

THE IMPACT OF SHIFT WORK ON FIREFIGHTERS

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of the Requirements for the
Executive Fire Officer Program

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Abstract

This study explored the impact of shift work on firefighters' well-being, rest/sleep patterns, job performance, and job satisfaction. Through semi-structured interviews with 15 firefighters from three different shift schedules, the study was conducted to answer three research questions: How do firefighters describe the impact of shift work on their overall well-being? What challenges do firefighters experience regarding sleep/rest due to shift work? How does shift work influence job performance and job satisfaction among firefighters? Thematic analysis of the collected data revealed advantages and disadvantages of shift work. While flexibility, opportunities for development and predictability in work schedules are advantages, challenges such as sleep deprivation, difficulty balancing work and personal life, and stress also occur. These challenges explored the impact of firefighters' overall job performance and satisfaction. Recommendations based on the study results include providing longer recovery periods between shifts, implementing open rest periods, and introducing employer-led sleep hygiene education programs. The study underscored the importance of addressing sleep-related challenges and promoting work-life balance to support firefighters' health and satisfaction in the fire service. Future research should focus on diverse departments and utilize mixed method approaches to comprehensively capture firefighters' experiences and outcomes, ultimately contributing to the enhancement of well-being and performance within the fire service.

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CHAPTER 1. INTRODUCTION

Filled with unique safety hazards, the business of firefighting has long been considered one of the most dangerous professions, placing firefighters' traits somewhere between Machiavellianism and risk-taking (Rosca et al., 2021). The fire service operates around the clock with no "closed for the holidays" period, leaving its members to work long shifts depending on the department. While shift work cannot be eliminated, shift work can be streamlined to better support its members. In this research study, members from various departments working an array of shift schedules were interviewed to explore the advantages and disadvantages of different work shifts.

Throughout history, the need for the fire service to adopt shift work grew out of the need for emergency workers to be available around the clock. As a result, shift work became the work cycle for those working in the industry. However, shift work in the fire service varies depending on the department and jurisdiction. Common shift schedules are 24/48-hour shifts requiring firefighters to work 24 hours on duty and have 48 off duty, 24/72-hour duty tours, and 24/48/24/96-hour duty tours, which have a wholly different set of off days. Firefighter shift schedules vary even more, such as the Fire Department of the City of New York (FDNY), which requires firefighters to work 2-day shifts from 9 a.m. to 6 p.m. and two off-duty shifts consecutively. Firefighters then return for 2-night tours from 6 p.m. to 9 a.m. having three days off before returning for the day shift tours (Breen, 2020).

In a quantitative study conducted by Frost (2021), it was found that shift schedules exceeding 12 hours within a minimum 40-hour work week resulted in firefighters experiencing increased injuries and decreased performance. These injuries and decreased performances were linked to the lack of sleep firefighters receive during a shift due to the irregular sleep patterns

firefighters experience. However, additional research is needed to determine how this plays a part with firefighters on a national scale.

Despite the benefits of shift work in the fire service, the business of firefighting brings inherent dangers. Many of these dangers are obvious and known to firefighters and the community, but one danger is often overlooked in the fire service. This is the health implications brought on by shift work over time. Shift work has been known to cause sleep deprivation (Lin et al, 2022), which can exacerbate obstructive sleep apnea, and lead to cardiovascular diseases, impairment in memory, and constant fatigue. Although these issues are often faced in shift work, research is needed to explore what changes in lifestyle can assist and mitigate these common, inevitable consequences of shift work and sleep deprivation. This study explored the challenges associated with shift work and identified ways of assisting firefighters working in this capacity. The advantages of different shift work schedules were also explored, to identify what should be kept in place to keep a happy and healthy workforce.

Background

Shift work for firefighters began in the 19th Century. During this time, fire departments were mostly composed of single men who resided at the firehouse. As the 20th Century emerged, the need for additional firefighters became apparent, which meant the construction of additional firehouses. This brought in men with different backgrounds and those with families, which created what is known today as shift work. Shift work is established in the fire service to allow firefighters time off from the station for family, activities, and rest.

Shift work for firefighters in most departments means that they are on shift and at the fire station for an average of a 24-hour tour. The duties of first responders require them to be alert and responsive to answer the call for help. This means that while firefighters have an

opportunity to sleep overnight, they must also be alert when an emergency call is dispatched. Going from steady sleep to being ready to respond at a moment's notice has been found to cause numerous health issues including insomnia, obstructive sleep apnea, and cardiovascular disease topping the list (Billings, 2022).

Shift work in general poses a challenge throughout the fire service industry due to the impact on its workers. Chin et al. (2023) conducted a cross-sectional study of 154 Northern California career firefighters. The authors discovered that nearly 75% of these participants experienced sleep disturbances. The common denominator seemed to be that job stress was greatly associated with high over-commitment and high effort. They concluded that because of the job stress findings, there is a significant need to address reducing job stress to improve sleep quality by designing interventions that directly address promoting health (Chin et al., 2023).

It is important to note that the fire service is on a path of continuous growth, and the associated health risks are also on the rise (Watkins et al, 2022). Failure to promptly address these issues could lead to situations in which the fire industry faces challenges, including having a workforce plagued by health problems and struggling to attract new recruits due to the hazards faced by personnel. The nature of the service prevents the firefighting industry from becoming obsolete or tolerating staffing shortages. The capacity to promptly react and respond to emergencies remains a fundamental prerequisite in the qualifications and requirements for the job (Cuenca-Lozano & Garcia, 2023). Research is needed to address the current issues faced as a result of shift work in the fire service.

Significance of the Study

The significance of this study was to explore the advantages and disadvantages of working the various shift cycles and that a shift cycle and how it can have a lesser negative

impact on firefighters' sleep hygiene resulting in obstructive sleep disorder. There are health and well-being implications. Shift work, especially night shifts, has been linked to various health issues, such as sleep disturbances, cardiovascular problems, and an increased risk of certain chronic conditions.

Understanding the specific impact of shift work on firefighters can help in developing targeted interventions to improve their health and well-being. In addition to health, the impact of job performance and safety is also a factor. Firefighting is a physically demanding and high-risk job that requires alertness and quick decision-making. The effects of shift work on fatigue and cognitive function can directly impact job performance and safety. Identifying how different shift patterns affect performance can guide the development of optimal schedules to enhance safety for both firefighters and the public.

This study will also bring an understanding to work-life balance. Shift work can disrupt work-life balance, affecting relationships, family life, and overall job satisfaction. Understanding the challenges that shift work presents for firefighters can inform policies and practices that support their work-life balance, ultimately improving retention and job satisfaction.

Recruitment and retention have become a challenge across the nation. Fire departments often face challenges in recruiting and retaining qualified and experienced personnel. Understanding the impact of shift work on firefighters' job satisfaction and turnover can inform strategies to make the profession more attractive and sustainable for employees.

This research can also lead to policy and scheduling decisions. Research on the advantages and disadvantages of shift work for firefighters can provide data-driven insights for policy and scheduling decisions. This includes determining the most effective shift patterns to minimize the negative health effects while maintaining operations efficiency and safety.

