

UNIVERSITY OF GHANA

**Work-related Musculoskeletal Disorders among Firefighters: Do Task
Characteristics and Work Experience Matter?**

BY

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**A THESIS SUBMITTED TO THE DEPARTMENT OF ORGANISATION AND HUMAN
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DECLARATION

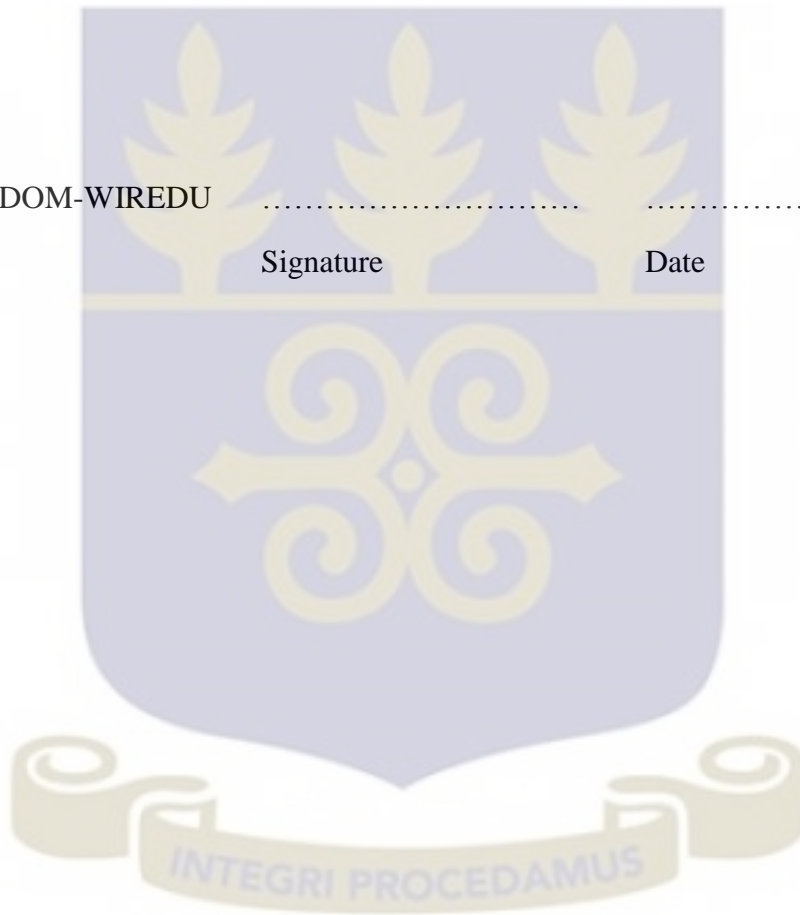
I hereby declare that this submission is my own work towards the award of an MPhil in Human Resource Management and that, to my best of knowledge, it contains no material previously published or written by another person which have been accepted for the award of any degree in any institution, except where due acknowledgement has been made to referenced materials.

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CERTIFICATION

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DEDICATION

I dedicate this thesis to the Almighty God for his mercies towards me. It is through His unending love and grace that has brought me this far. I also dedicate this thesis to my dear Dad, Mr. David Kofi Owusu-Wiredu for his relentless support throughout my course of study.



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LIST OF ABBREVIATIONS

GNFS	Ghana National Fire Service
WHO	World Health Organization
ILO	International Labour Organisation
WE	Work Experience
WMSDs	Work-related Musculoskeletal Disorders
CFO	Chief Fire Officer
ACFO	Assistant Chief Fire Officer
DO	Divisional Officer Class
ADO	Assistant Divisional Officer
SO	Station Officer
GO	Group Officer
ASO	Assistant Station Officer
DGO	Deputy Group Officer
SO	Subordinate Officer
AGO	Assistant Group Officer
NIOSH	National Institute for Occupational Safety and Health
SPSS	Statistical Package for Social Sciences

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ABSTRACT

The purpose of this research was to understand how firefighters' task characteristics and work experience affect their development of work-related musculoskeletal disorders (WMSDs). Guided by literature on task characteristics, work experience and WMSDs, data was collected from 320 firefighters within the Greater Accra Regional fire command. Data was then analysed through descriptive and inferential statistics. It was found that task characteristics had a significant positive effect on WMSDs. As such, increase in the severity and unpredictability of tasks performed by firefighters lead to increased incidences of WMSDs. Also, work experience did not have a significant effect on WMSDs. In addition, the task characteristics of firefighters did not moderate the relationship between their work experience and WMSDs. This reveals that task characteristics of firefighters do neither enhance nor reduce the effect of work experience on WMSDs. On the premise of the above findings it is concluded that the task characteristics of firefighters are challenging and unpredictable. Again, WMSDs are prevalent among firefighters. Also, work experience of firefighters does not influence their development of WMSDs. Based on these conclusions, it is recommended that fire commanders should minimize the intensity of tasks assigned to firefighters by introducing work dynamisms such as task sharing, job rotation and probably teleworking to enhance flexibility. Again, the Human Resource and Recruitment Department of the Ghana National Fire Service needs to consider the ability and fitness levels of potential firefighters during recruitment. When employed too, fire commanders need to consider the abilities of firefighters before assigning challenging tasks to them. In addition, regular physical activities and ergonomic policies should be put in place by the management of the Ghana National Fire Service to reduce the incidences of WMSDs.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The workplace is undoubtedly a key determinant of employee health and wellbeing since most employees spend much of their daily lives at work. As such most adverse health and safety developments among workers are likely to be contracted through their works. The International Labour Organisation (ILO) (2016) estimates that 2.2 million people die annually as a result of work-related sicknesses and injuries. Again, it is approximated by the World Health Organisation (WHO) (2013) that work-related stress will be the key cause of disability by the year 2020. Work-related stress and strains such as musculoskeletal disorders appears to be high in occupations with high work demands and unpredictable work schedules.

ILO (2003) estimated that while the firefighter to inhabitant ratio among European countries was 1: 1, 000-1, 200, that of Mali was 1: 33, 435. Also work-related musculoskeletal disorders have been associated with high perceived work stress, high workload and demand, low job control, work monotony and limited work experience (Cañadas-De la Fuente et al., 2015; Norlund et al., 2010). These situations appear to be similar to that of the Greater Accra Regional fire service command in Ghana.

Established for the prevention and management of fires in the national capital of Ghana, the Greater Accra, Tema regional and the National Headquarters are the main commands in the Greater Accra region of Ghana set for operational purposes by the Ghana National Fire Service (GNFS). However, the Grater Accra regional command forms the largest operational command. With a total staff strength of one thousand, three hundred and sixty-seven (1367), the Greater Accra regional command is headed by a regional commander, oversees 16 fire stations and reports to the national head office (GNFS, 2016).

Annually, the Greater Accra regional command fights an average of one thousand (1000) fires. For instance, out of the total of six thousand, two hundred and fourteen (6214) fire outbreaks in Ghana in the year 2015, the Greater Accra regional command fought one thousand, one hundred and ninety-seven (1197) representing 19.26% (GNFS, 2016). Generally, the Ghana National Fire Service was established as the main Ghana National Fire management institution by the Ghana National Fire Service (GNFS) Act of 1997 (Act 537) with a comprehensive goal of “prevention and management of undesired fires and other related matters”. However, the nature of works performed by fire service personnel can expose them to boring and repetitive tasks and musculoskeletal disorders. It is therefore presumed that the task characteristics and work experience of firefighters can affect their development of work-related musculoskeletal disorders.

Specifically, the Ghana National Fire Service was set up to perform functions such as: “organizing public fire education programmes to create and sustain awareness of the hazards of fire and heighten the role of the individual in the prevention of fires; provide technical advice for building plans in respect of machinery and structural layouts to facilitate escape from fire, rescue operations and fire management; inspect and offer technical advice on fire extinguishers; co-ordinate and advise on the training of personnel in firefighting departments institutions in the country; offer rescue and evacuation services to those trapped by fire or in other emergency situations; train and organize fire volunteer squads at community level and to undertake any other function incidental to the objective of the service (Ministry of Interior, 2015).”

There are however nine (9) main directorates that ensure the smooth running of the service. They are the following: Operations (form the core of the fire service and is responsible for firefighting, management and rescuing); Administration and finance (responsible for managing all the day to day administrative and financial activities of the service); Logistics (concerned with holding and delivery of equipment, machinery and personal protective equipment); Research and monitoring (concerned with research and evaluation of activities and performance of the service); Safety (concerned with education and awareness creation among institutions and individuals); Legal (handles all legal matters of the service); Rural fires (training of rural fire squads); Technical services (provision of technical assistance) and Training and HR (recruitment and other HR activities) (GNFS, 2016).

Again, like other paramilitary organisations, the fire service has ranks that ensures that orders are strictly adhered to. The ranks in the Ghana Fire Service can basically be put into two categories, namely, senior officers' ranks and junior officers' ranks. With regards to the senior officers' rank, on top of the hierarchy is the Chief Fire Officer (CFO) who is appointed by the president of Ghana. Next in command is the Deputy Chief Fire Officer (DCFO) followed by the Assistant Chief Fire Officer (ACFO) and the Divisional Officer Class I (DO I) recommended by the National Fire Service Council for presidential appointment. These ranks form the top decision making body of the Ghana Fire Service. The next are the Divisional Officer Class II (DO II), the Divisional Officer Class III (DO III), the Assistant Divisional Officer I (ADO I) and the Assistant Divisional Officer II (ADO II) which is the entry rank of the senior ranks. An ADO II is promoted to ADO I after two years and takes five years for an ADO I to progress to a DO III after a successful interview

and council's appointment. From the ADO II to the DO II form the senior management and are capable of heading departments, Districts or Regional commands (GNFS, 2016).

With regards to the junior officers' rank, males and females on the same rank are given different names. The highest in the juniors' rank is the Station Officer (SO I) (male) and the Group Officer (GO I) (female), capable of managing a fire station, followed by Station Officer (SO II) (male) the Group Officer (GO II) (female) capable of heading departments at the District level and the Assistant Station Officer (ASO) (male), a rank that heads male watches and the Deputy Group Officer (DGO) (female), a rank that manages females in the control room. The ranks after are the Subordinate Officer (Sub O) (male) and Assistant Group Officer (AGO) (female), Leading Fireman (male) and Leading Firewoman (female), Fireman (male) and Firewoman (female) and lastly Recruit fireman (male) and Recruit Firewoman (female). Recruit firemen and recruit firewomen are firefighter who have just graduated from the fire training Academy with less than 6 months' work experience and awaiting confirmation. All ranks ranging from the Assistant station Officer and Deputy Group Officer to Recruit Firefighters are the ranks actively involved in the day to day firefighting activities but station officers and group officers occasionally fights some fires when the need arises. Only a few females actually put out fires, but rather more males do. However, the females assist their male colleagues in terms of communication on the fire grounds and provide other administrative services such as typing and safety education (GNFS, 2016).

The skill of firefighting is divided into three central segments, which are; fire prevention, rescue, and firefighting. The prevention aspect institutes principles and procedures for the avoidance of

inadvertent fires. Regular surveys and inspections are employed to regulate such principles and procedures. Rescue involves salvaging victims ensnared in all forms of disasters, but more specifically by fire. With firefighting, upon getting to a fire scene, firefighters are required to identify the specific location of the fire and immediately began to rescue people, prevent exposures, sequester the fire, and afterwards quench the fire. While rescuing is not always required at most fires scenes, it must be seen as the foremost priority. Firefighters are expected to sojourn the spreading of the fire (protect exposures or confine) to other structures or portions of the structure in flames before they can putting themselves to the quenching of the flames. Ventitulation (removal of smoke, heat, and gases) is a part of the salvage effort which may be required at any time in the process of the firefighting operation (GNFS, 2016).

