307 responded to the survey with 255 meeting the inclusion criteria (forty-eight answers were excluded due to part-time, two for working less than a year, and two for inconclusive answers). The response rate was estimated to be 12%. Table 3 presents the descriptive statistics of the respondents. The majority (89%) were males and only 11% were females. Of the 255 respondents, more than two-thirds (68%) were between the ages of 30 and 49, and almost one-third (28%) had worked more than twenty years as a firefighter. The firefighters' self-reported height and weight were calculated to have an average BMI of 26 (SD = 3,2). A fourth (25%) of the respondents belonged to the federation Räddningstjänsten Syd (RSYD). However, most of the answers (30%) were categorized as “other”. In further description of the respondents, 9% for some reason were not eligible for smoke diving. In the sub-analysis, almost all (22/23) of them belonged to the age category 40–49 (n = 7) and 50–65 (n = 15).

The next part of the survey was concerned with self-reported health, most described it as excellent or very good and compared to one year ago it was about the same. Interestingly, no one described their health as poor (Table 3).

Table 3. The descriptive statistics of the respondents (*n* = 255)

<b>Factor</b>	<b><i>n</i> (%)</b>
Male	227 (89)
Female	28 (11)
<b>Work experience</b>	
1–5 y	43 (17)
6–10 y	51 (20)
11–15 y	54 (21)
16–20 y	37 (14)
> 20 y	71 (28)
<b>Age</b>	
20–29 y	26 (10)
30–39 y	85 (33)
40–49 y	90 (35)
50–65 y	53 (21)
<b>Approved for smoke diving</b>	

<b>Factor</b>	<b>n (%)</b>
Yes	233 (91)
No	23 (9)
BMI, M (SD)	26 (3,2)
<b>Federation</b>	
SSBF	56 (22)
RSGBG	9 (4)
RSYD	65 (25)
RSNV	28 (11)
SBFF	5 (2)
Brandkåren Attunda	15 (6)
Other	79 (30)
<b>Self-rated health</b>	
Excellent	43 (17)
Very good	125 (49)
Good	78 (30.5%)
Fair	9 (3.5%)
Poor	0 (0%)
<b>Compared to one year ago</b>	
Much better now than one year ago	14 (5)
Somewhat better now than a one year ago	49 (19)
About the same	144 (56)
Somewhat worse now than one year ago	43 (17)
Much worse than one year ago	5 (2)

BMI: body mass index; SD: standard deviation; y: years;  
 SSBF: Stor Stockholms brandförsvär,  
 RSGBG: Räddningstjänsten Storgöteborg; RSYD:  
 Räddningstjänsten Syd; RSNV: Räddningstjänsten  
 Skåne nordväst; SBFF: Södertörns brandförsvärsförbund.  
 Note. The number varies due to internal missing.

When asked about physical activity, more than half (63%) of the firefighters did at least 130 minutes of moderate exercise and 147 (57%) did more than 60 minutes of vigorous exercise. Moreover, 86% of the firefighters did at least one day of resistance training per week. When analyzing the answers to the least possible physical activity, only a minority (2.7%) had less than 60 minutes of moderate

exercise and less than 20 minutes of vigorous exercise and did not reach WHO's guidelines for physical activity (Table 4).

Table 4. Frequencies of minutes and days of physical activity per week during 2022 ( $n = 255$ )

	<i>n (%)</i>
<b>Moderate exercise</b>	
0-60 minutes/week	16 (6)
70-120 min./w	78 (31)
130-190 min./w	82 (32)
>200 min./w	79 (31)
<b>Vigorous exercise</b>	
0-20 min./w	34 (13)
30-50 min./w	75 (29)
60-90 min./w	82 (32)
>90 min./w	65 (25)
<b>Resistance training</b>	
<1-2 days/week	34 (13)
1-2 d/w	124 (48)
3-4 d/w	77 (30)
>5 d/w	21 (8)

Moderate exercise, increases your breath more than normal, but does not include walking;  
Vigorous exercise, increases your breath much more than normal.

Table 5. Most common physical activity during 2022 ( $n = 255$ )

<b>Gender</b>	<b>PA</b>	<b><i>n (%)</i></b>
Male	Cardio	86 (38)
	Strength training	75 (33)
	Cross-fit	27 (12)
	Team sports	25 (11)
	Racket sports	6 (3)
	Other	8 (4)
Female	Cardio	8 (29)
	Strength training	8 (29)
	Cross-fit	7 (25)
	Team sports	4 (14)
	Racket sports	0
	Other	1 (4)

PA, physical activity; Cardio, such as cycling or running; Team sports, such as soccer, floorball, or handball; Racket sports, such as tennis, paddle, or badminton.

In the final part of this section, respondents were asked which the most common physical activity was to participate in. For both females and males, it was most

common to do cardio exercise, such as running or cycling, followed by strength training and cross-fit (Table 5).

## 5 RESULT

Chapter 5 examines the results of the research questions, and thus presenting the main findings of the study.

### 5.1 Outcome measurement

The first question aimed to answer the occurrence of chronic MSD. The most striking finding from the data shows that 75% of the 255 respondents had some type of chronic MSD during 2022. The following question aimed to answer the most common body area to experience pain and disability. and the most common area was the lumbar spine 43% (95% CI = 37-49), shoulder 33% (95% CI = 27-39), and knee(s) 23% (95% CI = 18-28) (Table 6).

Table 6. Distribution of chronic bothersome MSDs during 2022

<b>Body area</b>	<b>n/255</b>	<b>%</b>	<b>95% CI</b>
Lumbar spine	104/255	43	37-49
Shoulder	80/255	33	27-39
Knee(s)	55/255	23	18-28
Neck/head	33/255	14	10-18
Hip(s)	29/256	12	8-16
Thoracic spine	28/255	12	8-15
Ankle/foot	28/256	12	8-16
Elbow	27/255	11	7-15
Wrist/hand	18/255	7	4-10
Other	4/255	2	0.3-4

MSD, musculoskeletal disorder; CI, confidence interval.

Table 7 presents the most bothersome body areas of chronic MSD according to grouping variables. What stands out in this table is the significantly higher reports of chronic MSDs among males compared to females ( $\chi^2 = 4.995$ ,  $p = 0.025$ ), even though the effect size was low (Phi-coefficient = 0.140). A closer inspection of the table shows that more than half (57%) of the females reported any type of chronic MSD, in contrast, males reported more than two-thirds (77%).

Furthermore, the shoulder had significantly higher rates among males compared

to females ( $\chi^2 = 10.485$ ,  $p = 0.001$ ), and higher age ( $> 39$ ) compared to lower age ( $\leq 39$ ) also presented a significant difference ( $\chi^2 = 10.485$ ,  $p = 0.001$ ,  $\Phi = 0.190$ ). In contrast, longer experience ( $\chi^2 = 0.496$ ,  $p = 0.481$ ) or higher BMI ( $\chi^2 = 2.845$ ,  $p = 0.092$ ) did not display such a difference between having an MSD and nothing bothersome.