In totality, this also has an economic impact on the fire service as a whole. The economic impact of shift work-related health issues, absenteeism, and turnover can be substantial for fire departments. Studying shift work for firefighters can lead to cost-effective solutions by reducing healthcare costs, improving productivity, and minimizing the need for recruitment and training for new personnel.

Overall, this study will contribute to a broader understanding. Firefighters are one of the many groups of shift workers in various industries. Research on the advantages and disadvantages of shift work for firefighters can contribute to a broader understanding of shift work effects on different occupations, potentially creating best practices across sectors.

In this qualitative study, members from various departments throughout the fire service who work 24/48-hour shifts, 48/96-hour shifts, and 10/14-hour shifts were interviewed to explore the advantages and disadvantages of the various shift schedules utilized by the fire service. One objective was to determine what advantages and disadvantages exist for firefighters in different departments and which shift cycle firefighters rate their well-being as healthy. Another factor is how their shift cycle, age, gender, and existing health comorbidities adversely affect the individuals working longer or shorter shifts.

Research has shown that not only is the health of first responders adversely affected when working long hours but there are also other negative implications, such as providing poor patient care and safety. While shift work may never be eliminated, learning how shift work impacts individuals could lead to a change in the fire service. This can possibly be accomplished by adjusting shift hours/days to a schedule more conducive to firefighter health and wellness.

Problem Statement

The problem addressed by this study is that shift work is necessary for firefighters but can have negative impacts on the health and well-being of firefighters over time. This study addresses the impact of shift work on firefighters' health and well-being. Firefighters often work long shifts, which has been linked to various health issues that can affect their ability to perform their duties safely and effectively. The study aims to understand the perspectives of firefighters on shift work and explore whether alternative shift schedules could improve their health and well-being. There are several impacts that affect the organization and community as well as the need for financial, cultural, and ethical considerations.

The past impacts include the need for firefighters to provide around-the-clock emergency services to their communities. However, these long shifts can lead to health problems such as obstructive sleep apnea (OSA), insomnia, restless leg syndrome, narcolepsy, excessive daytime sleepiness (EDS) and shift work disorder (SWD). With OSA being a high prevalence (80%) among first responders, there is also the associated serious comorbidities such as depression, anxiety, cardiovascular disease, diabetes mellitus, post-traumatic stress disorder (PTSD), and gastrointestinal reflux disorder.

What presently impacts this problem are the health-related deaths due to sudden cardiac arrest, stroke, and other unspecified medical issues. The 2022 National Fire Protection Association (NFPA) report indicated 96 deaths among firefighters on duty, with 51% due to overexertion and stress and 15% due to vehicular accidents. The high rate of health issues and fatalities points to the urgency of addressing shift work's impact on firefighters.

The probable future impacts lead to the purpose of the study. If the impact of shift work on firefighters' health is not addressed, it may lead to more fatalities, reduced effectiveness, and

increased medical costs. The negative health effects could lead to higher attrition rates and difficulties in recruitment and retention of firefighters, affecting the organization's ability to serve the community.

With these impacts come financial, cultural, and ethical considerations. Financially, health issues and fatalities result in higher medical costs and possible insurance liabilities for organizations. Finding a more suitable shift schedule could reduce these costs and improve productivity.

Culturally speaking, within the fire service there is a culture that often emphasizes toughness and dedication. This culture often leads to reluctance to report health issues or express concerns regarding shift work. Changing shifts might require adjustment to existing practices and norms. However, there exists an ethical responsibility to protect firefighters' health and well-being, ensuring they have a safe working environment and the support they need to maintain their health. Research can help identify whether certain shifts are more conducive to the health and well-being of firefighters and whether demographic factors play a role in how shift work affects different groups.

Purpose Statement

The purpose of this research was to explore the perceived advantages and disadvantages of three shift work schedules in the fire service with a focus on sleep health, job performance, and job satisfaction. The results from this study can contribute to an increased understanding of the impacts on the overall negative health caused by shift work in the fire service. According to the 21st Century White paper by the Center for Public Safety Excellence (CPSE) (2020), research on the health impacts specific to the fire and emergency services to evaluate the health risks of

long consecutive hours worked, sleep disruption, and impacts on employee health must be examined.

While sleep deprivation and obstructive sleep apnea are key factors to firefighter health, the need to evaluate the benefits of recovery times and other strategies within the fire service is necessary for improving sleep hygiene, fatigue, cognitive function, and psychomotor reaction in firefighters, and ultimately safety. The results from this study can lead to the development of recommendations for helping to alleviate some of the issues faced with shift work. This study focused on exploring these challenges across departments that work different shifts to provide these recommendations.

Research Questions

According to Creswell and Creswell (2018), utilizing qualitative research is ideal for research that is taken from multiple sources, including observations, interviews, documents, and audiovisual sources. The following research questions were developed to guide the study:

RQ1: How do firefighters describe the impact of shift work on their overall well-being?

RQ2: What challenges, if any, do firefighters experience regarding sleep/rest because of shift work?

RQ3: How does shift work impact job performance and job satisfaction among firefighters?

Summary

Shift work has both advantages and disadvantages for active-duty firefighters across the fire service. Despite its perceived benefits, shift work poses many health risks including but not limited to cardiovascular disease, fatigue, performance issues, and sleep disorders. As the fire service faces continuous growth, it must address the need to assess how shift work impacts

health risks to avoid a scenario in which the industry as a whole struggle with a workforce that is already plagued with recruitment challenges and health issues.

The significance of this study is to ascertain how various shift cycles impact firefighters' sleep hygiene and overall well-being. It comes down to two factors – longer hours with a longer recovery time and shorter tours of duty with shorter recovery times. While the benefits can vary from having the extra time off to work another job or time to spend with family, the disadvantage of sleep deprivation and obstructive sleep apnea plays an important role in their overall health.

Nevertheless, engaging in shift work presents inherent risks. Firefighters must be at the fire station for a 24-hour tour, allowing them to sleep overnight but necessitating immediate response when an alert is received. This abrupt transition from deep sleep to urgent action has been linked to various health concerns, with obstructive sleep apnea and cardiovascular being particularly prevalent. The research examined the importance of providing educational awareness to firefighters to improve the negative impact of sleep deprivation resulting from shift work and what measures they can take to improve sleep quality.

CHAPTER 2: LITERATURE REVIEW

Introduction

Firefighters experience occupational stressors and inherent dangers, including extensive exposure to trauma, a demanding work environment, and shift work leading to long working hours often resulting in sleep disorders, post-traumatic stress disorder, fatigue, and various comorbidities (Sundberg & Millis, 2023). These disorders are further exacerbated by varying shift rotation schedules ranging anywhere from working 24 hours to 48 hours during a single tour. The goal of this study is to explore the advantages and disadvantages of working a variation of tours with longer off-shift hours allowing for an extended recovery time.