In addition, the fire service uses several tools, equipment and clothing in the course of their work. Among them are water hose, fire trucks, proximity suit, fire resistant suit, breathing apparatus, turn-table ladder, firefighting tunic, safety boots, safety helmets, fire engines and many more. Aside, the service operates on strict compliance with safety tips, acting upon instructions of superiors and reporting to superiors always (GNFS, 2016).

As already indicated, the fire service profession is among the most strenuous and hazardous occupations around the world. This is because, in the process of preventing, rescuing and fighting fire, personnel are exposed to long hours of standing, stress, heat stress, over exertion, extreme heat conditions, burns, falls, exposure to biological hazards such as blood of victims being rescued, traumatic scenes like burnt or dead bodies and long term effects such as burnout, cardiovascular and cancer diseases and alcohol or substance addictions.

Like other fire service institutions in other developing countries, the Greater Accra regional fire command may be confronted with challenges such as monotonous tasks, work-related musculoskeletal complications and limited work experience.

1.2 Problem statement

The issues of stress and musculoskeletal disorders are universal since it occurs in both professional and social cycles. There are enormous theoretical and practical studies on occupational stress. Stress manifests itself in all types of occupations. If not well managed stress has the propensity to cause severe and undesirable consequences. Globally there have been quite a number of studies on the subject matter in the fire service and among other rescue and emergency service professions. This is because there are high possibilities that their job demands are likely to exceed their capabilities, considering the nature of their jobs. For example in the United States, Brennan (2002) studied the causes of work-related stress and burnout, associated to firefighters or paramedics and devised techniques of prevention. Brennan settled that industrial stress was a severe and destructive condition connected with firefighters and paramedics (Brennan, 2002).

Again, using a convenient sampling and a quantitative design, Ben, Scotti, Chen and Fortson (2006), appraised the pervasiveness of post-traumatic stress disorder indications in one hundred and thirty-one (131) male fire service personnel from two states in America. They found an extraordinary incidence of post-traumatic stress disorders. Similarly, Heinrichs et al., (2005), examined predictive risk factors associated with posttraumatic stress indications and comorbid psychopathological signs existent within the period before exposure to traumatic stress in high-risk professions in Germany. The findings of Heinrichs et al. (2005) suggest that specific

personality qualities can establish pointers of susceptibility to the increase of psychopathological signs after being exposed to trauma.

Fisher and Etches (2003) proposed an all-inclusive approach to workplace stress in firefighting. In their framework, Fisher and Etches projected that efficient workplace wellness and institutional health inventiveness are supposed to fit in three strategic elements, which are; building capacity, increasing resiliency, and supporting positive culture change (Fisher & Etches, 2003). Moran (2001) also attempted to outline probable factors that are likely to aid UK executives foresee individual trainee firefighters at the risk of developing stress. The results from the t-stats indicated that stress evaluation for items linked with emergency shot up during training of trainees (Moran, 2001).

In addition, Chamberlin and Green (2010) matched psychological distress and coping approaches for three separate forty (40) permanent firefighter categories in South-East Queensland, Australia. Their findings depict that older fire service workers recounted excessive common distress but exhibited no rise in posttraumatic stress indications. Also coping tactics appeared to be concomitant with higher levels of distress and posttraumatic stress (Chamberlin & Green, 2010). In the United States, Young, Gibson, Partington, Partington and Wetherell (2013) assessed the stress reactivity of particular activities at the time of command and control of an immersive, technology-based simulation by analyzing the variations among variables. The outcome of the study showed no significant variations in level of anxiety. Meanwhile stress levels and perceived workload were related to job roles (Young et al., 2013). Specifically, Young et al. (2013) found that incident commanders recounted the maximum levels of mental and spatial demands and stress when equated to Entry Control officers.

Malek, Mearns and Flin (2010) conducted a comparative study by examining the relationship among sources of stress, coping strategy, job satisfaction and psychological well-being and in addition assessed the functions of coping attitude as the moderator variable among Malaysian and United Kingdom fire services. The regression output from the six hundred and seventeen (617) firefighters from Malaysia and four hundred and thirty-six (436) firefighters from the United Kingdom revealed that the sources of occupational stress showed significant negative correlations with job satisfaction and psychological well-being. Based on the output of the regression analysis Malek et al. (2010) concluded that general stress managing attitude has a significant influence upon general work satisfaction for UK fire fighters but contrary for Malaysian fire service personnel. On the other hand, general coping activities had a significant effect as a moderating variable between sources of stress and psychological health for Malaysian fire fighters.

Also, Kim, Kim, Ryoo and Yoo (2013) assessed the conditions of work-related musculoskeletal disorders (WMSDs) in twenty one thousand, four hundred and sixty-six (21, 466) Korean male firefighters and explained the effect of job stress on the manifestation of WMSDs in a cross-sectional study. Findings from the study demonstrated that back pain was the commonest WMSD. Among the work stress sub-dimensions, physical surroundings, work load, organizational structure, industrial climate, deficiency of reward and job insecurity were related to the manifestation of work-related musculoskeletal disorders (Kim et al., 2013). However, Kim et al. (2013) found that unsatisfactory work control and interpersonal misunderstanding were not associated to incidences of WMSDs.

In Iran, Ziaei, Yarmohammadi, Izadi, Nazari and Hashemian (2014) determined work-related pervasiveness and matched it among personnel of firefighting institutions and emergency medical station (EMS). Results indicated that 98.9% of fire service personnel and 97.3% of EMS personnel were open to minimal and moderate amounts of stress, but no participant showed extreme stress level (Ziaei et al., 2014). In addition, Ziaei et al. (2014) found a significant association between work stress and age, work experience, marriage status, employment status and education among EMS staff and also with exercise, hypertension and gastrointestinal ailment among fire service staff. The rigorousness of work stress among fire service staff was expressively above that of EMS workforce.

In 2000, Throne, Bartholomew, Craig and Farrar in the United States of America investigated the efficiency of 16 weeks of keep fit training as an intervention to condense the psychophysiological reaction of fire service workers to mental stress (Throne, Bartholomew, Craig & Farrar, 2000). Throne et al. (2000) detected significant group variances after training, whereby exercise-trained respondents reacted with significantly minimal pulsation and mean arterial pressure above that of their colleagues in the control environment. Participants who exercised also recounted considerable reduced stress associated anxiety level and adverse impacts.

Also, Carlisle (1999) identified the characteristics of mental stress, its causativeness, identification, management, reduction and resolution in a small rural fire department in Alabama, USA. The review brought to light that fire service workers were stressed by their own station living environment, their protective work gear, their supervisors and leaders, current administrative

approaches, workfellow, and the stress as a result of abandoning their families and loved ones in periods of natural and man-made disasters. Carlisle (1999) also found that when firefighters and other emergency workers were briefed prior to entering an accident scene, such as an air crash scene, mental trauma was lessened. In the words of Carlisle, when area briefing demonstrations were championed in a well-ordered, attentive manner and following set protocols, mental stress was equally minimized. Certain personality types did not cope well with psychological stress. However, participants did cope better with proper instruction, education, and training.

Malek, Fahrudin and Kamil (2009) also investigated the causes of industrial stress and how they affect job satisfaction and psychological well-being among six hundred and seventeen (617) Malaysian fire service personnel. The function of stress management approaches and job motivation as moderators were tested. Malek et al. (2009) found that sources of work-related stress had significant inverse associations with job satisfaction and worker well-being. Hierarchical regression analysis was adopted to examine the moderating effect of work motivation and coping approaches on job satisfaction and mental well-being. It could therefore be inferred from the results that coping strategies and work motivation are among the potential moderating variables between sources of stress and job satisfaction. The study was however cross-sectional and used a self-reported questionnaire.

From the little review, it appears that globally, studies on stress among firefighters have focused on issues such as stress predictors, causes/effects, coping strategies, post-traumatic stress disorders (PTSDs), support, stress appraisal, work-related stress disorders, psychological wellbeing, job

satisfaction, stress identification, stress sources, stress causation, stress reactivity and stress reduction among others.

Studies on stress in Africa, particularly among firefighters appear to be quite insufficient considering the demanding nature of their job. For example, by using a cross-sectional survey, Naudé and Rothmann (2003) examined work-related stressors for emergency personnel in South Africa and found no essentially substantial variations between job-related stressors of emergency workers in different hierarchical levels and among different language sets, therefore creating the need to investigate the interaction of stress and stress coping mechanisms among firefighters.

Again, Naudé and Rothmann (2006), adopted a cross-sectional design in assessing the associations between industrial stress, sense of soundness, burnout and work engagement of emergency workers in Gauteng (South Africa) and continued to determine whether sense of soundness influences the effects of work-related stress on burnout and work engagement. Naudé and Rothmann (2006) found that work-related stress (as a result of a lack of job resources) and a weak sense of soundness predicted emotional exhaustion and depersonalisation while sense of soundness predicted personal accomplishment and work engagement. These studies nonetheless did not focus on other long term effects of stress.

From the review from Africa, the subject of stress in the fire service has been on stressors, burnout and work engagement but not on task characteristics, work demand and work experience. It is evident that not much has been done, especially on the issue of how work demands and work

experience affects firefighters' work stress, musculoskeletal disorders and their task characteristics.

1.3 Purpose of the research

The purpose of this research is to understand how firefighters' tasks characteristics and work experience affect their development of work-related musculoskeletal disorders.

1.4 Research objectives

The study seeks to achieve the following objectives:

1. To find out how the task characteristics of firefighters will affect their development of WMSDs
2. To find out whether firefighters' work experience will affect their levels of WMSDs
3. To find out the moderating role of task characteristics on the relationship between firefighters' work experience and WMSDs

1.5 Research questions

1. How does the task characteristics of firefighters affect their development of WMSDs?
2. How will the work experience of firefighters affect their levels of WMSDs?
3. Does task characteristics moderate the relationship between work experience and WMSDs?

1.6 Research hypotheses

The following are the research propositions as derived from the literature review:

H₁: The task characteristics of firefighters will positively affect their development of WMSDs

H₂: The work experience of firefighters will positively affect their levels of WMSDs

H₃: Task characteristics of firefighters will moderate the relationship between their work experience and WMSDs

1.7 Significance of the study

The research to assess the effect of firefighters' task characteristics and work experience on their work-related musculoskeletal disorders is relevant for the following.

The findings of this research will help the Ghana National Fire Service to be cognizant of the work-related musculoskeletal disorders of firefighters resulting from their task characteristics and work experience. This in essence will help the leadership of the fire service to re-examine the stimuli at fire stations and on fire grounds in order to reduce repetitive injury. In addition, the findings will shed more light on the benefits of health and wellbeing among emergency workers.

1.8 Research limitations

The focus of data collection was within some selected fire stations in the Greater Accra Regional fire command. If the study had covered all firefighters in the whole country, the results could have been different.

1.9 Organisation of the study

The study is structured into five main chapters. Chapter one is the introduction and entails the background of the study, statement of problem, research objective, research questions, hypothesis, significance of the study, study limitation and organisation of the study. Chapter two is the literature review and comprises of definition of key variables, empirical review, the theoretical review, study framework showing the relationships among the study variables. Chapter three is

the methodology. It deals with the research design, population of the study, sample size and techniques, method of data collection, ethical considerations and method of data analysis. Also chapter four is the data analysis and discussions. This chapter deals with analysis of the gathered data and its discussions and interpretations. Finally, chapter five deals with the summary of findings, conclusion and recommendations.