Sub-analysis revealed that 43% experienced pain in more than one body area. Also, females reported higher rates of wrist and hand problems compared to males ( $\chi^2 = 6.338$ ,  $p = 0.012$ ,  $\Phi = 0.162$ ), with 17% of the females reporting such MSD.

Table 7. The cumulative percentage of the most bothersome body areas according to grouping variables

		NB	LB	SH	KN	p-value
<b>Total (n = 255)</b>		<b>65 (25%)</b>	<b>104 (40%)</b>	<b>80 (31%)</b>	<b>55 (21%)</b>	
Smoke diving	Yes (n = 232)	60 (92%)	92 (100%)	69 (86%)	48 (81%)	ns
	No (n = 23)	5 (8%)	12 (0%)	11 (14%)	11 (19%)	
Gender	Male (n = 227)	53 (81.5%)†	94 (91%)	78 (99%)*	52 (94.5%)	0.025/0.001
	Female (n = 28)	12 (18.5%)*	9 (9%)	1 (1%)†	3 (5.5%)	
Experience	$\leq 15$ yr (n = 148)	40 (61.5%)	55 (53%)	41 (51%)	25 (45.5%)	ns
	$> 15$ yr (n = 108)	25 (38.5%)	49 (47%)	39 (49%)	30 (54.5%)	
BMI	$\leq 24.9$ (n = 72)	13 (20%)	33 (32%)	22 (27.5%)	10 (18%)	ns
	$> 24.9$ (n = 184)	52 (80%)	71 (68%)	58 (72.5%)	45 (82%)	
Age	$\leq 39$ (n = 111)	34 (53%)	41 (40%)	23 (29%)†	18 (33%)	0.003
	$> 39$ (n = 143)	30 (47%)	62 (60%)	56 (71%)*	37 (67%)	

BMI: Body Mass Index; yr: years; ns: Not significant; NB: Nothing bothersome; LB: Lower back; SH: Shoulder; KN: Knee; \*, Higher counts than expected ( $p < 0.05$ ); †, Lower counts than expected ( $p < 0.05$ ). Note, that numbers may vary due to multiple answers and internal missing.

As shown in Table 8, the only statistical difference in pain grade was between those eligible for smoke diving and those not ( $\chi^2 = 15.031$ ,  $p = 0.005$ ).

Interestingly, the firefighters who were not eligible experienced higher pain grades (III–IV) than their counterparts who were eligible and experienced lower

pain grades (0–II). The effect size was large with the interpretation of Cramer's  $V = 0.242$ . Higher age ( $> 39$ ), however, did not show significantly different pain grades ( $\chi^2 = 9.082$ ,  $p = 0.059$ ), even though higher proportions in the higher pain grades (III–IV) were observed. The most common pain grade was grade II (high pain/low disability) which affected 28% (Table 8).

Table 8. The cumulative percentage of pain grade according to grouping variables

		0	I	II	III	IV	<i>p</i> -value
<b>Total (<i>n</i> = 255)</b>		<b>64 (25%)</b>	<b>40 (16%)</b>	<b>71 (28%)</b>	<b>59 (23%)</b>	<b>22 (9%)</b>	
Smoke diver	Yes ( <i>n</i> = 232)	59 (92%)*	40 (100%)*	68 (96%)*	48 (81%)†	18 (82%)†	0.005
	No ( <i>n</i> = 23)	5 (8%)†	0 (0%)†	3 (4%)†	11 (19%)*	4 (18%)*	
Gender	Male ( <i>n</i> = 227)	52 (81%)	37 (92.5%)	63 (89%)	57 (97%)	18 (86%)	0.086
	Female ( <i>n</i> = 28)	12 (19%)	3 (7.5%)	8 (11%)	2 (3%)	3 (14%)	
Experience	≤ 15 yr ( <i>n</i> = 148)	39 (61%)	27 (67.5%)	42 (59%)	29 (49%)	11 (50%)	0.378
	> 15 yr ( <i>n</i> = 108)	25 (39%)	13 (32.5%)	29 (41%)	30 (51%)	11 (50%)	
BMI	≤ 24.9 ( <i>n</i> = 72)	13 (20%)	13 (32.5%)	20 (28%)	20 (34%)	6 (27%)	0.510
	> 24.9 ( <i>n</i> = 184)	51 (80%)	27 (67.5%)	51 (72%)	39 (66%)	16 (73%)	
Age	≤ 39 ( <i>n</i> = 111)	34(54%)	21(52.5%)	31(44%)	19(32%)	6(29%)	0.059
	> 39 ( <i>n</i> = 143)	29(46%)	19(47.5%)	40(56%)	40(68%)	15(71%)	

BMI: Body Mass Index; yr: years; Pain grade 0 denotes no pain, grade IV high disability - severely limiting; \*, Higher counts than expected; †, Lower counts than expected.

In further analysis of the most common body area, there were no differences regarding mean pain intensity or disability score (Table 9). However, the one-way ANOVA analysis displayed significant higher mean pain scores ( $F = 6.237$ ,  $df_1 = 3$ ,  $df_2 = 234$ ,  $p = 0.013$ ) and disability score ( $F = 4.570$ ,  $df_1 = 3$ ,  $df_2 = 234$ ,  $p = 0.034$ ) when compared to all other body-areas.

Table 9. Mean pain score and disability score of the most bothersome MSD body areas ( $n=239$ ).

Body area	Mean pain score 0-100 (CI, 95%)	Mean disability score 0-100 (CI, 95%)
Shoulder	64.7 (62.6-66.7)	45.6 (42.5-48.6)
Knee	62.1 (59.8-64.3)	45.7 (42.8-48.5)
Lumbar spine	65.2 (63.3-67)	50.8 (47.8-53.7)
<i>p</i> -value*	<i>ns</i>	<i>ns</i>

Disability score and pain score were calculated with each section's mean and multiplied with ten. *ns*: not significant; \*, analysis with student t-test; CI, confidence interval; MSD, musculoskeletal disorder.

Next, in Table 10 the question of whether the MSD was possibly influenced by the profession as a firefighter, less than half (38%) answered affirmatively. Also, 88% answered the onset of pain was gradual or both gradual and acute.

Table 10. Question if MSD was possibly influenced by profession as a firefighter, and the onset of pain

MSD influenced by profession ( <i>n</i> = 203)	<i>n</i> (%)
Yes, big influence	77 (38)
No, small influence	126 (62)
Debut ( <i>n</i> = 193)	
Acute	23 (12)
Gradual	93 (48)
Both	77 (40)

MSD, musculoskeletal disorder.