A commonality in current research is the discovery of several negative impacts on a firefighter's health and the need for interventions. Though firefighters sleep during their shifts, they are still required to readily respond and perform their duties at a moment's notice subjecting them to regular cycles of disrupted sleep which leads to chronic bouts of sleep disorders including sleep deprivation, insomnia, and other adverse health responses (Stout et al., 2021). Sleep deprivation and insomnia alone lead to a host of other adverse health issues as well as job performance issues (Gerstner et al., 2022, Nowak & Lukomska, 2021). While research has led to several intervention suggestions such as sleep hygiene education (Jang et al, 2020), further studies are required to determine the effectiveness of those suggestions (Nowak & Lukomska, 2021).

The scholarly literature on the effects of shift work in the fire service provides valuable insights into the causes and potential solutions for sleep deficits and associated health challenges among firefighters. By incorporating practitioner and scholarly literature, this review contributes to a better understanding of the complexities surrounding a few of the disadvantages known in

shift work such as sleep deprivation and its implications for firefighter well-being and job performance. A better understanding of the need for additional research is also obtained through research of scholarly and practitioner literature.

Existing Literature

Multiple databases were used to collect relevant articles specific to this research including Google Scholar, EBSCO, PubMed, Science.gov, Semantic Scholar, and CORE. To target specific information for this research, the following keywords were applied: firefighter, paramedic, first responders, EMTs, emergency medical technicians AND shift work, incidence, prevalence, epidemiology, probability, number, rates, shift work disorder, AND sleep disorders, insomnia, sleep apnea, sleep deprivation, shift wake disorder, excessive sleepiness, sleep behavior disorder AND comorbidities, depression, posttraumatic stress disorder) PTSD, anxiety, AND suicide.

The literature review focused on concerns surrounding the advantages and disadvantages of shift work. Firefighters face unique challenges due to their shift work schedules, unpredictable call volumes, and exposure to stressful situations. This review synthesizes existing research with a focus on scholarly literature to shed light on the impact of sleep, alarming rates of suicide, and associated comorbidities among firefighters.

Kling et al. (2022) conducted a qualitative study to determine how firefighters define their well-being. Data was collected by interviewing career firefighters from multiple departments. The study objective was to understand how firefighters define well-being and what factors at the organization and worker level affect their views. According to the participants, they defined well-being as having a balance of mental, emotional, and physical health which

provides an overall contentment with themselves. This study will add to the knowledge of firefighter's well-being and relationship with their shift schedule.

The overarching purpose of this study is to explore the impact of different shifts on the well-being of firefighters by identifying successes, challenges, and recommendations for improvement. From there, data from this research will identify several other subcategories such as station and coworker culture, supervisory roles on practices and attitudes, being reliable, having to compartmentalize and balance home and work managing trauma, and sleep deprivation. If firefighters view their well-being as a connection to one particular shift schedule, then the fire service as a whole should consider a shift schedule more conducive to the health of its members which allows them to perform better for their stakeholders.

Sleep deprivation, insomnia, and obstructive sleep apnea are common factors in poor health and well-being of those who participate in shift work, particularly in the case where fire service workers work more than 12 hours in a 40-hour work week. According to a systematic review conducted by Jones (2017), fatigue, cognitive impairment, poor concentration, decreased alertness, mood disorders, and overall poor quality of life for first responders resulted from sleep deprivations caused by disturbances in sleep patterns. Another study also revealed that even more so, demographic factors such as age, gender, education, environment, mental disposition, marital status, etc., as well as occupational factors such as type of work, support from peers, work schedules, etc. also played a major part in the study (Huang et al, 2022).

In a 2022 study of 35 firefighters spanning ages, years of service, and gender, a correlation between repeated bouts of shift work greatly influenced reaction time and rapid strength in career firefighters (Gerstner et al, 2022). Although there may be some advantages to shift work such as allowing time with family and more, there is a need to provide interventions

that could reduce the effects of work-related fatigue caused by sleep deprivation. Addressing the risks associated with shift work could drastically reduce the number of falls or other musculoskeletal injuries (Gerstner et al, 2022).

In this qualitative study, members from various departments throughout the fire service who work 24/48-hour shifts, 48/96-hour shifts, and 24/72-hour shifts were interviewed to explore the advantages and disadvantages of the various shift schedules utilized by the fire service. One objective was to determine what advantages and disadvantages exist for firefighters in different departments and which shift cycle firefighters rate their well-being as healthy. Another factor is how their shift cycle, age, gender, and existing health comorbidities adversely affect the individuals working longer or shorter shifts (Watkins et al, 2022).

Research has shown that not only is the health of first responders adversely affected when working long hours but there are also other negative implications, such as providing poor patient care and safety (Nena et al, 2018). While shift work may never be eliminated, learning how shift work impacts individuals could lead to a change in the fire service. This can possibly be accomplished by adjusting shift hours/days to a schedule more conducive to firefighter health and wellness (Watkins et al, 2022).

Practitioner literature, such as a study by Billings et al. (2022), highlights the intra-tour variation of firefighter sleep cycles. Their findings reveal that firefighters consistently operate in a sleep deficit, which can significantly impact job performance and overall well-being. Similarly, Pennington et. al (2021) conducted an epidemiologic study focusing on suicide among firefighters, revealing higher rates of post-traumatic stress disorder (PTSD) diagnosis compared to those, not in the fire service. This practitioner literature underscores the urgent

need for further research and interventions to address sleep deficits and associated mental health challenges among firefighters.

Sleep Deprivation Among Firefighters

Scholarly literature provides deeper insights into the underlying causes and potential interventions for sleep deprivation and associated comorbidities among firefighters. Redeker et al. (2019) proposed employer-initiated interventions to improve sleep habits, resulting in positive outcomes such as increased productivity and reduced absenteeism. Similarly, Huang (2022) highlighted the prevalence of sleep deprivation among firefighters due to irregular work hours and exposure to stress, emphasizing the need for tailored interventions.

Sleep is a biological function vital to human physical, neural, and cognitive development. Lack of such leads to poor health and sleep quality, which promotes depression, anxiety, post-traumatic stress disorder, diabetes, cardiovascular disease, and gastroesophageal reflux disorder. Working a longer cycle (48 hours) also allows for longer sleep, however, the question is if working longer puts the firefighter at a greater risk for other health complications (Cuenca-Lozano & Garcia, 2023).

Stout et al. (2021) and Marvin et al. (2023) emphasized the detrimental effects of sleep deprivation on cognitive and physical performance and safety behavior among firefighters. These studies underscore the importance of developing interventions to enhance both sleep quantity and quality to mitigate performance deficits and reduce risks of injury. Although this study does not intend to seek or provide recommendations for interventions, the interventions that have been proposed in the literature will guide in identifying whether or not the participants are currently engaging in these interventions.

Hilditch (2019) discusses the effectiveness of sleep education programs in improving sleep hygiene practices among shift workers, including firefighters. Additionally, Jang et al. (2020) introduce the FIT-In study, which tailors sleep interventions specifically to the needs of firefighters involving the development process to ensure cultural sensitivity and effectiveness.

Synthesis of the Existing Literature

The study of the advantages and disadvantages of shift work for firefighters is significant in terms of health and well-being, job performance and safety, and work-life balance.