CHAPTER TWO

LITERATURE REVIEW

2.1 Definition of key variables

This section comprises of the operational definition of key variables used in this study.

2.1.1 Task characteristics

The very nature of activities or tasks performed by workers can influence their levels of exertions. Fataurochman (1997) defined job characteristics as “the relationship between job characteristics and individual responses to work” (p. 1). With workers in the firefighting profession, the nature of their jobs might require additional efforts, and which might culminate into work stress.

2.1.2 Work experience

The term work experience can mean number of years spent in a profession, skill accumulation, continuous practice or training. According to Moran (1998), “work experience can refer to either years of service or involvement with certain types of critical incidents (p. 40).” Work experience may also be explained to mean some kind of short-term work placement in an organization where one will be assigned to work on junior-level tasks in order to get hands-on skills and understanding of the employment sector. It is believed that people with high work experience will be able to manage stress than those with low working experience. The ability to use past working experiences to manage new work stress according to Moran (1998) is termed “stress inoculation.” Typically, more experienced workers may transfer their experiences to less experienced workers through constant interaction and practice.

2.1.3 Work-related musculoskeletal disorders

Nunes (2009) defined “work-related musculoskeletal disorders include a wide range of inflammatory and degenerative conditions affecting muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels” (p. 121). Musculoskeletal conditions may take place when muscles or tendons are overextended or over-used beyond their capabilities. Among the likely ergonomic risk causes of work-related musculoskeletal disorders are repetitive motion, awkward posture, forceful exertions, pressure points, and static postures, National Institute for Occupational Safety and Health (NIOSH, 2007). Basically, musculoskeletal disorders has been used to indicate complications in the nerves, tendons, muscles, and supporting structures of the body.

2.2 Empirical Review

There appears to be an associations among task characteristics, work experience and work-related musculoskeletal disorders empirically. The nature of tasks performed by a workers can require extra efforts from the worker which can result into work-related musculoskeletal disorders. In the same way, the level of skills as well as the number of years spent in a profession (work experience) has consequences on the development of work-related musculoskeletal disorders.

2.2.1 Task characteristics

The task of fighting fire, rescuing victims and exposure to horrific scenes expose firefighters to unprecedented levels of work-related musculoskeletal disorders. The dynamics in work organisations such as uncertainty, variety, autonomy and feedback can influence stress levels among firefighters. In their article, Oosthuizen and Koortzen (2007) found that among other factors

such as fringe benefits and firm operation, task characteristics was related to the stress levels among South African firefighters.

Lambert, Cluse-Tolar and Hogan (2007) for instance assessed the effect of task characteristics and work involvement on the levels of work stress among two hundred and seventy-two (272) correctional workers. A 5-item scale developed by Crank, Regoli, Hewitt and Culbertson (1995) was adapted to measure work stress. Job characteristics was measured using dimensions like supervision, perceived riskiness of task, task variety, feedback, role stress, and work involvement. During analysis, demographic variables such as sex, age, work experience, education, and race were used as control variables. The output of the ordinary least squared regression indicated that sex, age, perceived riskiness of task, feedback, role stress, and work involvement significantly affected the stress levels of respondents.

In Canada, Dewa, Thompson and Jacobs (2011) investigated the relationships between work stress, work characteristics and work roles, using a total of two thousand, seven hundred and thirty-seven (2737) subjects. A logistic regression analysis was used to test elements related to elevated levels of work stress. The result demonstrated that task characteristics (working for long hours) was significantly related to work stress. Further, the logistic regression output indicated that male staff were 6 times less likely to perceive their works as stressful as compared to their female colleagues.

In South Africa, Steyna and Vawda (2014) studied the influences of job characteristics on job satisfaction, stress and depression among some selected employees. Participants completed Hackman and Oldham's (1974) job diagnostic survey, Cohen, Kamarch and Mermelstein's (1983) perceived stress scale and the Beck Depression Inventory (Ward, Mendelson, Mock & Erbaugh,

1961). A regression analysis was used to analyse the data. From the analysis, job characteristics (skill variety, task identity, task significance, autonomy and feedback) predicted job satisfaction, stress and depression. However, the output showed that job characteristics weakly predicts both stress and depression.

In Australia, the relationship between work characteristics and work stress was assessed by Noblet (Noblet, 2003). Evidence from the analysis indicated that work characteristics accounted for higher percentage in stress and job satisfaction. The Job Strain model developed by Fox, Dwyer and Ganster (1993) was used to explain the theoretical underpinnings between work characteristics and stress. Data was analyzed by t-test.

Jimmieson and Terry (1999) carried out two experimental studies to find out whether the stress-buffering effects of attitudinal control on task reactions differed as a function of procedural information. In the first study the researchers investigated work demands, attitudinal control, and procedural information among one hundred and twenty-eight (128) participants. The analysis of variance indicated a significant three-way interaction among the constructs in predicting individual work performance and work satisfaction. In addition, it was revealed that procedural information buffered the negative effects of work demands on scores of performance and satisfaction only when behavioral control was minimal. This results pattern portray that procedural information is likely to have a compensatory effect when the work environment is made up of a combination of high work demands and low behavioral control.

In their second study, Jimmieson and Terry (1999) assessed the degree to which the interactive relationship among work demands, attitudinal control, and procedural information differed as a function of task complexity. The study supported the stress-buffering role of procedural information on work task responses under conditions of low behavioral control. This effect, however, only existed when the in-basket activity was dominated by high task complexity, signifying that the interactive relationship among these variables may be contingent upon the type of tasks performed at work.

2.2.2 Work experience

In addition, in a study conducted by Moran (1998) to examine the linear and quadratic movements on stress and interrelated variables across three categories of skilled firefighters in Australia, they sustained the assumption that the association between work stress and work experience was quadratic, with stress peaking among the medium experienced firefighter, and lowest among the low and high experienced firefighter. Meanwhile Moran (1998) asserts that this outcome is not expounded by dissimilarities in real traumatic experiences or coping strategies. The study was quantitative and used the transactional model of stress. According to Moran (1998) the pattern of stress scores across levels of experience does not support a linear relationship, but supports a quadratic one which resembles an inverted-U. Hence the results support the proposition that the relationship is quadratic, but the direction is opposite to that predicted. Particularly, stress was highest in the middle experience group, and lowest in the low and high experience groups.

On the association between work experience and work stress, Azizpour, Shohani, Sayehmiri and Kikhavani (2013) tested whether a relationship existed among work experience, stress and some demographic factors. The cross-sectional study was conducted among fifty (50) Iranian

participants. Using descriptive and inferential tests like Chi-square, Pearson correlation, Anova and t-test, the correlation analysis indicated that there was no significant relationship between work stress and work shift, age, work experience, institutional category and marital status.

Hunnur and Bagali (2014) sought to find out how work stress is associated with demographic attribute like work experience, age and education from a sample of fifty (50). Matching Srivastava's (1981) occupational stress index against work experience, age and education, the findings of the study indicated that stress had no relationship with the demographic variables including work experience.

2.2.3 Work-related musculoskeletal disorders

The firefighting profession is among the most stressful occupations around the world. Work-related musculoskeletal disorders can have multiple causes coming from both inside and outside the work environment. With regards to the development of work-related musculoskeletal disorders (WMSDs), both tasks characteristics and work experience appear to be contributory factors. For instance, it is presumable that workers with high work experience will be likely to have minimal developments of WMSDs as compared to workers with low work experience due to long years of service and adaptation. Also workers whose work environment require them to exert extra energies are likely to be more susceptible to WMSDs than workers with low work demands. Work-related musculoskeletal disorders is common with rescue and emergency service workers, particularly firefighters.

In South Korea for instance, Lim, Baek, Chung and Lee (2014) studied elements connected with sleep syndromes in seven hundred and thirty (730) male firefighters employed in a metropolitan city. They used self-administered questionnaires including the Nordic Musculoskeletal Questionnaire (Korea Occupational Safety and Health Agency, 2013), Korean Occupational Stress Scale-Short Form (Chang, 2004), Psychosocial Well-Being Index-Short Form (Chang, 2000), Pittsburg Sleep Quality Index (Buysee, Reynolds, Monk, Berman & Kupfer, 1999), and Beck-Depression Inventory-2 (Beck, Steer & Brown, 1996) and surveys for gathering biographic attributes as well as occupational factors. The output of the logistic regression showed that the incidence of sleep complaints was 48.7%. Shift work, musculoskeletal indications, and depression were related with sleep syndromes. Musculoskeletal signs, shift work, and depression were found to be related to sleep complaints. Lim et al. (2014) therefore recommended that integrated health management is required to support decent sleep quality in the lives of fire service workers.

When workers are given tasks that exceed their capabilities in the absence of needed resources, they are likely to use means that will result in repetitive injuries. Through a cross-sectional design, Azma, Hosseini, Safarian and Abedi (2015) for instance investigated the pervasiveness of musculoskeletal pains and work stress among a sample of one hundred and forty-four (144) in Iran and tested for a relationship between musculoskeletal pains and work-related stress factors. The Health and safety executive (HSE) job stress questionnaire (Cousins et al., 2004) and the Cornell musculoskeletal discomfort questionnaire (Hedge, Morimoto & McCrobie, 1999) were the measures employed. The correlation output demonstrated that factors like stress, job demands, control and changes exhibited significant relationship with disorders in certain parts of the body, typically the neck, shoulders, back and hip.

Also, Dirkzwager, Yzermans and Kessels (2004) examined the long term paths of mental, musculoskeletal, breathing complications and illness absenteeism among one thousand and thirty-six (1036) rescue workers in Netherlands. Data on health and sickness absence both pre and post the disaster were assessed from the electronic database of the rescue employees' professional doctors. Health complications were coded in line with the occupational medicine version of the International Classification of Diseases (ICD-10), an adapted version of the ICD-10 (Dirkzwager et al., 2004). From the output, after the disaster a prolonged escalation in mental, musculoskeletal and breathing complications were identified. Dirkzwager et al. (2004) identified that in relation to six months before the catastrophe, the normal period of illness absenteeism in the first six months after the catastrophe shot up from a low of (6.6) to (11.6) days, and dwindled gradually in the subsequent six month duration. According to Dirkzwager et al. (2004), rescue and emergency personnel engaged in a catastrophe are likely to feel consequent deficiency in work-related operations.

In a similar study, Lusa, Miranda, Luukkonen and Punakallio (2015) investigated the incidence of low back discomfort among some Finnish firefighters and in addition, examined if sleep instabilities cause associations of low back aching paths. A total of three hundred and sixty (360) actively employed fire service workers responded to the Nordic questionnaire for MSDS (Kuorinka et al., 1987) in 1996, 1999 and 2009. The outcome of the study according to Lusa et al. (2015) indicated that within the 13-year follow-up, the incidence of searing low back ache shot up from 16% to 29 % while the occurrences of confined low back discomfort increased from 28% to 40 %. The following courses were recognized: "pain free," "recovering," "new pain," "fluctuating" and "chronic." Above one-fifth of the respondents fitted within to the new aching

path as compared to the two pain kinds, 6 % of the subjects fitted within the protracted radiating whiles 12 % were of the protracted confined low back pain trajectory (Lusa et al., 2015). Again, participants who had sleep complications at baseline had a 2.4-fold risk of joining to the new pain or protracted radiating pain category matched to pain-free rescue workers.