Table 11. Number of days with sick leave according to body area and if bothersome or not

Body Area	Bothersome	Days of sick leave				Total ( <i>n</i> = 161)	p-value
		0-6 ( <i>n</i> = 127)	7-14) ( <i>n</i> = 10)	15-30 ( <i>n</i> = 6)	>31 ( <i>n</i> = 18)		
Lumbar spine	No (%)	59 (46.5)	1 (10)	3 (50)	7 (39)	70 (43.5%)	0.153
	Yes (%)	68 (53.5)	9 (90)	3 (50)	11 (61)	91 (56.5%)	
Shoulder	No (%)	76 (60)	2 (20)	4 (67)	10 (56)	92 (57%)	0.100
	Yes (%)	51 (40)	8 (80)	2 (33)	8 (44)	69 (43%)	
Knee	No (%)	93 (73)	4 (40)	5 (83)	12 (67)	114 (71%)	0.135
	Yes (%)	34 (27)	6 (60)	1 (17)	6 (33)	47 (29%)	

Lastly, Table 11 displays self-reported data on days with sick leave, regarding the three most bothersome body areas. Days of sick leave were a measurement of the disability score, as described in the method part. The analysis revealed no significant difference between the most bothersome body areas compared to other body areas. Surprisingly, approximately 80% had a maximum of only six days of sick leave during 2022 because of their MSD.



## 6 DISCUSSION

The main aim of the present study was to determine the occurrence of chronic MSD in Swedish career firefighters. MSDs were highly prevalent among the respondents in 2022. The most bothersome body areas were the lumbar spine, shoulders, and knees with most likely a gradual onset. Female firefighters experienced higher rates of hand and wrist disorders compared to their male counterparts. Contrary, male firefighters reported overall higher rates of MSDs, with shoulders being more affected both with males and at higher ages. Analysis showed that pain grade II (high intensity/low disability) was the most common. For non-smoke divers, there were higher pain grades (III–IV) compared to those eligible for smoke diving. This information will provide officials and experts in MSDs with improved knowledge and help guide preventive strategies among firefighters with chronic MSDs.

The most important finding of the present study showed that 75% of firefighters reported chronic MSD. Similar results were observed in the Spanish wildland firefighters (203 males and 18 females), where García-Heras et al. (2022) reported approximately 60% had chronic pain and 45% reported pain from more than one body area. There was no difference in prevalence between males and females, besides the location of chronic pain. The female Spanish wildland firefighters reported similar rates of bodily pain to the Swedish female firefighters. In contrast to the present study, ages over 35 years [OR = 4.03 (95% CI 2.04-7.94)] and working more than 10 years ( $\chi^2 = 7.746$ ,  $p = 0.021$ ) increased the probability of chronic pain. Despite these findings, there is a lack of research both regarding gender differences and chronic MSD among firefighters. Future research should emphasize the classification of MSDs with longitudinal follow-up, and gender aspects.

Another important finding in the present study was that the lumbar spine had the highest reports [43% (95% CI = 37-49)] of MSDs. These reports are higher compared to previous research. For example, a longitudinal study by Lusa et al.

(2015) of Finnish firefighters investigated the prevalence of LBP. They observed that 6% had radiating LBP and 12% had local LBP and belonged to the group chronic. An explanation for the lower prevalence might be due to the dropout or retirement of participants having chronic LBP, thus, influencing the results. However, there have been similarities to Lusa et al. (2015) findings. For example, Carleton et al. (2017) observed that 35% of firefighters ( $n = 807$ ) had chronic pain, with the lower back (18.4%) being the most common, followed by the shoulder (15.7%) and neck (12.3%). Another explanation for the different rates of LBP could be reasoned by a smaller sample size in the present study compared with previous research. Therefore, there would be a note of caution when interpreting the results. Nevertheless, detecting low back MSD at an early stage will be important in preventing chronicity.

MSD has been reported as common in other professions, such as Swedish military personnel. Glad et al. (2012) studied 344 peacekeeping Swedish soldiers, 70% reported MSD, the most bothersome being the lumbar spine [17% (95% CI = 13–20)], shoulders [17% (95% CI = 13–21)], and lower extremities [14% (95% CI = 11–18)]. Fifty-five percent had pain for more than 31 days from these body areas, although most had grade I pain (low pain/low disability). There could be several explanations for the variation in pain grade—first, was the difference in inclusion criteria, where the present study only included chronic MSDs. Secondly, a longer time (one year compared to six months) might increase the probability of reporting an MSD. Lastly, even though both firefighters and military personnel carry additional weight (22-40kg), they have different exposures in their professions. For example, in Glad et al. (2012) study of peacekeeping soldiers, they were away from home for six months during their mission. Thus, explaining the discrepancy in the severity of MSDs must be addressed with caution.

The present study found that the shoulders were the second most common area to report pain and disability from [33% (95% CI = 27-39)]. Interestingly, of the female firefighters, only one reported such disorder. In comparison to the general population, MSD from the shoulder and neck has been seen as common in both

women and men (median 37.8 per 1000 person per year), with generally higher rates among women (Lucas et al. 2022; Safiri et al. 2020). It seems possible these differences are due to a small sample of female firefighters in the present study. Therefore, comparison and generalization of the results might be problematic. Importantly, MSD is considered a common health-care problem in the general population. For example, Wiitavaara et al. (2017) retrospective study of 2,000 Swedish patient records from two different primary healthcare centers highlighted that 60% either had MSD symptoms at the visit or during the reviewed three-year period. Lower and upper limbs were the most common areas for MSDs. Unfortunately, it did not address the prevalence of chronic MSD, even though 29% had MSDs at the visit to the physician.

Non-smoke divers experienced significantly more pain and disability compared to the ones being permitted to smoke dives ( $\chi^2 = 15.031$ ,  $p = 0.005$ ). These findings may be somewhat limited to the small sample size since Only 9% ( $n = 23$ ) reported not being eligible for smoke diving. In addition, every year firefighters require a medical examination to smoke dive. There could be medical reasons for not being permitted, which are not stated in the present study. Importantly, almost all the non-smoke divers (22/23) were between 40 and 65 years old. These results are in accord with a recent review, indicating that higher age with a decline in the physical condition and comorbidities such as cardiovascular disease have been suggested as risk factors for sustaining MSD in firefighters (Ras et al. 2022).

The average BMI in the study sample was 26 ( $\pm 3.2$ ) and classified as overweight according to WHO (2010). There was no difference in the occurrence of MSD between normal weight or overweight observed. However, this differs from American firefighters with obesity (BMI > 29.9). They had a 5.2-fold increased risk of musculoskeletal injury (95% CI = 1.1-23.4) compared to their normal-weight counterparts (Jahnke et al. 2013). Several factors could explain this observation. First, the differences in the classification of MSD, comparing reported work-related injuries to self-reported chronic MSD is problematic. Secondly, self-reported BMI has been discussed for its misclassification errors. It does not

reflect on body composition between fat and muscle mass, age, and gender (Rothman 2008). In further studies, waist circumference and other markers for classification are suggested.

The onset of MSD was either gradual (48%) or both acute and gradual (40%)—also, 43% experienced pain and disability from more than one body area. Accordingly, the variation of chronic pain is common to have fluctuations and episodes with acute pain, so-called flare-ups from one or more body areas. These episodes could be aggravated by lifting, bending, or overexertion (Suri et al. 2012; Vasseljen et al. 2013). The nature of a firefighter's daily work incorporates a lot of these movements which could be a reason why chronic MSDs are highly occurring in this sample of firefighters.