Researching how shift work impacts firefighters' health, including sleep disturbances and cardiovascular problems, can inform targeted interventions to improve their overall well-being. Additionally, understanding the relationship between shift work, fatigue, and cognitive function can guide the development of optimal schedules to enhance safety for both firefighters and the public.

The study also has implications for retention and recruitment, as well as policy and scheduling decisions. Insights into how shift work affects job satisfaction and turnover can help develop strategies to make the profession more attractive and sustainable. Data-driven insights can guide decisions regarding shift patterns and scheduling to minimize negative health effects and maintain operational efficiency. Additionally, studying the economic impact of shift work, such as healthcare costs and absenteeism, can lead to cost-effective solutions and improved productivity. This research contributes to a broader understanding of shift work's effects on different occupational groups and may inform best practices across various sectors.

Billings et al. (2022) conducted a study on the intra-tour variation of firefighter sleep cycles within a 24/48-hour tour and a 48/96-hour tour. They concluded that firefighters arrived to work in a sleep deficit, performed their job functions in a sleep deficit, and returned home in a

sleep deficit. Pennington et al. (2021) conducted an epidemiologic study of suicide among firefighters from 2003 to 2017. Utilizing data from the National Violent Death Reporting System, they analyzed and compared the risk factors and sociodemographics between non-firefighters and firefighters' deaths. The results were that firefighters were more likely to be diagnosed with post-traumatic stress disorder as compared to the non-firefighter group.

Most of the firefighters who suffer from sleep deficit or suicidal ideations had either a health or relationship issue before their death. It is reported that firefighters are three times more prone to die of suicide than in the line of duty (Pennington et al., 2021). Based on this statistic alone, there is a need to conduct further research into the impact of the varying shifts in the fire service.

Improving Sleep Patterns

Redeker et al. (2019) address specific interventions employers could initiate to improve sleep, thus increasing productivity, reducing absenteeism, improving overall health, and other conditions associated with sleep deficiency disorders. The results of the study suggested that by encouraging better sleep habits, the employees reported improvements in sleep-related outcomes (Redeker et al., 2019). The sleep patterns of firefighters have become a critical area of concern due to their unpredictable call volumes, and demanding shift work schedules, potentially leading to negative health outcomes such as cardiovascular disease, sleep deprivation, insomnia, obstructive sleep apnea, depression/anxiety, and post-traumatic stress disorder (Billings et al., 2022).

Huang's (2022) research highlighted the prevalence of sleep deprivation/insomnia among firefighters, attributed to irregular work hours and exposure to stressful situations. Shift work has been linked to various psychological and physical issues among first responders including sleep disorders. The result of their study underscored the need for interventions tailored to the unique

challenges faced by this occupational group. Redeker et al. (2022) suggested that incorporating the fire service in efforts to improve sleep will also improve sleep-related outcomes in what they term candidate workplace strategies to promote sleep health.

Studies have demonstrated a clear link between sleep deprivation and impaired cognitive and physical performance in firefighters. These findings emphasized the importance of developing interventions that improve sleep quantity and enhance sleep quality to mitigate these performance deficits (Stout et al, 2021). Marvin et al. (2023) conducted a study that also concluded sleep deprivation compromised safety behavior and injuries and suggested that both an objective and subjective assessment of firefighter fatigue is necessary for understanding risk management for emergency first responders.

Some occupational settings have implemented sleep education programs to raise awareness about the importance of sleep hygiene and provide strategies for improving sleep patterns. Interventions focusing on sleep hygiene practices, such as maintaining a consistent sleep schedule and creating a conducive sleep environment, have been effective in improving sleep quality among shift workers in various professions (Hilditch, 2019). One Korean study proposed a novel intervention. The FIT-IN study introduces a novel approach by tailoring sleep interventions specifically to the needs of firefighters (Jang et al., 2020). Understanding the unique challenges of their profession, such as shift work and exposure to critical incidents, the intervention aims to provide practical strategies for optimizing sleep duration and quality thereby reducing comorbidities and improving job function.

Unlike many previous studies, the FIT-IN study conducted actively involves the firefighter community in the development process. This collaborative approach ensures that the intervention is culturally sensitive and addresses the specific concerns and preferences of

firefighters. The development of a sleep intervention for firefighters, as outlined in the FIT-IN study, is a crucial step toward addressing the sleep-related challenges faced by this occupational group. By building on existing research on sleep interventions and tailoring strategies to the unique needs of firefighters, the FIT-IN study offers a promising approach to improving the overall well-being and performance of firefighters through enhanced sleep (Jang et al., 2020).

The findings from this study contributed valuable insights into the circumstances and demographic patterns involving firefighter suicides. The results from the data in this article are vital in providing a foundation for targeting preventative measures while highlighting the need for continuous research in this area of concern. The alarming rise in suicide rates alone among firefighters has sparked concern within the public health community. This literature review aims to synthesize existing research on sleep deprivation, the comorbidities, and the epidemiology of suicide among firefighters, with a specific focus on the findings presented in one article.

Summary

While further research has been recommended, the purpose of this study is to investigate the benefits and drawbacks of shift work within the fire service through a series of interview questions from members within the fire service. In collecting information on the impact of different shift schedules, it is important to recognize the common issues arising from shift rotation. To ascertain the advantages and disadvantages of different shift schedules will provide some indication as to whether these various sleep cycles allow firefighters to receive the proper rest required for recovery to perform adequately without deficits the next shift. Existing literature reveals a scarcity of research on effective interventions, emphasizing the need for further exploration.

CHAPTER 3: METHODOLOGY

Research Design

This research study was conducted to explore how shift work impacts the well-being of firefighters, with the goal of fostering a healthier and more resilient firefighting workforce. While the fire service is filled with unique safety hazards, recognizing how shift work impacts the lifestyle and health of its members is a means to improving how the fire service functions as a whole. Historically, the fire service has primarily functioned 24/7 without any break for holidays, placing a heavy burden on its employees who endure strenuous shifts. It is crucial to examine the work-sleep-work cycle to determine if firefighters believe that they receive or obtain adequate rest between each work cycle.

A qualitative method was used for this study. Three methods could have been utilized for this research: qualitative, quantitative, or mixed methods. For this specific study and the timeframe in which it was conducted, the quantitative and mixed method approach was not most appropriate. Quantitative research is based on numbers and closed-ended questions, while the mixed method approach lies in the middle of the other two research designs and incorporates elements from both (Creswell & Creswell, 2018, p. 653). Because this particular research project is based on collecting data involving the lived experiences of firefighters and the impact of shift work to their well-being, neither of these approaches was an appropriate method for this study.

The qualitative approach was most suitable because this method is designed for exploring and understanding group and individual perspectives, particularly in addressing human or social issues and lived experiences (Adeoye-Olatunde & Olenik, 2021). Given the aim to explore how different shifts impact sleep, job performance, and job satisfaction among members of the fire service, the qualitative method was ideal for delving into the advantages and disadvantages of

shift work which has been proven to be the underlying perceived causes of sleep deprivation and fatigue among fire service workers. While these things are indeed a major disadvantage to shift work, there are perceived benefits that come along with the challenges of different shift work schedules, and the strategies that are used to mitigate certain challenges play a major part in a firefighter's job performance and satisfaction.