In addition, Costa and Vieira (2008) scrutinized writings to shed light on the physiological impacts and significances of, and misunderstandings about, stretches adopted to minimize musculoskeletal conditions. A total of nine databases were appraised to recognize works that studied the helpfulness of stretching to averting job-associated musculoskeletal complications. Relevant studies were appraised based on the quality of their design and measured by means of the PEDro scale (Maher, Sherrington, Herbert, Moseley & Elkins, 2003). Costa and Vieira (2008) found that the functional influences of stretches could add to decreasing discomfort and ache. It was however found that if other measures were not available to mediate their sources again, stretches are likely to subdue responsiveness to threats, causing additional devastating damages. Costa and Vieira contend that if inefficiently executed, stretches can equally cause or exacerbate injuries and a careful evaluation and stretching program designs are needed prior to carrying out stretches. In addition, the seven studies assessing the efficiency of stretching to avoid musculoskeletal complaints among diverse profession were identified and analyzed. Costa and Vieira (2008) found mixed outcomes, but then again revealed some valuable influence of stretching in inhibiting job-linked musculoskeletal illnesses.

Moreover, in 1997, Westgaard and Winkel (1997) reviewed studies on ergonomic interventions with the goal of identifying efficient ergonomic interventions for better musculoskeletal conditions at work so as to outline recommendations for quality standards in ergonomic intervention research. In this effort, Westgaard and Winkel (1997) developed models to be used in the cataloguing of ergonomic intervention studies and to demonstrate the complications in deducing ergonomic intervention information. A two-fold process was used to select relevant literature. In the first place relevant literature were recognized through inclusion standards, then secondly, excellence benchmarks were carried out to identify studies of high standards for operational intervention. According to Westgaard and Winkel (1997), the interventions tended to be first of all “organizational culture” and then secondly “modifier interventions”. While “organizational culture” uses multiple interventions with enhanced stakeholder commitment in minimizing recognized risk factors, “modifier interventions” particularly centered on employees at risk through methods which keenly involve the person.

Again, Kea and Seo (2007) examined musculoskeletal disorders (MSDs) incidences among one hundred and two (102) Korean emergency workers. An adjusted self-reporting survey was adapted from the Nordic questionnaires to measure musculoskeletal complications. The survey was carried out within four periods, once every three months for one year. Musculoskeletal disorders were defined according to three measures; namely, frequency, duration and intensity indications. The Nordic questionnaires (Kuorinka et al., 1987) was used to measure musculoskeletal disorders. The findings indicated that the 12-month pervasiveness of MSDs in at least one location of the body by measure 1, 2 and 3 were 56.8%, 53.7% and 45.7%, correspondingly, while the shoulder appeared to be the most predisposed body part to MSDs, then the knee, lower back, hand or wrist,

neck, ankle or feet, finger, and then other areas of body. Further, Keea and Seo (2007) identified the wards in which respondents worked as the only statistically significant risk factor by running the X^2 test (testing the relationship between the developments of MSDs and demographic variables). From the output, the incidence of MSDs appeared to be the utmost complication in the intensive care unit, followed by the surgical ward, while the emergency unit recorded the lowest. When matched according to countries, Keea and Seo (2007) contend that pervasiveness of MSD in Korea tended to be much lesser than incidences in other nations like the United States, Sweden, Japan and other places. The authors therefore mentioned from their findings that when bearing in mind poor working situations and reduced awareness of MSDs equated to more developed states, the frequency of occurrence of MSDs are likely to rapidly increase in Korea in the time yet to come.

Furthermore, Smith, Mihashi, Adachi, Koga and Ishitake (2006) assessed musculoskeletal disorder (MSD) risk elements in a sample of eight hundred and forty-four (844) Asian nurses working in a teaching hospital. An adjusted Japanese-language form of the Standardized Nordic Questionnaire (Kuorinka et al., 1987) was used to measure musculoskeletal disorders among the nurses. Musculoskeletal disorder classifications centered on areas like the shoulder, upper back, neck, and lower back sections. The Japan simple statistical relations among demographic, place of work, and psychosocial attributes (for all MSD subdivisions) were at the start estimated with the help of a chi-square test for separate variables and one-way analysis of variance for constant variables (Smith et al., 2006). Risk elements were then and there evaluated at the same time using logistic regression and articulated as adjusted odds ratios (OR) with 95% confidence intervals (95% CI). In the study, MSD served as the outcome variable, while demographic characteristics, work

environment elements, and psychosocial factors acted as the explanatory variables. Constant variables like age, length of service, and weekly hours of working were estimated with cumulative increments of 1 year of age, 1 year of work, and 1 hour per week, respectively. The 12-month duration-incidence of MSD at any area of the body stood at 85.5%. It was gain found that MSD was most frequently felt at the shoulder (71.9%), second is lower back (71.3%), the neck (54.7%), and upper back (33.9%). Further, alcohol intake, tobacco smoking, and having kids appeared to be significant risk indicators, having adjusted Odds Ratios of 1.87 (95%CI: 1.17–2.96), 2.45 (95%CI: 1.43–4.35), and 2.53 (95%CI: 1.32–4.91), correspondingly (Smith et al., 2006). Among the workplace risk conditions identified by Smith et al. (2006) encompassed manually lifting sick people (OR: 2.07 to 11.97) and carrying out physically backbreaking tasks (OR: 2.09 to 2.76). In addition, nurses who experienced pre-menstrual strain were 1.66 and 1.94 times more probable to feel lower back and upper back MSD, in that order. Meanwhile Smith et al. (2006) found that high mental tension was also recognized as a significant risk factor for MSD of the neck and shoulder.

Moreover, Lee, Wilbur, Kim and Miller (2008) examined the associations among job-linked psychosocial influences and lower-back job-associated musculoskeletal conditions among some female workers. A cross-sectional, e-mailed survey was carried out in 2004 with participants based on job-associated psychosocial elements that comprised of mental work response, decision autonomy, communal support, work insecurity, and external environmental issues (Lee et al., 2008). Physical workload was explained according to overall laboriousness across 41 work tasks while a 4-point scale of strenuousness scale was used to measure it. Again, Lee et al. (2008) defined lower-back job-linked musculoskeletal complications as lower-back indications that happened at least once every month or lasted at least for a week in the previous year and triggered at least some

modest discomfort. According to Lee et al. (2008), participants who experienced lower back job-associated musculoskeletal complications, equated to respondents who did not experience lower-back job-associated musculoskeletal complications, had greater observed psychological workloads, work insecurity, and physical work burden. Lee et al. (2008) found that high job uncertainty suggestively augmented the danger for lower-back work-associated musculoskeletal complaints after controlling for physical workload and individual characteristics. This therefore gives the impression that emergency workers are supposed to be acquainted with the significance of evaluating the effect of both work tasks and job-linked psychosocial elements on lower-back job-linked musculoskeletal complications

2.2.4 WMSDs and task characteristics

Several studies have reported incidences of work-related musculoskeletal disorders among firefighters. Kim, Kim, Ryoo and Yoo (2013) for example examined the levels of work-related musculoskeletal disorders (WMSDs) among twenty one thousand, four hundred and sixty-six (21,466) Korean male fire service workers and also explained the effect of work stress on the incidences of WMSDs. In the study job stress features were measured through the usage of the short version of the Korean Occupational Stress Scale (KOSS-26) (Chang, 2004) whiles the work-related musculoskeletal disorders were assessed using the Korean NIOSH Symptom Survey (KOSAH, 2012). The outcome of the study seemed to suggest levels of WMSDs in nearly all male Korean fire service workers and to elucidate the impact of work stress on the incidence of WMSDs, of which spinal aching happened to be the commonest WMSDs. Kim et al. (2013) realized that among the work stress subgroup, physical environment, work demands, organizational structure, occupational climate, inadequate rewards and job insecurity had relationships with the

manifestation of WMSDs. Meanwhile, inadequate work control and relational conflict were not associated to the manifestation of WMSDs (Kim et al., 2013). Also work stress was correlated to the incidence of WMSDs among fire service personnel.

By using a stratified and random sampling, Cole, Ibrahim, and Shannon (2005) assessed factors that predicted work-related repetitive strain injuries using data from about twenty thousand (20,000) households in Canada. The focus of the study was on participants aged from 18-64 in 1994-1995, with paid jobs, responded furthermore to a shortened version of the job content questionnaire, and had not felt repetitive strain injuries prior to 2000-2001. The results indicated that sex (females), education, job insecurity, high levels of physical exertion, and high levels of psychological demands all had positive associations with work-related repetitive strain injuries.

In a related study, Park and Jang (2010) reviewed previous works that assessed the associations between upper extremity musculoskeletal disorders and psychosocial work factors, with the intention of suggesting possible factors that could influence this relationship. The review used articles that were based on the job demand-control-support model (Karasek, 1979; Karasek & Theorell, 1990). The study revealed that excessive shock in the upper limit was significantly attributed to less decision opportunity at work; work demands had a significant relationship with neck and shoulder complaints whereas control over time was related to neck complaints; and the addition of high demands and low decision opportunity significantly predicted shoulder and neck complaints among the female respondents. It was suggested that further studies need to be conducted to clarify the association between psychosocial factors and upper extremity musculoskeletal disorders and possibly work characteristics.

In Brazil, Fonseca and Fernandes (2010) identified factors that are related with musculoskeletal disorders among three hundred and eight (308) female workers. The study adopted a cross-sectional design and sampled respondents randomly. The job content questionnaire (Karasek, 1985) and the Nordic musculoskeletal questionnaire (Kuorinka et al., 1995) were used to measure work demands and work-related musculoskeletal disorders respectively. The multivariate output showed that work-related musculoskeletal complaints in neck, shoulder or upper back and the lower back had relationships with physical work demands (handling heavy materials, poor back position and repetitive tasks), psychosocial demands and hazardous physical fitness. Musculoskeletal complaints in distal upper parts were related to physical work demands (repetitive and energetic tasks) as well as number of years in service. The study pointed the necessity for intervention approaches by fitting in both the organizational elements of work and adaptations in the physical environment and in the characteristics of work assignments.

In the United States of America, Krause, Scherzer and Rugulies (2005) assessed the incidences of back and neck ache, and proceeded to examine how they relate to physical workload, ergonomic complaints, and growing work demands using nine hundred and forty-one (941) subjects. The logistic regression model indicated that occurrence of extreme bodily aches was 47% in general, 43%(neck), 59%(upper back) and 63%(low back pain). Respondents who fell within the uppermost exposure quartiles for physical workload and ergonomic complaints were 3.24-5.42 times more probable to report extreme aches than those in the lowermost quartile. Also adjusted odds ratios for work increase was between 1.74 (upper back) to 2.33 (neck).

2.2.5 WMSDs and Work experience

The relationship between work experience and WMSDs is still debatable. This is because, as some studies report of a significant relationship, others find no relationship. For instance, Shaik, Gotru, Swamy and Sandeep (2014) investigated the occurrence of musculoskeletal complaints and their association with probable risk elements among three hundred respondents (300). The Nordic musculoskeletal questionnaire (Kuorinka et al., 1995) was the main tool used to measure musculoskeletal complaints. Data was analyzed by way of logistic regression. The findings revealed that work experience and working hours per week were significantly associated with knee pains. None of the factors exhibited significant relationship with pains in the neck. In addition, working experience was significantly associated with ankle ache. In general, age and work experience portrayed significant positive relationships with overall musculoskeletal disorders.