Although MSD was highly occurring, firefighters reported fewer days of sick leave due to their MSDs per year compared to the general population (Hubertsson et al. 2014). These results, however, must be interpreted with caution because of different biases, for example, the misclassification of diagnosis with self-reported sick leave compared to doctors-prescribed sick leave. Also, recall bias might be a consideration. On the other hand, despite these biases, firefighters' working situation may differ from that of other professions where longer days between shifts could influence recovery time for MSDs. Since most firefighters in the present study experienced high pain intensity and low disability, it is possibly explained by the ability to remain at work and therefore still be able to participate in some work-related tasks.

In addition to sick leave, most of the firefighters reported high physical activity, with common activities such as cardio, strength training, and cross-fit. The ability to perform such a high dosage of training while suffering from a chronic MSD was rather surprising. Similarly, the reported average low disability might also be a reason for the high physical activity. Where one with an MSD from the shoulder, might choose a training method which is not as demanding for the shoulder. However, this needs to study further before any conclusions can be made.

Other factors which have not been considered in the present study are, sleep disorders, mental health problems, and personal protective equipment which might affect the occurrence of MSDs (Airila et al. 2014; Khoshakhlagh et al. 2023; Yunus et al. 2022). Even though firefighters have a similar work description across Sweden, workloads such as the number of emergency calls, types of accidents, and sleep during shift work may vary in different districts. This must also be taken into consideration when analyzing exposure at work and risk factors for developing MSDs. However, the aim of this study was not to determine any causality with MSD but to outline the occurrence of such a disease. Therefore, further longitudinal studies are needed.

### **6.1 Validity, reliability, and study limitations**

To the best of the author's knowledge, this is the first study to determine the occurrence and severity of chronic MSDs in Swedish firefighters, including both males and females. For the outcome measurement of chronic pain, Von Korff CPQ has been validated and reliable, on the other hand, it has mainly been used for measurement between 3-6 months (Von Korff et al. 1992). In the present study, the timeline was changed to one year. Notably, recall bias might be a consideration. However, as Rasmussen et al. (2018) demonstrate, durations between one year and six months in retrospective studies are reliable at a group level compared to monthly measurements.

There are some limitations to this study. First, the number of respondents was less than calculated for statistical power, in addition, due to the methodological setting the response rate could not be calculated accurately. Despite this, at least 4% (192/4947) of all Swedish firefighters suffer from a chronic MSD. Secondly, the smaller sample size of females could affect the validity of the results, when compared to the analysis of variance between males. Although the present study is based on a smaller sample size of females, it should be considered that approximately 10% of all female firefighters answered the survey in comparison to nearly 5% of males. Lastly, selection bias should be a consideration when

conducting web surveys (Bethlehem 2010). Accordingly, participants with MSD might be more prone to answer the survey compared to the ones without MSD.

## **7 CONCLUSION**

The study set out to assess the occurrence, variance, and severity of chronic musculoskeletal disorders among Swedish career firefighters. The result showed that it was highly occurring with 75% of the firefighters reporting such disorders during 2022. The lumbar spine was the most common body area to report pain and disability, followed by the shoulder and knee. Regarding the most bothersome body areas, there were no significant differences in mean pain and disability, however, forty-three percent experienced pain and disability from more than one body area. Thus, significantly higher mean pain and disability scores were observed in the lumbar spine, knees, and shoulder, compared to all other body areas. The results also showed that males and higher-aged firefighters experienced significantly greater rates of chronic MSD from the shoulder, whereas females had similar results from the wrist and hand. In contrast, analysis of pain grade revealed no significant differences in gender, BMI, age, or working experience. On the contrary, not being eligible for smoke-diving was significantly associated with higher pain grades. Finally, the most common pain grade was grade II (high intensity/low disability).

This highlights the importance of preventing MSD early, for example, during yearly medical examinations and assessing comorbidity for non-smoke divers. Further longitudinal studies should identify risk factors and causality for MSD among career firefighters.

## **8 ACKNOWLEDGEMENT**

There are some persons and organizations that need acknowledgment. To Malin Olofsson, for your patience and valuable insights. Brandmännens Riksförbund and Nätverket Kvinnor inom Räddningstjänsten, for making this study possible. To my friends Lars Olofsson and Jaleh Taheri for helping with the English grammar and suggesting improvements. Also, to my supervisors Anita Näslindh-

Ylispangar and Petteri Koski, for your feedback. Lastly, all the participants who took the time to answer the survey. Thank you!

## REFERENCES

- Ainsworth, B.E., Bassett, D.R., Strath, S.J., Swartz, A.M., O'Brien, W.L., Thompson, R.W., Jones, D.A., Macera, C.A. & Kimsey, C.D. 2000. Comparison of three methods for measuring the time spent in physical activity. *Medicine & Science in Sports & Exercise*, 32 (9), 457–464. E-journal. Available at: <https://doi.org/10.1097/00005768-200009001-00004> [Accessed 28 April 2023].
- Airila, A., Hakanen, J.J., Luukkonen, R., Lusa, S., Punakallio, A. & Leino-Arjas, P. 2014. Developmental trajectories of multisite musculoskeletal pain and depressive symptoms: The effects of job demands and resources and individual factors. *Psychology & Health*, 29 (12), 1421–1441. E-Journal. Available at <https://doi.org/10.1080/08870446.2014.945929> [Accessed 17 March 2023].
- Berg, P. 2023. President. Email discussion. 28 April – 5 May 2023. The Confederation of Swedish Firefighters.
- Bethlehem, J. 2010. Selection Bias in Web Surveys. *International Statistical Review*. 78 (2), 161–188. E-journal. Available at: <https://doi.org/10.1111/j.1751-5823.2010.00112.x> [Accessed 24 March 2023].
- Bylund, P.-O. & Björnstig, U. 1999. Medical impairing injuries among Swedish firefighters. *Work*, 12 (2), 117–122. E-journal. Available at: <https://content.iospress.com/articles/work/wor00025> [Accessed 27 October 2023].
- Campbell, R. & Hall, S. 2022. United States Firefighter Injuries in 2021 (No. FF110). National Fire Protection Association. Report. 1 December 2022. Available at: <https://www.nfpa.org/education-and-research/research/nfpa-research/fire-statistical-reports/firefighter-injuries-in-the-united-states> [Accessed 24 March 2023].
- Carleton, R.N., Afifi, T.O., Turner, S., Taillieu, T., El-Gabalawy, R., Sareen, J. & Asmundson, G.J.G. 2017. Chronic pain among public safety personnel in Canada. *Canadian Journal of Pain*, 1 (1), 237–246. E-journal. Available at: <https://doi.org/10.1080/24740527.2017.1410431> [Accessed 8 July 2023].
- Daniel, W.W. & Cross, C.L. 2019. *Biostatistics: A Foundation for Analysis in the Health Sciences*. Hoboken: Wiley & Sons, Inc. E-book. Available at: [https://faculty.ksu.edu.sa/sites/default/files/145\\_stat\\_textbook.pdf](https://faculty.ksu.edu.sa/sites/default/files/145_stat_textbook.pdf) [Accessed 21 August 2023].
- Data Protection Act 2018/1050.
- Dennison, P.E., Brewer, S.C., Arnold, J.D. & Moritz, M.A. 2014. Large wildfire trends in the western United States, 1984–2011. *Geophysical Research Letters*,



41 (8), 2928–2933. E-journal. Available at: <https://doi.org/10.1002/2014GL05957> [Accessed 2 October 2023]

Dixon, D., Pollard, B. & Johnston, M. 2007. What does the chronic pain grade questionnaire measure? *PAIN*, 130 (3), 249–253. E-journal. Available at: <https://doi.org/10.1016/j.pain.2006.12.004> [Accessed 21 August 2023].