The generic qualitative inquiry design is appropriate to explore the lived experiences of participants while minimizing constraints or potential interviewers' biases (Ruslin et al., 2022). Generic qualitative inquiry design was utilized because it is a broad and flexible approach to qualitative research without being constrained by a specific theoretical framework or method. This design allows for a variety of qualitative research methods and techniques to be used, enabling the researcher to adapt to the research questions and study context (Percy et al., 2021).

By focusing on themes and patterns that emerged from the data, rather than predetermined categories, this exploratory approach aimed to gain a deep understanding of how shift work impacts firefighters. The generic qualitative inquiry design proved particularly useful in exploring complex or novel instances where traditional theories or frameworks were not sufficient due to a lack of research. As a result, this particular approach captured the depth and richness of qualitative data to inform a nuanced understanding of the research topic (Addoye-Olatunde & Olenik, 2021).

As such, open-ended interview questions were developed to allow participants to share their lived experiences regarding shift work, sleep, and job performance and satisfaction. Focusing on a firefighter's current shift, the aim was to capture current experiences and their lifestyle activities following a shift cycle. Their perception of the advantages and

disadvantages of their current shift should provide some indication as to how they view the impact of shift work.

Population and Sample Size

A purposive sampling of full-time active-duty firefighters from three cities were chosen for this study, beginning the interview process with participants from the Atlanta Fire Rescue Department (AFRD), then Ocean City Fire Department, and finally Pittsburgh Fire Department. To be eligible for inclusion, participants were required to have at least one year of full-time active service (in-station) experience. Fifteen participants were interviewed in total. The goal was set at 5 participants from a 24/48-hour shift, 5 from a 24/72-hour shift, and 5 from a 24/48/24/96 schedule.

The population of the three cities - Atlanta, Georgia, Pittsburgh, Pennsylvania, and Ocean City, New Jersey - varies in size of active members. Atlanta and Pittsburgh are relatively close in the size of the workforce, with Ocean City having the least. In addition to having one year of experience, these members' inclusion criteria are that this time be in the station, preferably at a busy company. The fire chiefs were advised that members working a 40-hour work week could not be included.

Instrument

Adeoye-Olatunde and Olenik (2021) suggested the most appropriate process for collecting data consisted of utilizing a semi-structured interview process with open-ended interview questions designed to sample the lived experience of fire service members working on multiple work schedules of interest. A total of 18 interview questions were created to target the goal of the research. Upon completing the interview guide, a field test of the questions was conducted. This field test was conducted by having three individuals review the questions. All

three individuals have terminal degrees and extensive experience in qualitative research. The interview guide was revised based on the results of the field test. The following interview guide was used to collect data from participants:

1. What is your current shift work schedule?
 - a. What other shifts, if any, have you worked on?
2. How would you describe your activity level in the first 24 hours following your shift?
3. How does shift work impact your time and interactions with family, friends, and/or colleagues?
4. How would you describe your sleep pattern while on shift?
 - a. How does this differ from when you are not on shift?
5. What do you consider to be the benefits of your current work shift?
6. What do you consider to be the challenges of your current work shift?
7. How does shift work impact your time off shift?
8. How would you describe your typical workday on shift regarding activity and energy level?
9. How would you describe the average call volume at your station?
 - a. How does this impact your sleep while on shift?
10. If you could choose, what would be your ideal work shift/schedule?
11. What work shift/schedule would you least prefer?
12. What steps do you take to get adequate sleep/rest while on shift?
13. What steps do you take to get adequate sleep/rest while off shift?
14. How long, if at all, does it take you to recover in terms of sleep/rest after your shift has ended?

15. What, if anything, do you do to help recover in terms of sleep/rest after your shift has ended?
16. How does your current work shift impact your job satisfaction?
17. Would your current work shift ever influence your decision to consider leaving your department/fire service? Why or why not?
18. What information would you add that hasn't been asked pertaining to the advantages/disadvantages of shift work?

Research Process

To complete this project, three departments representing three common shifts in the fire service were selected - Atlanta Fire Rescue, Pittsburgh Fire Department, and Ocean City Fire Department. An email was sent to each fire chief to include the name of the researcher, the reason for choosing their department, permission to conduct the study, and what was required to participate in the study. Utilizing a non-probability sample selection technique such as self-selection, each fire chief was requested to provide the names and email addresses of members from their department, who fit the inclusion criteria, for a selection of 5 of their members to be chosen by the interviewer.

Once the fifteen participants were purposefully selected, an email confirmation was received stating that they were interested in participating in the study on the effects of shift work in the fire service. The purpose of the study was clearly stated, emphasizing the importance of understanding the impact of shift work on firefighters' well-being. Interested parties were then sent an informed consent form to sign and return prior to the interview.

Upon the participant returning the informed consent form, each identified participant received a follow-up confirmation email restating the purpose of the study, the estimated length

of time for the interview, along with a request to submit their off-duty availability Monday through Friday from 8:00 am to 5:00 pm EST. They were provided three options for scheduling a 30-minute interview via Zoom, encouraging participants to choose days when they were not on active duty to minimize disruptions to their work schedule.

At the beginning of the interview, information that was collected was basic demographic and occupational information (age range, marital status, years of service, current shift worked, past shift worked). The interview questions focused on their current shift work schedules and how shift work plays a part in their day-to-day life outside of their employment, the perceived benefits, and downsides of different shift work schedules on sleep hygiene, job performance, and job satisfaction. The data being collected was for the purpose of ascertaining how well members described their ability to recover following their assignment work shift hours. However, the main focus was to gather information on their view of the benefits and challenges of shift work in the fire service.

Ruslin et al. (2022) described the interviews to be between the interviewer and interviewee as a conversation and as such that conversation started with Question 1 from the previously referenced interview guide and the participant was allowed to speak freely. Each interview was recorded and transcribed through Zoom® (Version 5.17.10). The recordings were transcribed verbatim through Google Docs.

During the one-on-one interviews, participants were asked the same questions and allowed to answer freely without prompt. These questions not only asked for personal opinions of shift work but also allowed the participant to provide a comprehensive examination of the existing challenges posed by irregular work schedules and sleep disturbances, as well as the development of evidence-based strategies to optimize shift patterns, improve the quality of sleep,

and enhance the overall safety of and performance of the fire service. The direction and shape of this study were guided by the narratives provided by the participants.

At the time interviews were conducted with the Atlanta Fire Rescue Department, a working relationship was in place with most participants. Although this was the case, it did not hinder the participant from sharing reliable information from their viewpoint. All interviews were recorded with the participant's consent and transcribed for analysis. All interviews were transcribed using JVC Communications, a transcription service.

The data from the interviews was processed and organized to identify recurring patterns and themes by way of a thematic analysis (Creswell & Creswell, 2018, p 309). The goal was to contribute to creating a supportive and sustainable work environment that prioritizes the health and readiness of firefighters to ensure their ability to respond effectively and efficiently to emergencies while minimizing the long-term inherent health risks associated with the profession. The interview questions not only asked for personal opinions of shift work but allowed the participant to provide a comprehensive examination of the existing advantages or challenges posed by irregular work schedules and sleep disturbances, as well as the development of evidence-based strategies to optimize shift patterns, improve the quality of sleep, and enhance the overall safety of and performance of the fire service.