Using data collected from October 2013-December 2013, Noroozi, Hajibabaei, Saki and Memari (2015) for example tested the pervasiveness of work-related musculoskeletal disorders among a sample of three hundred and ninety-two (392) through descriptive statistics, t-test and chi-square. The Nordic musculoskeletal questionnaire (Kuorinka et al., 1995) was used to measure the incidences of bodily complaints. Pains were mostly felt in the back area (51%), which prompted 18.9% of workers to absent themselves from daily activities. Further, the chi-square analysis also showed 36.7% neck complaints in respondents, which indicated significant relationship with work experience and age.

Aziz, Razali and Jaafar (2016) also investigated immediate conditions that impact low ergonomics danger attentiveness among a total of two hundred and forty-five (245) workers in Malaysia.

Multiple regression and moderated regression were used to analyse data. The output showed positive linear association between minimal ergonomic risk cognizance and wrong procedures and equipment, as well as tight work schedule. In other words, the higher unsuitable technique and equipment used, the lower their ergonomic risk consciousness. Similarly, the more tight work schedule is, the lower ergonomic risk consciousness. Also, the association between minimal ergonomic risk consciousness and unsuitable procedures and equipment is contingent on the age as well as level of education of the worker. Besides the association between minimal ergonomic risk consciousness and tight work schedule, repetitive injuries depend on the work experience and number of projects worker has taken part in.

On the contrary, other studies have reported of no significant relationship between work experience and WMSDs. In a related study, Amin, Nordin, Fatt, Noah and Oxley (2014) assessed the relationships between psychosocial job elements and the possibility of work-related musculoskeletal complaints among three hundred and seventy-six (376) workers in Malaysia using a cross-sectional survey and found no significant relationship. Multiple logistic regression was employed to calculate WMSDs, using the Job Strain Model's psychosocial risk factors. More than two thirds of the respondents felt pain or ache in at least one location of their body parts within the past year. The descriptive output showed that the neck was the most predominant part (48.94%), afterwards the feet (47.20%), then the upper back (40.69%) and the lower back (35.28%). Also, over 50% of the respondents reported of complications in region one (neck, shoulders and upper back) and region four (hips, knees, ankles, and feet). In addition, the study showed that psychological work demands, work strain and iso-strain ratio exhibited significant differences in their means between staff having WMSDs and those not having conditions. The univariate logistic

regression showed that all psychosocial risk elements demonstrated significant relationship with incidences of WMSDs in various body parts. The output of the multiple logistic regression expressed significant relationships between all psychosocial risk elements and WMSDs in various parts of the body apart from region 1 (neck, shoulders and upper back) and region 4 (hips, knees, ankles, and feet). Lastly, all demographic factors apart from number of years of work had statistically significant relationships with WMSDs. This finding contradicts with earlier reviews that found significant relationship between work experience and WMSDs.

2.3 Theoretical Review

The research adopts a conceptual framework because all the variables being studied have different underpinning theories. Therefore the adoption of a conceptual framework will better explain the interaction among the various variables.

2.3.1 Task characteristics theory

The way in which work is organized and tasks are performed are determined by a host of factors. However, the concept of task characteristics appears to be detailed in Hackman and Oldham's (1975) job characteristics model. Hackman and Oldham submit that employees who acquire the vital psychological states of meaningfulness of work, experience responsibility for work outcomes, and awareness of the actual results of work activities would be highly intrinsically motivated, perform better, have enhanced job satisfaction, and will be less absent from work often than those who do not experience such psychological states.

The authors further proposed that the three psychological states can be achieved by ensuring that the work environment is designed with the following five core characteristics or dimensions in

mind: (a) skill variety – the extent to which the job provides workers with opportunities to use different skills or talents; (b) task identity – the extent to which workers feel as though they complete a whole, identifiable product; (c) task significance – the extent to which work performed impacts other people in a substantial way; (d) autonomy – the extent to which the job offers workers the freedom to determine work schedules or procedures; and (e) feedback- the extent to which workers are informed about their level of work effectiveness (Hackman & Oldham, 1980).

The dimensions of skill variety, task identity, and task significance combine to elicit the critical psychological state of experienced meaningfulness of the work. Autonomy elicits the state of experienced responsibility or control, and feedback leads to experiencing knowledge of the results of one’s work efforts. Ultimately, designing work with the core dimensions in mind lead to workers experiencing the critical psychological states which, in turn, leads to the positive work outcomes described above.

2.3.2 Work demands theories

Work demand has been identified to be linked with emergency workers. One of the well-known theories underpinning work demand is the job-demand resource concept. According to Bakker and Demerouti (2007) and Demerouti, Bakker, Nachreiner and Schaufeli (2001), both “job demands and job resources” tend to be two categories of working conditions existent in the settings of all establishments. As a component of the job-demand resource model, Bakker and Demerouti (2007) identified the physical, psychological, social, or organizational elements of one’s work that necessitates sustained physical, cognitive, or responsive exertion or abilities and are as a result linked with physiological and/or psychological costs as attributes associated with work demands.

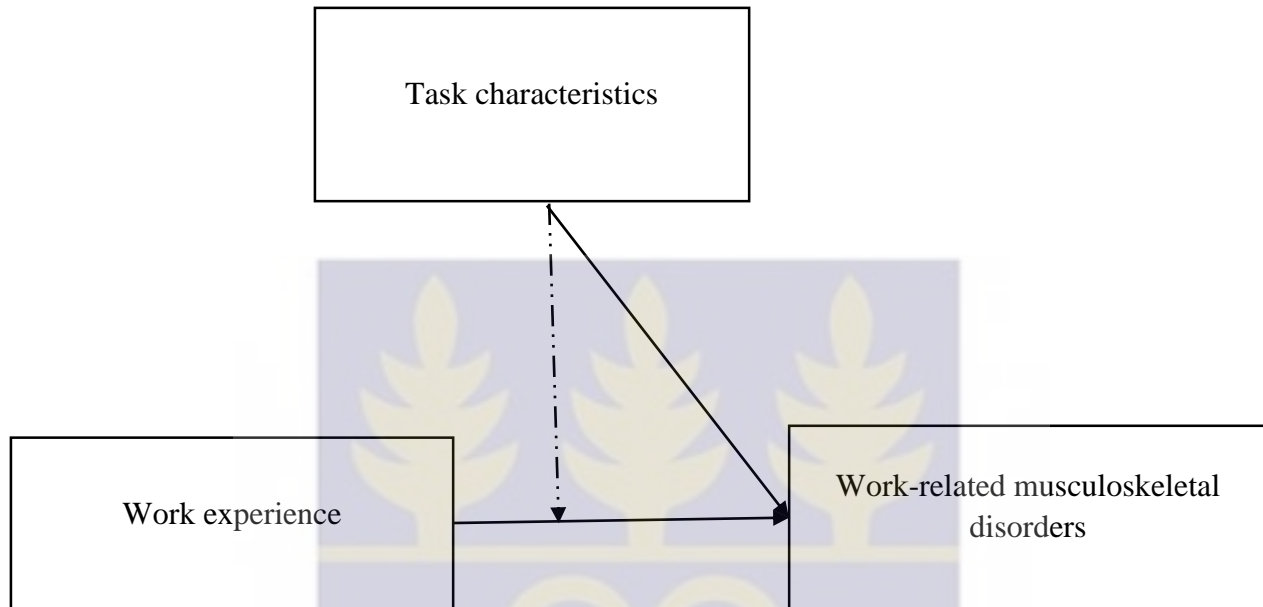
Again, Fredrickson (2001) formulated the Broaden-and-Build (BaB) theory to explain the theoretical linkage between work outcomes and work ability. In the view of Fredrickson, positive emotions deepens the thought action inventories of individuals, improves their individual long-term resources and subsequently results in enhanced wellness (Ouweneel, Le Blanc, Schaufeli, & Van Wijhe, 2012). As such, on the basis of the BaB theory, the dynamic nature of tasks performed by firefighters can be considered to build health-associated resources, like work demands

The review of the above theories suggest an interplay of relationships among the various constructs (task characteristics, work stress, work demand, work experience and WMSDs). For example the task characteristics of firefighters can result in their experience of work stress and WMSDs. Nonetheless, task characteristics has been found to influence a host of organizational and worker characteristics on one side and health and organizational outcomes on the other side (Schaufeli & Bakker, 2004). For instance task characteristics influences work demand and work stress, working experience and work stress, work experience and WMSDs and work demand and WMSDs. Firefighters whose tasks have much variety or autonomy will experience lesser levels of work stress and WMSDs than those with highly monotonous and unpredicted tasks. Both internal and external factors to firefighters affect their stress levels and development of WMSDs. External factors are outside of the work context, for instance family, whiles the internal factors are inside the work context, such as task characteristics. Specifically, work characteristics like the degree of uncertainty, exposure to human loss, interpersonal tension, shift work, overloading, under loading, and traumatic incidents are considered as causes of stress and WMSDs among emergency workers. For instance firefighters who are exposed to more deaths, have heavy workloads and have no control over their shifts will experience heightened stress and WMSDs.

Again, the work demands of a firefighter can influence his or her experience of stress or development of WMSDs. Firefighters whose works are extremely demanding and require much exertion will definitely experience high levels of stress than those with less demanding assignments. For instance operational firefighters who go to put off fires, rescue injured victims and come across dead bodies will experience higher stress levels than other white color workers. Similarly firefighters who exert so much physical energies (like standing for long hours, lifting heavy equipment and working from heights) in their works are likely to develop pains in their joints, tendons and other parts of the body.

Lastly, the experience of various negative health and diminishing job outcomes have been linked to the level of experience of workers. Firefighters with little or no firefighting experience will be more likely to experience high stress levels and WMSDs than their colleagues who are more experienced. Work experience appears to play a crucial role in the occurrences of stress and the development of WMSDs, because more experienced workers will have gone through stressful and demanding working conditions before and might have developed adaptability or coping mechanisms. In the emergency setting, work experience may either be described as the number of years in service or participation in particular kinds of serious emergencies. Therefore, it is presumed that as a firefighter works for more years, he or she gathers more experience and will exhibit more resilience to stress and WMSDs. Also, the more a firefighter participates in demanding tasks, the more the person gets acquainted to stressful situations. As such, fire service workers who have few years of work experience or have little exposure to horrific assignments are likely to experience high levels of work stress and WMSDs than colleagues with more number of years in firefighting and have been engaged in several demanding works.

2.4 Framework of the study



Note: ———→ = Main effect; - - - - -→ = Moderation effect

Figure 2.1: Study framework

From figure 2.1, task characteristics will affect WMSDs. It is presumed that the nature of tasks performed by firefighter can lead to their development of WMSDs. When the nature of tasks performed becomes flexible and has much variety, it will lead to mild WMSDs complaints and vice versa. Also work experience will affect WMSDs. It is held that workers' with high working experience will have lower levels of WMSDs as compared to low experienced workers. It is therefore assumed that firefighters' task characteristics and work experience will predict their development of WMSDs.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

This research employed a quantitative design. Typically, quantitative research methods are employed when a researcher seeks to carry out statistical analysis, involve many participants, or strive for precision and to generalize. Again, a quantitative research design establishes a causality among variables (Boateng, 2014). Also a cross-sectional survey approach was employed in this research. With cross-sectional research approach, data is being collected at one point in time (Neuman, 2007). In this study, questionnaires were administered to fire service personnel in the Greater Accra regional command of Ghana at one point in time.

3.2 Population of the study

A study population is the complete set of cases from which a representative sample can be selected. Although the study sought to investigate firefighters in Ghana, the objective population for the study comprised of firefighters in the Greater Accra regional command. The command has sixteen (16) fire stations and a total staff strength of one thousand three hundred and sixty-seven (1367).