Dworsky, M., Seabury, S.A. & Broten, N. 2021. The frequency and economic impact of musculoskeletal disorders for California firefighters. *Rand Health Quarterly*, 9 (2), 4. E-journal. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8383844/> [Accessed 16 October 2023].

Ebert, J. F., Huibers, L., Christensen, B., & Christensen, M. B. 2018. Paper- or Web-Based Questionnaire Invitations as a Method for Data Collection: Cross-sectional comparative study of differences in response rate, completeness of data, and financial cost. *Journal of medical Internet research*, 20 (1), e24. E-journal. Available at: <https://doi.org/10.2196/jmir.8353> [Accessed 12 November 2023].

EU General Data Protection Regulation 2016/679.

Finnish National Board on Research Integrity. 2023. The Finnish code of conduct for research integrity and procedures for handling alleged violations of research integrity in Finland. Web page. Available at: [https://tenk.fi/sites/default/files/2023-05/RI\\_Guidelines\\_2023.pdf](https://tenk.fi/sites/default/files/2023-05/RI_Guidelines_2023.pdf) [Accessed 11 December 2023].

Frost, D.M., Beach, T. a. C., Crosby, I. & McGill, S.M. 2015. Firefighter injuries are not just a fireground problem. *Work: Journal of Prevention, Assessment & Rehabilitation* 52 (3), 835–842. E-journal. Available at: <https://doi.org/10.3233/WOR-152111> [Accessed 17 March 2023].

García-Heras, F., Gutiérrez-Arroyo, J., León-Guereño, P., Carballo-Leyenda, B. & Rodríguez-Marroyo, J.A. 2022. Chronic Pain in Spanish Wildland Firefighters. *Journal of Clinical Medicine*, 11 (4), 989. E-journal. Available at: <https://doi.org/10.3390/jcm11040989> [Accessed 24 March 2023].

Glad, D., Skillgate, E. & Holm, L.W. 2012. The occurrence and severity of musculoskeletal disorders in Swedish military personnel during peacekeeping operations in Afghanistan. *European Spine Journal*, 21 (4), 739–744. E-journal. Available at: <https://doi.org/10.1007/s00586-011-2142-6> [Accessed 29 June 2023].

Gu, J.K., Charles, L.E., Andrew, M.E., Ma, C.C., Hartley, T.A., Violanti, J.M. & Burchfiel, C.M. 2016. Prevalence of work-site injuries and relationship between obesity and injury among U.S. workers: NHIS 2004–2012. *Journal of Safety Research*, 58, 21–30. E-journal. Available at: <https://doi.org/10.1016/j.jsr.2016.06.001> [Accessed 17 March 2023].

- Hubertsson, J., Englund, M., Hallgärde, U., Lidwall, U., Löfvendahl, S. & Petersson, I.F. 2014. Sick leave patterns in common musculoskeletal disorders-- a study of doctor prescribed sick leave. *BMC Musculoskeletal Disorders*, 15, 176. E-journal. Available at: <https://doi.org/10.1186/1471-2474-15-176> [Accessed 8 July 2023].
- Jacobsson, A., Backteman-Erlanson, S., Brulin, C. & Hörnsten, Å. 2015. Experiences of critical incidents among female and male firefighters. *International Emergency Nursing*, 23 (2), 100–104. E-journal. Available at: <https://doi.org/10.1016/j.ienj.2014.06.002> [Accessed 27 October 2023].
- Jacobsson, A., Backteman-Erlanson, S. & Egan Sjolander, A. 2020. Diversity, preventive work and education-matters of health and well-being in firefighter discourse. *International Journal of Qualitative Studies on Health and Well-Being*, 15 (1), 1817661. E-journal. Available at: <https://doi.org/10.1080/17482631.2020.1817661> [Accessed 27 October 2023].
- Jahnke, S.A., Poston, W.S.C., Haddock, C.K. & Jitnarin, N. 2013. Obesity and incident injury among career firefighters in the central United States. *Obesity*, 21 (8), 1505–1508. E-journal. Available at: <https://doi.org/10.1002/oby.20436> [Accessed 10 March 2023].
- Jang, T.-W., Ahn, Y.-S., Byun, J., Lee, J.-I., Kim, K.-H., Kim, Y., Song, H.-S., Lee, C.-G., Kwon, Y.-J., Yoon, J.-H. & Jeong, K. 2016. Lumbar intervertebral disc degeneration and related factors in Korean firefighters. *BMJ Open*, 6 (6), e011587. E-journal. Available at: <https://doi.org/10.1136/bmjopen-2016-011587> [Accessed 10 March 2023].
- Jenkins, N., Smith, G., Stewart, S. & Kamphuis, C. 2016. Pre-employment physical capacity testing as a predictor for musculoskeletal injury in paramedics: A review of the literature. *Work: Journal of Prevention, Assessment & Rehabilitation*, 55 (3), 565–575. E-journal. Available at: <https://doi.org/10.3233/WOR-162422> [Accessed 13 March 2023].
- Kesmodel U. S. 2018. Cross-sectional studies - what are they good for?. *Acta obstetrica et gynecologica Scandinavica*, 97 (4), 388–393. E-journal. Available at: <https://doi.org/10.1111/aogs.13331> [Accessed 12 November 2023].
- Khoshakhlagh, A.H., Al Sulaie, S., Yazdanirad, S., Orr, R.M., Dehdarirad, H. & Milajerdi, A. 2023. Global prevalence and associated factors of sleep disorders and poor sleep quality among firefighters: A systematic review and meta-analysis. *Heliyon*, 9 (2), e13250. E-journal. Available at: <https://doi.org/10.1016/j.heliyon.2023.e13250> [Accessed 17 March 2023].
- Kim, M.G. & Ahn, Y.-S. 2021. Associations between lower back pain and job types in South Korean male firefighters. *International journal of occupational safety and ergonomics: JOSE*, 27 (2), 570–577. E-journal. Available at: <https://doi.org/10.1080/10803548.2019.1608061> [Accessed 10 March 2023].