Data was collected using the qualitative method. In-depth interviews were conducted to explore the lived experiences of firefighters regarding shift work and sleep disorders. Data was collected from three fire departments with different shift work hours. The overall selection of participants were members from three different departments who work 24/48-hour shifts, 24/72-hour shifts, and 24/48/24/96-hour shifts were interviewed. Research questions had the opportunity to delve into their benefits or issues regarding shift work. Specifically, this research

utilized one-on-one semi-structured interviews with open-ended questions to elicit individual responses to the key questions of this research program (Creswell & Creswell, 2018, p. 3).

Data for this research was collected utilizing a video and voice recording through Zoom®. The participants were notified that they would be recorded, and a copy was available upon their request. The Zoom® platform was deemed to be reliable due to its ability to pull verbiage as it was stated and provide transcripts for each session. The transcription was completed via Google Docs ®.

Qualitative analysis analyzes recurring themes and patterns in qualitative data. The information collected is used to contextualize qualitative data. Percy et al (2021) suggested that theoretical data analysis should be applied to this study due to the predetermined themes/categories. In this analysis, the following steps were adhered to: data collection, data organization, data reduction, data display, data interpretation, conclusion drawing, verification, and reporting. The results of the research had the possibility of new information deriving as a result of the project (Creswell & Creswell, 2018, p. 308).

According to the process outlined by Percy et al. (2015), the data collected was individually analyzed, and the developed patterns were organized and separated. More specifically, the first step was reviewing and becoming familiar with the information provided during the interview by the first participant. The next step in the process was to determine what, if any, information coincided with any of the research questions, and the information was highlighted accordingly.

Any data that was not related to the research question was then removed and placed in a separate file for non-related data to be stored in the event there is use for it in the future. All data was assembled, placed into sets, and named. Any data determined to be related was placed in a

cluster to identify any patterns within. Once the process was concluded with the first interviewee, all others being interviewed were subjected to an identical process (Percy et al., 2015).

Similarly, each individual's data that was reviewed and analyzed was also compared and contrasted with the data previously analyzed. To maintain uniformity throughout the process, all corresponding data that aligned with a specific pattern or theme was separated and from the transcribed interviews, direct quotes were included to further identify potential patterns with the participants and any overarching themes. Specifically, data was organized into themes according to the related patterns. A detailed analysis was written to describe the substance and scope of each theme identified. Quotes from the data were utilized to support each pattern. Lastly, to form the composite synthesis, the data was synthesized by question (Percy et al., 2015).

These qualitative data analysis techniques were employed to identify common themes, patterns, and insights related to the effects of shift work on firefighters. Findings from the interviews were interpreted in the context of existing literature on shift work and its impacts (Adeoye-Olatunde & Olenik, 2021). Conclusions were drawn regarding the specific benefits and challenges of shift work in the fire service. In accordance with the requirements of the National Fire Academy, this data will be retained for a period of four years from the completion of the study and then destroyed.

Ethical Considerations

Before beginning any interviews, permission was granted by the respective Fire Chief to do so. To ensure that ethical procedures were followed, informed consent was collected from all participants before scheduling them for an interview. In the interview, each participant was asked

if they approved of being recorded. The purpose of the recording was thoroughly explained, and participants could end the interview at any time (Bhandari, 2021).

Ensuring ethical standards and participant safety in research involving human subjects was paramount for maintaining trust, respect, and integrity within the scientific community and society as a whole. The ethical considerations that were held are extensive, and they are reflected through the research process (Creswell & Creswell, 2018 p.90). This study made a concerted effort to comply with all ethical standards and guidelines while conducting research involving human participants. The study adhered rigorously to the regulations that govern human subject research. These guidelines require principles such as confidentiality, informed consent, protection of privacy, and measures to reduce potential harm to its participants. By adhering to these guidelines, the study aimed to ensure that the participants were treated respectfully and ethically throughout the research process.

Any potential conflicts of interest were disclosed to maintain transparency and thoroughly justified. Conflicts of interest can arise from various sources, such as personal and/or professional relationships, which may influence the research process or outcomes. By disclosing and justifying any conflicts of interest, the study aimed to maintain transparency and credibility in its findings.

Additionally, the study implemented strict privacy protocols to safeguard the confidentiality of participants. Privacy protocols included measures such as secure storage, data encryption, and restricted access to sensitive information. By adhering to these protocols, the study aimed to protect the privacy rights of participants and prevent unauthorized access to their personal information. Proactive measures were taken to minimize bias to ensure there was integrity in the research findings. To achieve this, the study employed rigorous research

methodologies, data collection procedures that were transparent, and utilized techniques for systematic data analysis.

Participant safety was a major priority throughout this research process. Measures were implemented to not cause undue harm or risks as a result of participating in the study, including providing informed consent and ensuring adequate information about the nature and the purpose of the study was provided. This study demonstrated a solid commitment to ethical conduct, the safety of its participants, and research integrity (Creswell & Creswell, 2018, p 329).

Summary

The research project focused on identifying how shift work impacts firefighters by exploring the advantages and disadvantages of different shift schedules. The ultimate goal of the research was to foster a healthier and more resilient firefighting workforce. Qualitative research methods, one-on-one semi-structured interviews in particular, were used to elicit individual responses to the key questions of the research program. The study aimed to examine the work-sleep-work cycle to determine if adequate rest is obtained between each work cycle.

The process of collecting this data was done utilizing a generic qualitative inquiry design. This was done by conducting one-on-one interviews with firefighters who work various shifts. The intent was to discover any advantages and disadvantages of shift work in the fire service. The results of these interviews assisted with an evaluation of what seems to be the best option for shift work in the fire service. Although shift work is needed in the fire service, discovering the best schedule for a healthier force is optimal.

CHAPTER 4: STUDY RESULTS

Introduction- Demographics of the Participants

Research exploring the advantages and disadvantages of shift work in the fire service was done by conducting qualitative interviews. For information to be relevant, firefighters who work different shifts had to be interviewed. Participants were purposefully selected from three departments that work different shift schedules: 24/48-hour shifts, 48/96-hour shifts, and 24/72-hour shifts were interviewed.

A total of 15 participants were selected and asked questions pertaining to their viewpoint on the impacts of shift work in the fire service. The participants were 12 males and 3 females. 12 participants were Caucasian, 3 African American, ages 21-55, with a range of tenure on the job 4- 20 years and more.

After the semi-structured interviews were concluded, common themes were discovered that will be discussed later in the chapter. The goal of conducting this research was to answer the research questions for shift work in the fire service. The following research questions were answered through structured interview questions:

RQ1: How do firefighters describe the impact of shift work on their overall well-being?

RQ2: What challenges, if any, do firefighters experience regarding sleep/rest because of shift work?

RQ3: How does shift work impact job performance and job satisfaction among firefighters?