3.3 Scope of the study

Although the research was conducted in the Ghana fire service, geographically, the scope of the study covered parts of the Greater Accra region. Within the Greater Accra region, the Greater Accra regional command was the specific jurisdiction where the research was carried out. The study involved all fire stations and firefighters in the command. Also, respondents were selected from all nine departments, namely; the Operations, Administration/finance, Logistics, Research

and monitoring, Safety, Legal, Rural fires, Technical services and Training and HR) and ranks ranging from the Chief Fire Officer to recruit fire officers. This is because, as a paramilitary institution, all actively employed firefighters are professionally trained to fight fire at any time and positions are also rotational.

3.4 Sampling

Sample is “a set of people or subjects chosen out of a bigger population for the purpose of representing the entire population” (Robson, 2002). Sampling is mostly important in research when it is impossible to study an entire population due to reasons such as limited budget, time and how urgent results are needed. Considering the research objective, limited time and resources, researcher acknowledged that it was impossible to study all fire stations and firefighters in the Greater Accra Region, therefore some fire stations and firefighters were selected to represent all fire stations and firefighters in the Region.

3.4.1 Sampling technique

The research employed a multistage sampling approach. While purposive sampling was employed to select the Greater Accra region due to the rampant fire outbreaks in the region, convenient sampling was used to select nine (9) fire stations due to time and resource constraints. By this technique, the first nine (9) fire stations that granted access were used. The stations that granted access were the Legon fire station, Madina fire station, Adenta fire station, Accra city fire station, the National head office, Greater Accra regional head office, Korle-Bu fire station, Industrial fire station and the Dansoman fire station. In addition, all respondents were conveniently

sampled, in that firefighters who were available and willing to answer the questionnaire were selected to form part of the study.

3.4.2 Sample frame and sample size

The sample frame for this research consists of all fire service workers working in the Greater Accra regional fire command of the Ghana National Fire Service. Krejcie and Morgan's (1970) sampling size determination table was employed in determining a representative sample size for the 1367 firefighters working in the Greater Accra Regional fire command.

Table 3.1 Sample size determination

Population	Number (N)	Population	Number (N)
10	10	500	217
100	80	1000	278
250	152	1367	320

Source: Krejcie & Morgan (1970)

Using Krejcie and Morgan's (1970) sample size determination table, considering a population of 1367, a sample size of 306 was deemed appropriate to represent the entire population. However 320 firefighters were sampled for the study. In anticipation of potential shortages in questionnaires returned, researcher administered a total of 350 questionnaires in order to enhance response rate, out of which 320 were used for the study.

3.5 Sources of Data

The study collected data from multiple sources. In most business researches, multiple methods of data collection are increasingly encouraged in situations where a single study can gather data from both primary and secondary sources (Denscombe, 2008). Questionnaire was used because it is

easy to administer as compared to interview. It also helped researcher to cover a wide range of respondents.

Data for this study was principally collected from a primary source. The primary data collection method adopted was a structured questionnaire which were administered to firefighters. Also information was obtained from sources such as journals articles, reports, textbooks, related dissertations and the internet.

3.5.1 Instrumentation

Existing psychometric scales were used to measure two of the study variables (task characteristics, and work-related musculoskeletal disorders) with the exception of work experience which was treated as a demographic variable. The questionnaire was made up of three sections. These three (3) sections were; demography, task characteristics and musculoskeletal disorders.

Section A was the demographic section and was made up of items like gender, age, rank, years of working and number of working hours. This section was designed by researcher based on the basic characteristics of fire fighters. Work experience was measured using number of years spent in the firefighting profession. Work experience was treated as a demographic variable and as such formed part of the demographic section. Work experience was measured using a 3-year equally spaced cut off point of: less than a year (Very low experience), 1-3 years (Low experience), 4-6 years (Moderate Experience), 7-9 years (High experience) and 10 years and above (Very high experience).

Section B consisted of items that measures task characteristics. Task characteristics was also measured using the adapted subscale of the Experience of Work and Life Circumstances

Questionnaire developed by (Van Zyl & Van der Walt, 1991). The task characteristics sub-scale comprises of statements that addressed the work characteristics of firefighters. The original sub-scale was made up of 14 items but was reduced to 11 items through expert opinion. Items under this section were rated on a 5-point Likert scale ranging from (1- very low, 2- Low, 3- Neutral, 4- High to 5- very high). The scale has a reliabilities ranging from 0.83 to 0.92 (Van Zyl & Van der Walt, 1991). The scale had items like “degree of uncertainty.”

Section C measured work-related musculoskeletal disorders. Measures of work-related musculoskeletal disorders (WMSDs) was adapted from the standardized Nordic questionnaire (Kuorinka et al., 1987). The Nordic questionnaire comprises of nine (9) body parts, joints and tendons. This scale sought to find out whether a firefighter had experienced pains, hurts or aches for the last 12 months in any of the nine (9) body parts (neck, shoulder, elbow, wrist, upper back, lower back, hip, knee, and ankle). Items for this measure were rated on a 5-point Likert scale (1- Very unlikely, 2- Unlikely, 3- Neutral, 4- Likely & 5- Very likely).

3.6 Validity and reliability

For every research to adequately measure a construct in focus there is the need for validity and reliability. To ensure content validity, measurement instruments used were validated through the expert opinion of lecturers’ in the Department of Organisation and Human Resource Management and the support from the Ghana national fire service. According to Thanasegaran (2009), reliability is the degree to which measures are free from error and therefore can yield consistent results. To ensure reliability, researcher conducted a pilot test using thirty (30) firefighters working at the University of Ghana fire station and verified through a Cronbach’s test (Nunnally & Bernstein,

1994). All factors had acceptable reliability values. The Cronbach's values are presented in table 3.2

Table 3.2 Cronbach's test of reliability for study variables

Variables	Original Cronbach value (α)	New Cronbach's value (α)
Task characteristics	0.83	0.72
WMSDs	-	0.92

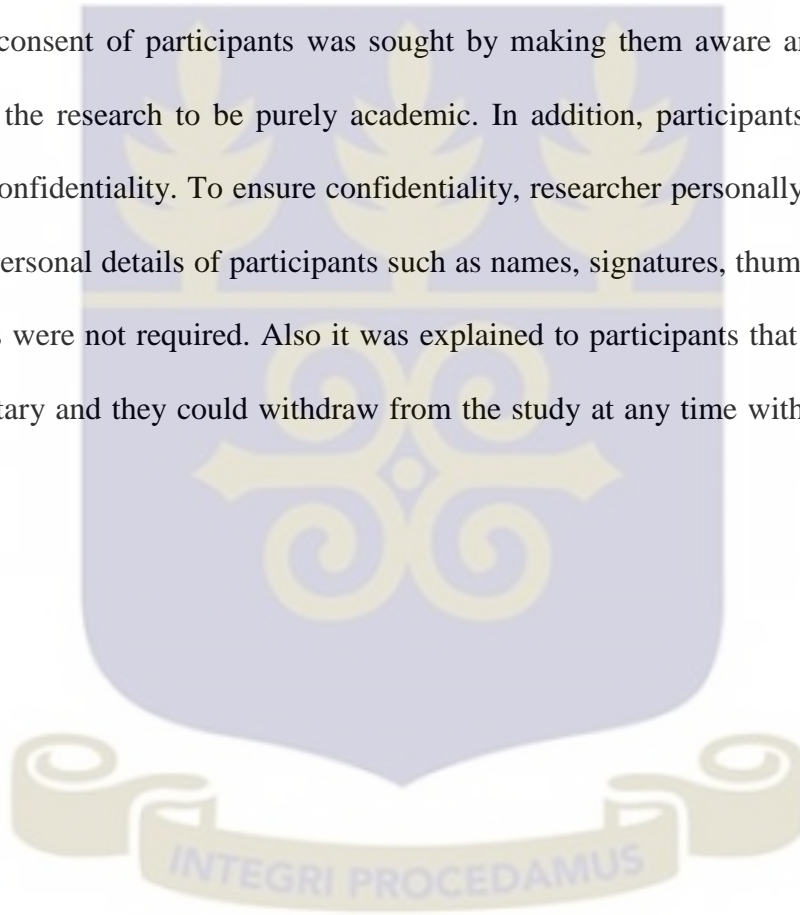
From table 3.2, the Cronbach's alpha values for the variables are as follow; task characteristics had ($\alpha= 0.72$) and work-related musculoskeletal disorders had ($\alpha= 0.92$). Nunnally (1967), asserts that a Cronbach alpha value above 0.70 is acceptable. Therefore, all the variable were considered reliable

3.7 Method of data analysis/statistical procedure

Data gathered was analyzed quantitatively. First, biography of respondents were analysed through descriptive statistics. Frequencies and percentages were used to describe patterns of respondents' demography. Secondly, a Pearson's correlation analysis was conducted to find out whether relationships existed among the various study variables. Thirdly, a hierarchical regression analysis was carried out to find out the causal effect of task characteristics and work experience on WMSDs. The trail version of the Statistical Package for Social Sciences (SPSS) version 22.0 was the main analytical tool employed to analyze the data.

3.8 Ethical Considerations

Every research must certify certain ethical issues, particularly with regards to participants (Creswell, Clark, Gutmann & Hanson, 2008). This study observed all ethical issues as such. First and foremost, two introductory letters from the Department of Organisation and Human Resource Management, University of Ghana Business School were addressed to the National Chief Fire Officer and the Greater Accra regional fire service commander respectively for authorization. Upon approval, consent of participants was sought by making them aware and explaining the rationale behind the research to be purely academic. In addition, participants were assured of anonymity and confidentiality. To ensure confidentiality, researcher personally administered the questionnaires. Personal details of participants such as names, signatures, thumbprints and social security numbers were not required. Also it was explained to participants that participation was absolutely voluntary and they could withdraw from the study at any time without conviction or resistance.



CHAPTER FOUR

DATA ANALYSIS AND DISCUSSIONS

A total of three hundred and fifty (350) questionnaires were administered. Out of this number, three hundred and twenty (320) questionnaires were valid and used for the final analysis, representing a response rate of 91.4%.

4.1 Analysis of respondents' demography

The following is a tabular representation of the demographic information of firefighters such as gender, age, rank, years of working and number of working hours per a day.

Table 4.1: Summary of respondents' demography

Details	Frequency	Percentage (%)
Gender		
Male	234	73.1
Female	86	26.9
Age		
18-24yrs	26	8.1
25-34yrs	104	32.5
35-44yrs	87	27.2
45-55yrs	90	28.1
Over 55yrs	13	4.1
Rank		
Recruit fireman/firewoman	16	5.0
Fireman/firewoman	99	30.9
Leading fire officer	46	14.4
CFO/DCFO/ACFO/DO/ADO	41	12.8
SO/GO/ASO/DGO/Sub O/AGO	118	36.9
Years of working		
Less than a year	3	0.9
1-3yrs	55	14.4
4-6yrs	46	17.2
7-9yrs	35	10.9
10yrs and above	181	56.6
Number of working hours		
Less than 5hrs	3	0.9
5-7hrs	21	6.6
8-10hrs	97	30.3
10-12hrs	18	5.6
Over 12hrs	181	56.6

From table 4.1 above, males were 234(73.1%), while females were 86(26.9%). This shows that the firefighting profession is dominated by males. In terms of age, 26(8.1%) were between 18-24 years, 104(32.5%) were between 25-34 years, 87(27.2%) were between 35-44 years, 90(28.1) were aged between 45-55 years and 13(4.1%) were over 50 years of age. This indicates that most of the respondents were youthful and aged between 25-34 years. With regards to ranks, 16(5%) were recruit firemen/firewomen, 99(30.9%) were firemen/firewomen, 46(14.4%) were leading fire officers, 118(36.9%) were within the ranks of station officer/group officer/assistant station officer/deputy group officer/sub officer/ assistant group officer and the remaining 41(12.8%) were Chief Fire officer/Deputy Chief Fire Officer/Assistant Chief Fire Officer/Divisional officers/Deputy divisional officers. This suggests that most respondents fall within the category of fighting fires. On the issue of number of years of working, 3(0.9%) had worked for less than a year, 46(14.4%) had worked for 1-3 years, 55(17.2%) had worked for 4-6years, 35(10.9%) had worked for 7-9 years and 181(56.6%) had worked for 10 years and above. The results indicate that majority of firefighters have more than 10 years of working experience. In terms of number of working hours, 3(0.9%) worked for less than 5 hours, 21(6.6%) worked for 5-7 hours, 97(30.3%) worked for 8-10 hours, 18(5.6%) worked for 10-12 hours, and 181(56.6%) worked for over 12 hours. This suggests that most firefighters work for more than 12 hours per day.