Kok, J., Vroonhof, P., Snijders, J., Roullis, G., Clarke, M., Peereboom, K., Dorst v. P. & Isusi, I. 2019. Work-related musculoskeletal disorders: prevalence, costs and demographics in the EU. Luxembourg: Publications Office of the European Union. E-book. Available at: <https://data.europa.eu/doi/10.2802/66947> [Accessed 20 March 2023].

Lucas, J., van Doorn, P., Hegedus, E., Lewis, J. & van der Windt, D. 2022. A systematic review of the global prevalence and incidence of shoulder pain. *BMC musculoskeletal disorders*, 23 (1), 1073. E-journal. Available at: <https://doi.org/10.1186/s12891-022-05973-8> [Accessed 8 August 2023].

Lusa, S., Miranda, H., Luukkonen, R. & Punakallio, A. 2015. Sleep disturbances predict long-term changes in low back pain among Finnish firefighters: 13-year follow-up study. *International Archives of Occupational and Environmental Health*, 88 (3), 369–379. E-journal. Available at: <https://doi.org/10.1007/s00420-014-0968-z> [Accessed 17 March 2023].

National Association of Swedish Firefighters. 2023. Viktig enkät om smärtproblem för heltidsbrandmän. Web page. Available at: <https://brandfacket.se/2023/02/06/viktig-enkatstudie-om-landryddssmarta-for-brandman/> [Accessed 14 December 2023].

Nazari, G., MacDermid, J.C., Sinden, K. & D'Amico, R. 2020. Prevalence of musculoskeletal symptoms among Canadian firefighters. *Work*, 67 (1), 185–191. E-journal. Available at: <https://doi.org/10.3233/WOR-203264> [Accessed 10 March 2023].

Plat, M.J., Frings-Dresen, M.H.W. & Sluiter, J.K. 2011. A systematic review of job-specific workers' health surveillance activities for fire-fighting, ambulance, police and military personnel. *International Archives of Occupational and Environmental Health*, 84 (8), 839–857. E-journal. Available at: <https://doi.org/10.1007/s00420-011-0614-y> [Accessed 22 April 2023].

Quinn, T.D., Marsh, S.M., Oldham, K., Wurzelbacher, S.J. & Naber, S.J. 2023. Workers' compensation injury claims among firefighters in Ohio, 2001–2017. *Journal of Safety Research*. 85, 147-156. E-journal. Available at: <https://doi.org/10.1016/j.jsr.2023.01.014> [Accessed 17 March 2023].

Raja, S.N., Carr, D.B., Cohen, M., Finnerup, N.B., Flor, H., Gibson, S., Keefe, F.J., Mogil, J.S., Ringkamp, M., Sluka, K.A., Song, X.-J., Stevens, B., Sullivan, M.D., Tutelman, P.R., Ushida, T. & Vader, K. 2020. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain*, 161 (9), 1976–1982. E-journal. Available at: <https://doi.org/10.1097/j.pain.0000000000001939> [Accessed 24 March 2023].

Ras, J., Smith, D.L., Kengne, A.P., Soteriades, E.E. & Leach, L. 2022. Cardiovascular disease risk factors, musculoskeletal health, physical fitness, and occupational performance in firefighters: a narrative review. *Journal of Environmental and Public Health*, 2022, 1-20. E-journal. Available at: <https://doi.org/10.1155/2022/7346408> [Accessed 13 March 2023].

Rasmussen, C.D.N., Holtermann, A. & Jørgensen, M.B. 2018. Recall Bias in Low Back Pain Among Workers. *Spine (Phila Pa 1976)*, 43 (12), E727–E733. E-journal. Available at: <https://doi.org/10.1097/BRS.0000000000002457> [Accessed 21 August 2023].

Roquelaure, Y. 2018. Musculoskeletal disorders and psychosocial factors at work. *SSRN Journal*. ETUI research paper – report 141. Available at: <https://doi.org/10.2139/ssrn.3316143> [Accessed 20 March 2023].

Rothman, K.J. 2008. BMI-related errors in the measurement of obesity. *International Journal of Obesity*, 32 (3), S56–S59. E-journal. Available at: <https://doi.org/10.1038/ijo.2008.87> [Accessed 15 September 2023].

Safiri, S., Kolahi, A.-A., Hoy, D., Buchbinder, R., Mansournia, M.A., Bettampadi, D., Ashrafi-Asgarabad, A., Almasi-Hashiani, A., Smith, E., Sepidarkish, M., Cross, M., Qorbani, M., Moradi-Lakeh, M., Woolf, A.D., March, L., Collins, G. & Ferreira, M.L. 2020. Global, regional, and national burden of neck pain in the general population, 1990-2017: systematic analysis of the Global Burden of Disease Study 2017. *BMJ*, 368, 1-11. E-journal. Available at: <https://doi.org/10.1136/bmj.m791> [Accessed 30 August 2023].

Scholz, J., Finnerup, N.B., Attal, N., Aziz, Q., Baron, R., Bennett, M.I., Benoliel, R., Cohen, M., Cruccu, G., Davis, K.D., Evers, S., First, M., Giamberardino, M.A., Hansson, P., Kaasa, S., Korwisi, B., Kosek, E., Lavand'homme, P., Nicholas, M., Nurmikko, T., Perrot, S., Raja, S.N., Rice, A.S.C., Rowbotham, M.C., Schug, S., Simpson, D.M., Smith, B.H., Svensson, P., Vlaeyen, J.W.S., Wang, S.-J., Barke, A., Rief, W., Treede, R.-D. & Classification Committee of the Neuropathic Pain Special Interest Group (NeuPSIG). 2019. The IASP classification of chronic pain for ICD-11: chronic neuropathic pain. *Pain*, 160 (1), 53–59. E-journal. Available at: <https://doi.org/10.1097/j.pain.0000000000001365> [Accessed 24 March 2023].

Sinden, K., MacDermid, J., Buckman, S., Davis, B., Matthews, T. & Viola, C. 2013. A qualitative study on the experiences of female firefighters. *Work: Journal of Prevention, Assessment & Rehabilitation*, 45 (1), 97–105. E-journal. Available at: <https://content.iospress.com/articles/work/wor01549> [Accessed 13 March 2023].

Smith, B.H., Penny, K.I., Purves, A.M., Munro, C., Wilson, B., Grimshaw, J., Chambers, W.A. & Smith, W.C. 1997. The Chronic Pain Grade Questionnaire: validation and reliability in postal research. *Pain*, 71 (2), 141–147. E-journal. Available at: [https://doi.org/10.1016/s0304-3959\(97\)03347-2](https://doi.org/10.1016/s0304-3959(97)03347-2) [Accessed 18 August 2023].

Suri, P., Saunders, K.W. & Von Korff, M. 2012. Prevalence and characteristics of flare-ups of chronic nonspecific back pain in primary care: a telephone survey. *The Clinical Journal of Pain*, 28 (7), 573–580. E-journal. Available at: <https://doi.org/10.1097/AJP.0b013e31823ae173> [Accessed 18 August 2023].