Research Results

While exploring the advantages and disadvantages of shift work in the fire service, the data collected through qualitative interviews were analyzed using thematic analysis. This was conducted to identify key themes that are associated with each of the following perspectives. As

a result of the analysis, several themes emerged regarding the advantages and disadvantages of shift work. These themes also revealed a commonality within each specified shift, which will be discussed further.

From the data collected, what emerged were six themes in order of most discussed to least for the participants: a) Family time, b) predictability, c) recovery time from stress and fatigue, d) sleep deprivation, e) flexibility, and f) opportunity. The overarching themes are separated and identified by the research questions. The first research question has two themes centered around family time and predictability. The second research question's common themes were recovery time and sleep deprivation. The third research question's main themes were flexibility and opportunity. While opportunity referred to the potential for personal and professional development, flexibility, according to the participants, afforded the ability to allocate time for personal errands and tasks. Out of the six themes, predictability was discussed by the participants repeatedly as valuable in that having a consistent work schedule facilitated planning for personal activities and commitments.

However, despite these benefits to shift work, the disadvantages of shift work were also characterized by distinct themes, in which three themes emerged. These were missed family time, the need for time to recover from the shift hours, and sleep deprivation. An overwhelming majority of the participants noted that it is the demanding nature of shift work that resulted in missing out on valuable time with family, friends, and colleagues. This same demand also necessitated adequate recovery time to maintain mental and physical well-being. The most common theme and concern was sleep deprivation which was attributed to the irregular work hours causing disruption to natural sleep patterns, leading to fatigue and other potential health issues.

Theme #1: Family Time

This addresses question 1. An overarching theme that 14 out of 15 participants included as a disadvantage was missing family events and an inability to be active enough to engage with their spouses and children. P10 stated,

“When you have kids, being away as you leave your spouse or your partner to fend for themselves for 24 hours you know. You can’t do anything other than maybe talk to the kids on the phone to get them straightened out. That’s the tough part.”

Another participant (P2) remarks,

“Sometimes 24-hour shifts you miss things, but the shifts we work afford a good amount of time off, so actually my wife was a teacher so whatever the kids were actually my wife was a teacher. And whenever the kids were in school, she was in school, so I was able to attend a lot of school events and all that kind of stuff.”

Theme #2: Predictability

This addresses research question 1. Being able to plan is a major advantage of shift work, and 13 out of the 15 participants stated what they enjoy about shift work. P7 stated that being on a 24/48-hour shift schedule, he can plan events because “the structured nature of the shift pattern, particularly the 24/48 schedule, was seen as advantageous for planning personal events.” Another participant (P1) states being a husband and father of three children under the age seven, the advantage is that out of the three shifts that he’s previously worked including his current schedule, he prefers his current shift. He states,

“Now that I am a father of three young kids that are very energetic and have a wife, it’s a lot easier when you have four days off in a row to be able to plan for things to do, things with the family such as planning a getaway”.

Having a set schedule makes it easier to plan things ahead of time, which seems to lure individuals into this field.

Theme #3: Recovery Time from Stress and Fatigue

This addresses research question 2. A key factor with shift work is the time it takes to recover from a difficult shift. From the interviews, 12 out of 15 participants stated that recovery time was a significant factor in shift work. “Challenges are in recovery” is a comment provided by P9 with the Atlanta Fire Department. The 24/48-hour schedule has the most complaints when it comes to recovering from stress and fatigue. P6 said,

“The demanding nature of the job, coupled with the irregular sleep patterns, can lead to fatigue and stress among firefighters. This can impact their overall well-being and job performance.”

Many of the participants across the shifts agree that the 48 hours in between shifts doesn’t provide adequate recovery time before the start of the next shift. One participant (P8) from Atlanta Fire indicated,

“So 98% of the time when I was at 1s, I would come home and crash. I would have to spend at least 3/4 of the day recuperating. My sleep pattern on shift and, kind of bear with me when I say this, my sleep pattern since I’ve been on the job. My being off shift has always been messed up because when I’m at home I sleep completely different. I sleep harder when I’m at home than when I’m at work. I kind of, if I can use these words now, I catnap. So, when everybody is sleeping, I’m not really asleep.”

In order to remain healthy working long hours, recovery time is paramount and that's exactly what was exhibited in these interviews.

Theme #4: Sleep Deprivation

This addresses research question 2. Sleep deprivation was significantly the most recurring disadvantage encountered throughout the study. Eleven out of fifteen participants' current assignments are at busy stations averaging a minimum of 15 calls per shift. P12 currently works at the busiest station with the highest number of calls per shift maxing out at 35 calls in a shift. He states that:

“Sleep is a little erratic, we wake up in the middle of the night a lot and we try to do what we need to do during the day, as far as around the house plus the calls will start coming in by the evening. When it starts, as far as us sitting back waiting on calls, when it gets to be around 10 or 11 o’clock, we run a lot of calls. We return to the station and try to go to fall back asleep, but the bell might go off again and you know after a couple of times during the night it breaks up and your sleep is rough.”

Although the participants worked at busy stations, they attempted to get as much sleep as possible, when possible.

When asked about his sleep quality, P2 states,

“I think when I am in the firehouse on shift that I have a much more shallow sleep pattern. It was definitely a low quality of sleep that I kind of got used to, and early in my career, my kids were infants and I when I was home, a bomb had to go off to wake me up.”

P4 has had experience working a number of shift schedules. He is a married father with three young children. According to him, he describes his temperament as “the two middle days in between work generally like lower energy level days depending on how busy we are. I definitely

have a shorter temper with the kids.” Sleep deprivation really gives an insight into RQ 2 on what challenges firefighters experience regarding sleep/rest because of shift work.

Theme #5: Flexibility

This addresses research question 3. Flexibility was a common theme for the advantages of shift work. Ten out of Fifteen participants discussed flexibility within the context of shift work. This was centered around time off or the lifestyle of firefighters on shift. P3 stated,

“You can go grocery shopping in the middle of the week and not have to worry about crowds. If you need to run errands or go to your doctor's appointment, it makes it very easy to set up those appointments and do what you need to do, and not worry about a large crowd of people”.

The advantage of flexibility was that most participants shared that their respective shift work allotted them the time to do desired activities outside of work. P7 stated:

“I value the amount of time off afforded by their shift schedule, which allows me to attend family events, school functions, and other activities. I appreciate the flexibility to swap shifts with colleagues when necessary, facilitating work-life balance.”

Despite the challenges of shift work, the participants from Ocean City Fire Department and Pittsburgh Fire emphasize the positive impact their schedule has on their relationship with their families. More specifically, they appreciate the extended periods of time off afforded by their schedule, allowing for meaningful interactions and bonding with their children, which they view as a blessing. P12 from Pittsburgh comments,

“The biggest advantage of it is, is the structure of having the days off and how you can plan out your days. The first day off I’m like a zombie. Then the third day before I come

back, I can probably get some stuff done early and then later on in the day, I'm trying to wind down before I get ready for that 24-hour shift again."