4.2 Analysis of relationships among study variables

To be able to identify the relationships among the various variables, a Pearson correlation test was conducted. The correlation estimates (r) are shown in table 4.2.

Table 4.2: Pearson correlation matrix for study variables

Variables	Mean	SD	1	2	3	4	5	6
1. Gender	1.27	0.44	1					
2. Age	2.88	1.04	-0.05	1				
			(0.38)					
3. WHs	4.10	1.10	-0.25**	-0.18**	1			
			(0.00)	(0.00)				
4. WE	4.08	1.18	-0.12*	0.64**	-0.04	1		
			(0.03)	(0.00)	(0.50)			
5. TC	38.68	6.42	-0.12*	0.16**	0.09	0.24**	1	
			(0.03)	(0.00)	(0.12)	(0.00)		
6. WMSDs	32.28	8.44	-0.06	0.05	-0.13*	-0.02	0.26**	1
			(0.29)	(0.42)	(0.03)	(0.72)	(0.00)	

**Correlation is significant at 0.01 level. Sig. (2-tailed). () = The probability estimates

Note: SD, Standard deviation; WHs, Working Hours; WE, Work experience; TC, Task characteristics; WMSDs, Work-related musculoskeletal disorders

In order to determine whether there are associations among study variables, a Pearson's correlation test was carried out. The correlation estimates are shown in table 4.2. It was found that work experience does not have a significant relationship with WMSDs ($r = -0.02$, $p > 0.05$). The results also indicate that task characteristics has a significant relationship with WMSDs ($r = 0.26$, $p < 0.01$). This result shows that task characteristics is related to WMSDs, and as the nature of

firefighters' tasks become challenging and unpredictable the chances of developing WMSDs also increases.

4.2.3 Control variables

In order to determine the actual effect of task characteristics and work experience on WMSDs, gender, age and working hours were used as control variables. Among the control variables, working hours was the one that had a significant negative relationship with WMSDs ($r = -0.13$, $p < 0.05$). This suggest that as working hours increase, WMSDs minimizes, which is quite surprising and contradictory to earlier studies (Mihashi et al., 2006) that found working hours to be positively related to incidences of WMSDs. This results may be due to the fact that firefighters who are assigned long hours of work are also given long breaks. The notion is that, as a firefighter is given more hours of work, the person is also given more hours of rest time. For example operational firefighter spend 24 hours at work and are also given 24h hours as off day. The correlation matrix in table 4.2 further shows that age and gender did not have any significant relationship with WMSDs. The correlation estimate between gender and WMSDs was not statistically significant ($r = -0.06$, $p > 0.05$). Also the correlation estimates between age and WMSDs was not statistically significant ($r = 0.05$, $p > 0.415$). These findings suggest that a firefighter's age or gender do not relate to their development of WMSDs. These findings contradict previous studies (Shaik et al., 2014; Smith et al., 2006) which reported a significant relationship between age and WMSDs.

4.3 Effect testing

In order to establish the extent of the relationship, hierarchical regression analyses were conducted.

The regression estimates are presented in table 4.3 and 4.4

4.3.1 Analysis of the effect of task characteristics on WMSDs

Objective one sought to find out how the task characteristics of firefighters will affect their development of WMSDs. Based on that the following hypothesis was proposed:

H₁: The task characteristics of firefighters will positively affect their development of WMSDs

In order to test the causal effect of task characteristics on WMSDs, a simple linear regression analysis was carried out. The regression estimates are presented in table 4.3.

Table 4.3: A hierarchical regression showing the effect of task characteristics on WMSDs

Step 1:	B	S.E	β	t	Sig.	R ²	ΔR^2
(Constant)	36.23	1.82	-	19.962	0.00	0.068	-
WHs	-0.96	0.43	-0.13	-2.25	0.03		
Step 2:							
(Constant)	23.08	3.125	-	7.39	0.00	0.090	0.074
WHs	-1.15	0.413	-0.15	-2.77	0.00		
TC	0.36	0.07	0.27	5.07	0.00		

Note: S E; Standard error, B; Unstandardized beta, β ; Standardized beta, Δ ; Change

From table 4.3, the regression coefficient of task characteristics indicates a significant positive effect on WMSDs ($\beta = 0.27$, $N = 320$, $p < 0.01$) after controlling for working hours. Working hours was entered in step one which had a significant negative effect on WMSDs ($\beta = -0.13$, $N = 320$, $p < 0.05$) and accounted for 6.8% ($R^2 = 0.068$) variance in WMSDs. Again, task characteristics explained 7.4% ($\Delta R^2 = 0.074$) of variance in WMSDs. The regression results had a beta (β) of 0.27 and a significance level of 0.00 which is below 0.05. This implies that a unit increase in the challenging and unpredictability nature of tasks performed by firefighters will lead to a 0.27 times increase in WMSDs, holding all other factors constant. These findings suggest that increase in the challenging nature of tasks carried out by firefighters lead to increased occurrences of WMSDs.

As such, firefighters with challenging and unpredictable task characteristics will experience increased incidences of WMSDs. These results support earlier findings by Kim et al. (2013) who found that among other things, physical environment, work demands, organizational structure and occupational climate to be related to WMSDs. The findings further support reports by Cole et al. (2005) who indicated that high levels of physical exertion and high levels of psychological demands all had positive associations with work-related repetitive strain injuries. The findings are also in line with Park and Jang's (2010) findings which reported that high demands and low decision opportunity significantly predicted shoulder and neck complaints among workers. Fonseca and Fernandes (2010) also found that neck, shoulder or upper back and the lower back had relationships with physical work demands (handling heavy materials, poor back position and repetitive tasks), psychosocial demands and hazardous physical fitness, which underscores the current findings. Therefore hypothesis (1) was supported.

4.3.2 Analysis and discussion of how firefighters' work experience will affect their WMSDs

In order to address objective two which sought to find out whether firefighters' work experience will positively affect their levels of WMSD, it was hypothesized that:

H₂: The work experience of firefighters will positively affect their levels of WMSDs

A hierarchical regression was then used to estimate the causal effect of work experience on WMSDs whiles controlling for working hours.

Table 4.4: A hierarchical regression showing the effect of work experience on WMSDs

Step 1:	B	S.E	β	t	Sig.	R ²	ΔR^2
(Constant)	36.23	1.82		19.96	0.00	0.02	
WHs	-0.96	0.43	-0.13*	-2.25	0.03		
Step 2:							
(Constant)	36.99	2.48		14.90	0.00	0.02	0.00
WHs	-0.97	0.43	-0.13*	-2.27	.02		
WE	-0.18	0.40	-0.03	-0.45	0.65		

From table 4.4, the regression coefficient of work experience is not statistically significant. In testing this hypothesis, the regression estimate between work experience and WMSDs was tested in table 4.4. In step 1, working hours was controlled for since it had a significant relationship with WMSDs in the correlation test. From the analysis, working hours has a significant negative effect on WMSDs ($\beta = -0.13$, $N = 320$, $p < 0.05$) and accounted for a significant variance of 0.2% ($R^2 = 0.02$) in WMSDs. Work experience was entered in the second step. The regression estimate between work experience and WMSDs was not significant. Therefore work experience has no significant effect on WMSDs ($\beta = -0.03$, $N = 320$, $p > 0.05$). In addition, work experience did not explain any variation in WMSDs 0% ($\Delta R^2 = 0.00$) as shown in step 2. These results imply that an increase or decrease in the work experience of firefighters does not affect their development of WMSDs. This result is inconsistent with the findings of Shaik et al. (2014) and Noroozi et al. (2015) who reported of a significant positive relationship between work experience and WMSDs.

These findings however buttress earlier studies by Amin et al. (2014) who reported that there is no significant relationship between work experience and WMSDs. Therefore Hypothesis (2) was not supported.

4.4 Test for moderation

In order to find out whether task characteristics could moderate the relationship between work experience and WMSDs, further analysis was conducted. It was therefore hypothesized that:

H₃: The task characteristics of firefighters will moderate the relationship between their work experience and WMSDs

To test for moderation, a hierarchical regression (Baron & Kenny, 1986) was carried out, where task characteristics was used to moderate between work experience and WMSDs. Both the predictor (work experience) and the moderator (task characteristics) were centered before creating their interactive term in order to minimize possible multicollinearity (Aiken & West, 1991).



Table 4.5: A hierarchical regression showing the moderating role of task characteristics on the relationship between work experience and WMSDs

Model 1	β	t	Sig.	F	Sig.	R ²	ΔR^2
(Constant)		19.96	.00	5.08	.03	.016	
WHs	-.13*	-2.25	.02				
Model 2							
(Constant)		14.90	0.00	0.20	0.65		.001
WHs	-0.13*	-2.27	0.02				
WE	-0.03	-0.45	0.65				
Model 3							
(Constant)		7.59	0.00	28.76	0.00		.082
WHs	-0.16**	-2.88	0.00				
WE	-0.10	-1.75	0.08				
TC	0.30**	5.36	0.00				
Model 4							
(Constant)		7.32	0.00	0.00	0.46		0.002
WHs	-0.16**	-2.93	0.00				
WE	-0.09	-1.61	0.11				
TC	0.30**	5.41	0.00				
Interaction term	0.04	.73	0.46				

Note: Δ = change.

From table 4.5, in model 1, working hours was entered first. Working hours was used as a control variable since it had a significant relationship with WMSDs in the correlation test. It accounted for a significant amount of variance in WMSDs ($R^2 = 0.016$, $\beta = -0.13$, $P < 0.05$). The beta (β) value of -0.13 and the significance level of 0.02 implies that working hours has a significant negative effect on WMSDs. Work experience was entered in the second model and did not account for a

significant variance in WMSDs ($\Delta R^2 = 0.001$, $\beta = -0.03$, $P > 0.05$). The change in R^2 of 0.001, beta (β) value of -0.03 and the significance level of 0.65 show that the work experience of firefighters does not significantly affect WMSDs. Task characteristics was entered in the third model and accounted for a significant variance in the model ($\Delta R^2 = 0.082$, $\beta = 0.30$, $P < 0.00$). The change in R^2 of 0.082, beta (β) value of 0.30 and the significance level of 0.00 show that the task characteristics of firefighters significantly affect their development of WMSDs. The interaction term between work experience and task characteristics was entered in model 4. This did not account for a significant variation in the model ($\Delta R^2 = 0.002$, $\beta = 0.04$, $P > 0.05$). The change in R^2 of 0.002, beta (β) value of 0.04 and the significance level of 0.46 show that the task characteristics of firefighters does not moderate the relationship between work experience and WMSDs. Therefore hypothesis (3) was not supported.