Swedish Civil Contingencies Agency, MSB. 2022. Personal i operativ tjänst, 2000-2022. Web page. Available at: <https://ida.msb.se/ida2#page=2666b47c-2b7d-42f7-9a9e-2c302ddbfe9> [Accessed 18 August 2023].

Swedish Firefighters Magazine. 2023. Naprapaten David Havias enkät om smärtproblem för heltidsbrandmän. Web page. Available at: <https://firefighters.se/2023/03/22/viktig-enkat-om-smartproblem-for-brandman/> [Accessed 14 December 2023].

Swedish Network for Female Firefighters. n.d. Web page. Available at: <http://www.kirtj.se/?fbclid=IwAR3-ssb4ByEqnBvdgZm9XpaJgg80cVInypYdYSjhbExTqQLhtequ3WiwMVY> [Accessed 14 December 2023].

Swedish Research Council. 2017. Good Research Practice. Web page. Available at: <https://www.vr.se/english/analysis/reports/our-reports/2017-08-31-good-research-practice.html> [Accessed 21 August 2023].

Vasseljen, O., Woodhouse, A., Bjørngaard, J.H. & Leivseth, L. 2013. Natural course of acute neck and low back pain in the general population: the HUNT study. *Pain*, 154 (8), 1237–1244. E-journal. Available at: <https://doi.org/10.1016/j.pain.2013.03.032> [Accessed 21 June 2023].

Von Korff, M. & Saunders, K. 1996. The course of back pain in primary care. *Spine (Phila Pa 1976)*, 21 (24), 2833–2837; discussion 2838-2839. E-journal. Available at: <https://doi.org/10.1097/00007632-199612150-00004> [Accessed 18 August 2023].

Von Korff, M., Ormel, J., Keefe, F.J. & Dworkin, S.F. 1992. Grading the severity of chronic pain. *Pain*, 50 (2), 133–149. E-journal. Available at: [https://doi.org/10.1016/0304-3959\(92\)90154-4](https://doi.org/10.1016/0304-3959(92)90154-4) [Accessed 28 April 2023].

Vos, T., Flaxman, A.D., Naghavi, M., Lozano, R., Michaud, C., Ezzati, M., Shibuya, K., Salomon, J.A., Abdalla, S., Aboyans, V., Abraham, J., Ackerman, I., Aggarwal, R., Ahn, S.Y., Ali, M.K., AlMazroa, M.A., Alvarado, M., Anderson, H.R., Anderson, ... Murray, C.J. 2012. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, 380 (9859), 2163–2196. E-journal. Available at: [https://doi.org/10.1016/S0140-6736\(12\)61729-2](https://doi.org/10.1016/S0140-6736(12)61729-2) [Accessed 24 March 2023].

Wang, S. & Wang, Y. 2022. Musculoskeletal model for assessing firefighters' internal forces and occupational musculoskeletal disorders during self-contained breathing apparatus carriage. *Safety and Health at Work*, 13 (3), 315–325. E-journal. Available at: <https://doi.org/10.1016/j.shaw.2022.03.009> [Accessed 17 March 2023]

Ware, J.E. & Sherbourne, C.D. 1992. The MOS 36-Item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. *Medical Care*, 30

(6), 473–483. E-journal. Available at: <https://www.jstor.org/stable/3765916> [Accessed 28 April 2023].

WHO. 2010. Recommendations for a healthy lifestyle. Web page. 6 May 2010. Available at: <https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations> [Accessed 28 April 2023] + <https://www.who.int/news/item/17-07-2023-who-updates-guidelines-on-fats-and-carbohydrates> [Accessed 14 December 2023].

Witavaara, B., Fahlström, M. & Djupsjöbacka, M. 2017. Prevalence, diagnostics and management of musculoskeletal disorders in primary health care in Sweden – an investigation of 2000 randomly selected patient records. *Journal of Evaluation in Clinical Practice*, 23 (2), 325–332. E-journal. Available at: <https://doi.org/10.1111/jep.12614> [Accessed 8 July 2023].

Yunus, M.N.H., Jaafar, M.H., Mohamed, A.S.A., Azraai, N.Z., Amil, N. & Zein, R.M. 2022. Biomechanics Analysis of the Firefighters' Thorax Movement on Personal Protective Equipment during Lifting Task Using Inertial Measurement Unit Motion Capture. *International Journal of Environmental Research and Public Health*, 19 (21), 14232. E-journal. Available at: <https://doi.org/10.3390/ijerph192114232> [Accessed 10 March 2023].

## LISTS OF TABLES

Table 1. Literature search table .....	10
Table 2. Research table.....	10
Table 3. The descriptive statistics of the respondents ( $n = 255$ ) .....	18
Table 4. Frequencies of minutes and days of physical activity per week during 2022 ( $n = 255$ ) .....	20
Table 5. Most common physical activity during 2022 ( $n = 255$ ).....	20
Table 6. Distribution of chronic bothersome MSDs during 2022.....	21
Table 7. The cumulative percentage of the most bothersome body areas according to grouping variables .....	22
Table 8. The cumulative percentage of pain grade according to grouping variables.....	23
Table 9. Mean pain score and disability score of the most bothersome MSD body areas ( $n=239$ ). .....	23
Table 10. Question if MSD was possibly influenced by profession as a firefighter, and the onset of pain .....	24
Table 11. Number of days with sick leave according to body area and if bothersome or not.....	24

## APPENDICES

Appendix 1/1

Information och förfrågan om att delta i enkätstudie

### **Till dig som är heltidsarbetande brandman**

Ländryggssmärta och andra besvär från rörelseapparaten är idag bland de vanligaste orsakerna till försämrad livskvalitet över hela världen. Det finns idag inga studier som visar på hur dessa besvär ser ut för brandmän i Sverige.

Jag genomför därför en enkätstudie med syftet att undersöka förekomsten av långvariga muskel och ledbesvär hos heltidsarbetande brandmän. Resultatet ska leda till en ökad kunskap om långvariga besvär från muskler och leder samt om det finns skillnader inom gruppen.

Heltidsarbetande brandmän i Sverige tillfrågas att delta i denna enkätundersökning. Studien riktar sig till dig som är heltidsarbetande och jobbat minst ett år inom yrket, oavsett om du har besvär eller inte från rörelseapparaten. Deltagandet är helt frivilligt och du kan närsomhelst avbryta din medverkan. Du deltar genom att fylla i enkäten via länken eller QR-koden. Din medverkan tar ungefär 10 minuter.

Dina svar kommer vara anonyma och publicerat material kommer redovisas på gruppnivå. Efter publicerat resultat kommer insamlade data att raderas.

Jag som genomför studien heter David Havia jobbar som Leg. Naprapat och läser masterprogrammet i naprapati på South-Eastern Finland University of Applied Science. I utbildningen ingår att göra en masteruppsats, därav anledningen till denna enkätstudie. Vid frågor är du välkommen att höra av dig.



Lund 2023-01-16

David Havia

0736419838 david@lundsnaprapatlinik.se

Handledare:

Salla Leinonen Salla.Leinonen@xamk.fi

## **Undersökning av muskel- och ledbesvär hos brandmän i Sverige**

Obligatoriska frågor är markerade med en stjärna (\*)

### **1. Med den informationen jag fått angående studien samtycker jag till att delta. \***

- Ja
- Nej

I Del 1 av undersökning får du svara på bakgrundsfrågor om dig själv, din fysiska aktivitet och generella hälsa. I Del 2 besvaras frågor om dina eventuella muskel- och ledbesvär. Undersökningen tar ungefär 10 minuter att genomföra. Du kan längst ned på varje sida spara dina frågor och fortsätta vid ett senare tillfälle.

DEL 1 Bakgrundsinformation

### **2. Anställningsform \***

Vänligen ange din nuvarande anställningsform (gäller även vid sjukskrivning, föräldrarledighet etc).

- Heltidsarbetande brandman
- Deltidsarbetande brandman (RIB)

### **3. Antal yrkesverksamma år som brandman \***

mindre än 1år

- 1-5
- 6-10
- 11-15
- 16-20

- 20+

#### 4. Kön

- Man
- Kvinna
- Annat

#### 5. Ålder

- 20-29
- 30-39
- 40-49
- 50-65

#### 6. Ange din vikt och längd.

Längd (centimeter, cm) \_\_\_\_\_

Vikt (kilogram, kg) \_\_\_\_\_

#### 7. Är Du för tillfället godkänd för rökdykning?

- Ja
- Nej

#### 8. Vilken är din arbetsgivare?

Hittar du inte det som passar, ange övriga.

- SSBF - Stor Stockholms brandförsvär
- RSGBG - Rtj Stor Göteborg RSYD - Rtj Syd
- RSNV - Rtj Nordvästra Skåne RÖB - Östra Blekinge
- RVB - Västra Blekinge
- SBFF - Södertörns brandförsvär Brandkåren Attunda
- Uppsala brandförsvär
- RTJ Umeå
- RTJ Kiruna
- RTJ Östersund
- RTJ Medelpad

- RTJ Dala Mitt
- RTJ Nässjö/Vetlanda
- SERF - Södra Älvsborg RTJ Halmstad
- RTJ Gotland
- Övriga

Frågor om din hälsa.

**9. I allmänhet, skulle du vilja säga att din hälsa är:**

- Utmärkt
- Mycket god
- God
- Någorlunda
- Dålig

**10. Jämfört med för ett år sedan, hur skulle du vilja bedöma ditt allmänna hälsotillstånd nu?**

- Mycket bättre nu än för ett år sedan
- Något bättre nu än för ett år sedan
- Ungefär detsamma
- Något sämre nu än för ett år sedan
- Mycket sämre nu än för ett år sedan

Frågor om din fysiska aktivitet.

**11. I genomsnitt senaste året (2022), hur många minuter i veckan utför du träning som är måttligt\* ansträngande?**

\*Måttligt ansträngande fysisk aktivitet innefattar aktiviteter som upplevs som arbetsamma och får dig att andas något kraftigare än normalt. Ej promenader.

- 0-60 minuter
- 70-120
- 130-190

- >200

**12. I genomsnitt senaste året (2022), hur många minuter i veckan utför du träning som är mycket\* ansträngande?**

\*Mycket ansträngande fysisk aktivitet innefattar aktiviteter som upplevs som mycket arbetssamma och får dig att andas mycket kraftigare än normalt.

- 0-20 minuter
- 30-50
- 60-90
- >90

**13. I genomsnitt senaste året (2022), hur många dagar i veckan genomförde Du muskelstärkande\* träning?**

\*Muskelstärkande träning innebär lyft av vikter, sin egen kroppsvikt eller annat motstånd flera gånger för att stärka en eller flera muskelgrupper.

- mindre än 1-2 dagar/vecka
- 1-2 dagar/vecka
- 3-4 dagar/vecka
- mer än 5 dagar/vecka

**14. Vilken typ av aktivitet är den vanligaste aktivitet du ägnar dig åt?**

- Konditionsträning (löpning, cykling etc)
- Styrketräning
- Cross-fit
- Lagidrott (fotboll, innebandy, handboll etc.)
- Racketsport (tennis, badminton, paddel etc)
- Annat

Följande frågor ska du besvara om du haft besvär totalt 3 månader eller mer, någonstans i kroppen det senaste året. Har du inte haft besvär fyller du i det i fråga 17 och enkäten avslutas.

**15. Jag har under de senaste året (2022) haft besvär totalt 3 månader eller mer i ett av följande område/områden.**

- Nacke
- Övre delen av rygge (bröstrygg)
- Nedre delen av ryggen (ländrygg)
- Axel/skuldra
- En eller båda höft, lår
- En eller båda knä
- Armbåge
- Ankel/fot
- Hand/handled
- Annat
- Inga besvär i den utsträckningen

**16. Ange hur det mest besvärade området debuterade**

- Plötslig debut (akut)
- Smygande debut (gradvis)
- Både smygande och plötslig

**17. Upplever du att något av dina muskel- och ledbesvär möjligen är orsakat av yrket som brandman?**

- Ja, stor påverkan
- Nej, liten påverkan

Nedan ska du beskriva smärtan och din nedsättning pga smärta från det mest besvärande området.

**18. Hur skulle du skatta din smärta från 0-10 just nu?**

Ingen smärta 0 1 2 3 4 5 6 7 8 9 10 Värsta tänkbara smärta

**19. Under det senaste året (2022) hur intensiv var din värsta smärta?**

Ingen smärta 0 1 2 3 4 5 6 7 8 9 10 Värsta tänkbara smärta

**20. Under senaste året (2022) hur var din smärta i genomsnitt (vanligen då du upplever smärta)?**

Ingen smärta 0 1 2 3 4 5 6 7 8 9 10 Värsta tänkbara smärta

**21. Har du varit sjukskriven pga din smärta i det angivna området senaste året (2022)?**

- Ja
- Nej

**22. Ange hur många dagar du varit sjukskriven pga din smärta.**

- 0-6 dagar
- 7-14 dagar
- 15-30 dagar
- 31 dagar

**23. Under det senaste året (2022) hur mycket har smärtan påverkat dig i dina dagliga aktiviteter\*?**

\*så som gå upp ur sängen, påklädnad etc.

Inte alls 0 1 2 3 4 5 6 7 8 9 10 Kan ej utföra aktiviteter

**24. Under det senaste året (2022) hur mycket har smärtan ändrat din förmåga att delta i social- och familjeaktivitet\*?**

\*så som lek, spel, rekreation med familj och/eller vänner.

Ingen skillnad 0 1 2 3 4 5 6 7 8 9 10 Extrem skillnad

**25. Under det senaste året (2022) hur mycket har smärtan ändrat din förmåga att arbeta (inklusive hushållsarbete)?**

Ingen skillnad 0 1 2 3 4 5 6 7 8 9 10 Extrem skillnad