4.5 Revisiting the study framework

Prior to the analysis, a study framework was proposed in figure 2.1. In the framework, firefighters' task characteristics was proposed to affect their development of WMSDs. Based on the new findings, the conceptual framework is modified for understanding firefighters' task characteristics, work experience and their WMSDs in figure 4.1.

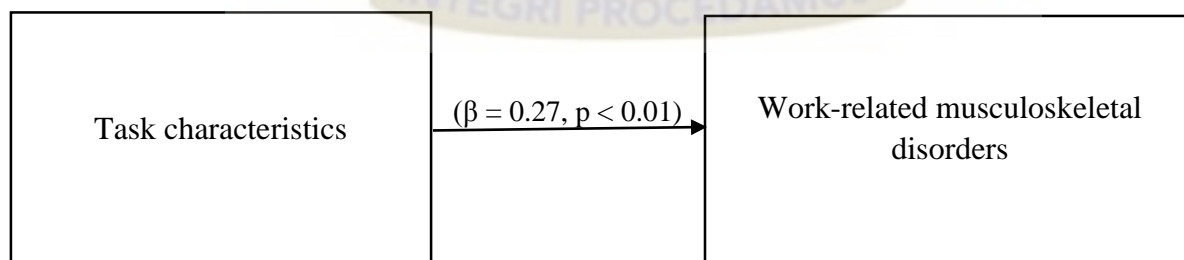
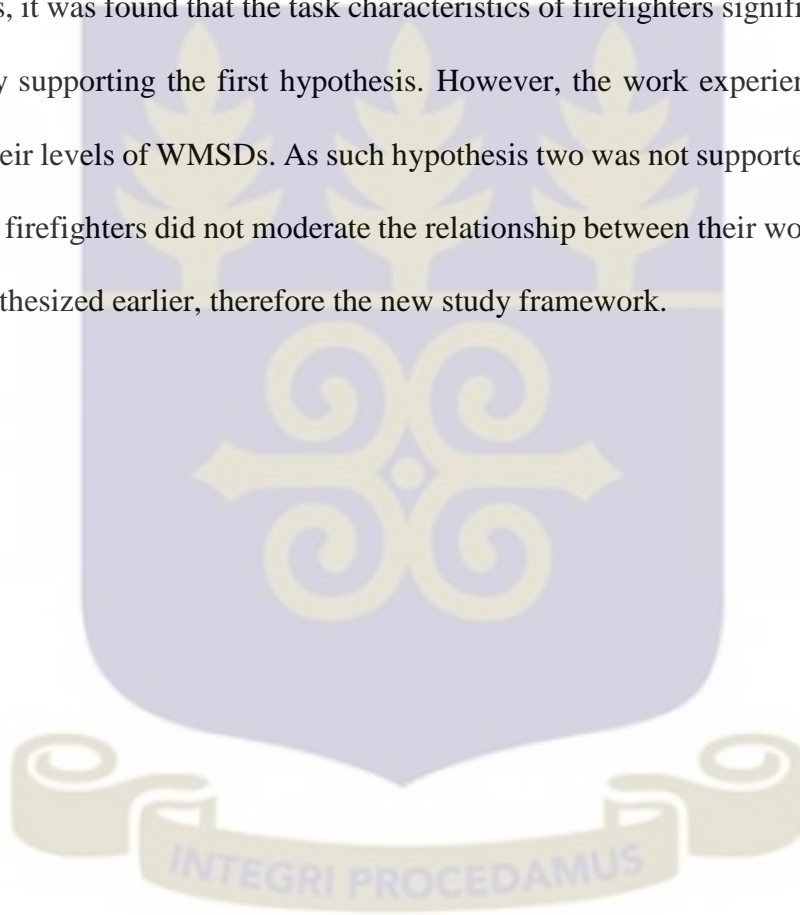


Figure 4.1: Framework after the relationships testing

Figure 4.1 presents the framework after the study. It was initially hypothesized that the task characteristics of firefighters will have as significant positive effect on their WMSDs. Again, it was hypothesized that the work experience of firefighters will have a significant positive effect on their levels of WMSDs. Lastly, it was hypothesized that the task characteristics of firefighters will moderate the relationship between their work experience and WMSDs.

After the analysis, it was found that the task characteristics of firefighters significantly affect their WMSDs, thereby supporting the first hypothesis. However, the work experience of firefighters does not affect their levels of WMSDs. As such hypothesis two was not supported. Again, the task characteristics of firefighters did not moderate the relationship between their work experience and WMSDs as hypothesized earlier, therefore the new study framework.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of findings

The main goal of the study was to assess the effect of firefighters' task characteristics and work experience on their development of WMSDs. As a result, the research tried to answer some research questions and test hypotheses in an effort to achieve the research objectives. The researcher adopted a cross-sectional survey design. A total of three hundred and twenty (320) firefighters were randomly selected to participate in the study. The following are the findings of the study.

5.1.1 The effect of firefighters' task characteristics on WMSDs

The first objective was to find out how firefighters' task characteristics affected their development of WMSDs. The findings showed that task characteristics had a significant positive effect on firefighters' development of WMSDs. This shows that, as task characteristics of firefighter become more challenging and unpredictable it will lead to high occurrences of WMSDs. These findings suggest that firefighters whose tasks are challenging and unpredicted will experience increased incidences of WMSDs.

5.1.2 The effect of firefighters' work experience on WMSDs

The second objective to find out whether firefighters' work experience affected their development of WMSDs showed that work experience had no significant effect on WMSDs. Therefore, work experience does not predict WMSDs. This implies that firefighters' development of WMSDs does

not depend on their levels of work experience. In other words, variations in work experience does not influence firefighters' development of WMSDs.

5.1.3 The moderating role of task characteristics between firefighters' work experience and WMSDs

The third objective to find out the moderating role of firefighters' task characteristics in the relationship between their work experience and WMSDs showed that task characteristics does not moderate the relationship between work experience and WMSDs. Therefore, the nature of tasks performed by firefighters do neither enhance nor minimize the way their work experience affects their development of WMSDs.

5.2 Conclusions

In conclusion, researcher tried to understand the effect of firefighters' task characteristics and work experience on their development of work-related musculoskeletal disorders. The following conclusions are made based on the findings of the study.

- The task of firefighting is very challenging and unpredictable. Therefore, it is concluded that the challenging and unpredictable nature of firefighters' work can lead to their development of musculoskeletal injuries.
- From the study, work experience and WMSDs are not related. Particularly, work experience does not affect the development of WMSDs. Hence it is concluded that firefighters' development of WMSDs does not depend on their level of experience in firefighting.

- Again, it was revealed that task characteristics does not moderate the relationship between firefighters' work experience and WMSDs. This implies that the nature of tasks performed by firefighters do neither enhance nor minimize how their level of experience affects their development of WMSDs.

5.3 Recommendations

In line with the findings of the study, the following were recommended:

- Since the task characteristics of firefighters is challenging and unpredictable, it is recommended that commanders should modify the nature of tasks performed by firefighters by introducing work dynamisms such as job sharing, teleworking and job rotation.
- Also, since the work of firefighters is challenging, it is recommended that the Human Resource and Recruitment Department of the Ghana National Fire Service need to consider the ability and stamina of potential firefighters during recruitment and selection
- Since work experience does not influence WMSDs, much emphasis should be put on regular education by station commanders within their various fire stations. Also, to minimize WMSDs, fire commanders need to consider the abilities of firefighters before assigning tasks to them. In addition, the needed equipment for fighting need to be provided by the management of the Ghana National Fire Service in order to minimize incidences of WMSDs.

APPENDIX

Appendix A

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RESEARCH QUESTIONNAIRE

Effect of Firefighters' Work Demands and Work Experience on their Experience of Work Stress and Development of Work-related Musculoskeletal Disorders: The Influence of Task Characteristics

Synopsis

This research is being undertaken to understand the influence of firefighters' work demands and work experience on work stress and their development of work-related musculoskeletal disorders as well as the contribution of their task characteristics on this influence in fire stations in Accra. The aim of this study is to provide an understanding into the relationship between work demands, work experience, work stress, work-related musculoskeletal disorders and task characteristics in selected fire stations in Accra, Ghana.

This study will thereby provide an understanding of how much work demands, work experience and task characteristics firefighters are faced with and how these can have an effect on their experience of stress and the development of work-related musculoskeletal disorders.

I would be very grateful if you could kindly spare me some of your time to answer these questions for me.

I undertake that information provided will be used for the purpose of this research only and will be treated anonymously.

Thank You.

Justice Kwabena Kodom-Wiredu

MPhil, Research Student

Contact: 0242810186/ 0502349629

E-mail: *wiredujustice@yahoo.com*

SECTION A
DEMOGRAPHY

Please kindly answer the following by ticking (✓) the appropriate answer of your choice.

1. Gender:

Male

Female

2. Age:

18-24years

25-34years

35-44years

45-55years

Over 55years

3. Rank:

Recruit fireman/woman

Fireman/woman

Leading fire officer

SO/GO/ASO/DGO/Sub O/AGO

CFO/DCFO/ACFO/DO/ADO

4. Number of years spent in the firefighting profession:

Less than a year

1-3 years

4-6 years

7-9 years

10years and above

5. Number of working hours in current position:

Less than 5hours

5-7hours

8 - 10hours

10-12hours

over 12 hours

SECTION B: Firefighters’ task characteristics

The following (11) items below give a description of the task characteristics of firefighters. Please kindly indicate your assessment of each item from 1- very low to 5- very high estimates for each point by ticking (✓) the appropriate answer of your choice.

Very Low	Low	Neutral	High	Very High
1	2	3	4	5

		1	2	3	4	5
Q29.	Degree of uncertainty	1	2	3	4	5
Q30.	Exposure to human loss	1	2	3	4	5
Q31.	Interpersonal tension	1	2	3	4	5
Q32.	Shift work	1	2	3	4	5
Q33.	Overloading/underloading	1	2	3	4	5
Q34.	Traumatic incidents	1	2	3	4	5
Q35.	Accountability for decisions taken under pressure	1	2	3	4	5
Q36.	Terrible sensory experiences	1	2	3	4	5
Q37.	Serious fires in which people are trapped	1	2	3	4	5
Q38.	The danger of injuries to and illness of firefighters	1	2	3	4	5
Q39.	Slow response time	1	2	3	4	5

SECTION C: Firefighters’ work-related musculoskeletal disorders

The following (8) items below describe nine (9) tendons, joints and body parts where firefighters feel pains, aches or hurt for the past 12 months. Please kindly indicate your assessment of each item from 1- very unlikely to 5- very likely estimates for each point by ticking (√) the appropriate answer of your choice.

Very Unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

		1	2	3	4	5
Q40.	Neck	1	2	3	4	5
Q41.	Shoulder	1	2	3	4	5
Q42.	Elbow	1	2	3	4	5
Q43.	Wrist/hands	1	2	3	4	5
Q44.	Upper back	1	2	3	4	5
Q45.	Lower back	1	2	3	4	5
Q46.	One or both hips/thighs	1	2	3	4	5
Q47.	One or both knees	1	2	3	4	5
Q48	Ankle	1	2	3	4	5

End of Survey

Thank you for taking out time off your busy schedule to complete this questionnaire!!!

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