Theme #6: Opportunity

This addresses question 3. Many of the participants indicated that the given work shifts afforded them the opportunity to develop personally and professionally. Nine out of Fifteen participants stated that they would like to or have advanced their education while doing shift work. One participant (#7) working the 24/48-hour schedule stated,

"I'm pretty happy with the shift work and working as a firefighter. I guess I should say I'm currently going to my master's program for Fire Executive Leadership Emergency Scene Management. Being able to see the whole big picture now means I'm getting a lot of satisfaction out of it as well as being a part of the health and safety program operations committee."

P5 works the 24/96-hour shift and she reported,

"With our schedule, we work only 10 days a month, so I have a lot of time off which allows me to have another job which is mostly in the summer which is of course our busy time."

Most of the participants seem to enjoy the free time that shift work affords them.

Summary

The research on the advantages and disadvantages of shift work in the fire service consisted of semi-structured interviews with firefighters across three different shift schedules. Fifteen participants, comprising both men and women, ages 21 - 55, from various racial backgrounds with job tenures ranging from 4 to 30 years were interviewed. The study aimed to address specific research questions regarding the impact of shift work on firefighters'

overall well-being, challenges related to rest/sleep, and its effect on job performance and satisfaction.

Thematic analysis of the interviews uncovered common themes across both the advantages and disadvantages of shift work. Advantages included flexibility, opportunity for personal and professional development, and predictability in work schedules. Participants valued their ability to manage personal errands and tasks, pursue educational opportunities, and plan activities around their work schedules.

However, the disadvantages too were evident, most notably sleep deprivation, missed family time, and insufficient recovery periods between shifts. The demanding nature shift work, characterized by irregular sleep patterns and high call volume, often led to fatigue and stress among the participants. Many participants expressed concerns about the impact on their relationships with family and the challenges of recuperating adequately between shifts. Despite the benefits, the study highlighted challenges associated with shift work to ensure the well-being and job satisfaction of firefighters.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

The purpose of this research was to explore the advantages and disadvantages of shift work on firefighters. This was done by researching three different work schedules, interviewing members who work each of these schedules, and then asking what they portrayed as being the advantages or disadvantages of their particular work schedule. The goal was to obtain a basic knowledge of how shift work impacts their sleep health, job performance, and satisfaction with their current schedule.

The need for this research is that the problem that remains is that while shift work is necessary in the fire service it has been proven to have negative impacts on the health and well-being of a firefighter over time. With shift work being a necessity due to the nature of the job, research was conducted to see what steps these members take to keep themselves healthy. Also, this is necessary to research the impacts they perceived shift work had on their well-being, good or bad. Exploring this topic shed much light on how members of the fire service view their occupation, as it pertains to shift work.

Summary of the Results

During the process of determining the advantages and disadvantages of shift work, several overarching themes became the focus. Although members from three departments were interviewed, many results were similar. This research was able to gain an overview of what the participants felt were the most valuable aspects of shift work and how they cope with the struggles of it.

The common theme of the advantages was the flexibility of it, the opportunity, and the predictability. The flexibility of shift work allows firefighters the chance to participate in things during their off time. Participants mentioned that during downtime, there is an opportunity to

complete tasks and assignments. This suggests that the longer shift allows for flexibility in managing work tasks. This flexibility enhances their work-life balance and overall well-being.

This can be opportunities such as owning a business or as simple as going to the store when everyone else is at work. The participants mentioned that it's easier to avoid crowds and get tasks done during off-peak hours. One participant mentioned that working a 10-day schedule allows for significant time off, enabling them to pursue other interests, such as a second job or leisure activities like golf and travel.

The opportunity that shift work provides for firefighters is that they can advance in their careers if desired. Shift work provides an avenue where a member can further their education, or work towards a new certification. Despite the challenges of shift work, participants mentioned that they find satisfaction in pursuing personal and professional development opportunities.

For example, one participant is pursuing a master's program and engaging in committees related to departmental operations. Even during regular shift work, while the participants indicated they don't get much sleep during shifts, they also mentioned the possibility of catnapping. This implies that there are opportunities for rest during downtime, even if it's not continuous sleep.

The predictable part of shift work is that it gives the ability to schedule things months out. For example, the consistency of the shift allows for scheduling future events. Several participants agreed that having a set schedule, such as the 24-hour shifts they work, allows for clear planning and goal setting. This structure fosters a mindset conducive to achieving tasks within the allocated time frame.

This is a significant advantage for members, as they can plan family trips, or make necessary appointments outside of work. Participants highlighted that their family members are

aware of their work schedule and can plan around it. Communication with family members about workdays and availability for social engagements was seen as important for maintaining relationships.

Although there are numerous advantages to shift work, the disadvantages are just as numerous. The common themes that were discovered with the disadvantages were sleep deprivation, family time, and the recovery time from stress and fatigue. A majority of the participants work at busy fire stations, which provided an in-depth look at the disadvantages shift work has on their well-being.

Sleep deprivation is a common theme with the disadvantages of shift work. Oftentimes firefighters have to awaken from sleep to respond to an alarm, which can cause erratic sleep patterns, which leads to fatigue and other issues. The interviews conducted acknowledged the challenges of maintaining a consistent sleep pattern due to the nature of shift work. They described experiencing shallow sleep and poor sleep quality during their early years in the fire service, particularly during night shifts.

Additionally, they highlight the stress of downtime during slower periods at work, which can contribute to feelings of restlessness and mental strain. The participants describe difficulty maintaining a consistent sleep pattern due to the unpredictable nature of emergency calls and the need to remain alert during overnight shifts. Participants note that even on the quieter nights, the possibility of being awakened by calls from other stations disrupts their sleep.

During the interview process, participants expressed how shift work contributed to them missing time with their families. Time missed, such as on the holidays or a child's game, was frequently discussed as a common disadvantage amongst firefighters. While they appreciate the understanding and support of their colleagues, they acknowledge the challenge of being away

from loved ones during special occasions. Participants mentioned challenges in attending these events or spending time with family and friends due to the demands of shift work. This suggests that shift work can strain personal relationships and limit social engagements.

Conclusions Based Upon Your Results

The exploration into the impacts of shift work showed how active members in the fire service view their occupation and the benefits and challenges associated with it. According to the 21st Century Fire and Emergency Services White Paper (2019), the research on the impacts of shift work can be applied to the fire service in several ways. There are health and wellness initiatives, policy and legislative changes, recruitment and retention, shift work management, training and education, and employee feedback.

Under the health and wellness initiative, understanding the impacts of consecutive hours worked and sleep disruption on employee health, the fire service can create health and wellness initiatives tailored to address these issues. This could potentially include providing better sleep facilities, offering health and wellness programs that focus on physical and mental health, and implementing work schedule adjustments to allow for sufficient rest periods. These initiatives could also serve to assist with policy and legislative changes.

Based on the research findings, the fire service can advocate for policy and legislative changes that protect the health of the workforce. This may involve setting limits on consecutive hours worked, or be enforcing mandatory rest periods, and providing additional health and wellness initiatives. A healthier workforce also improves in recruitment and retention.

Understanding the advantages of working in the fire service can be used to enhance recruitment and retention efforts. By highlighting the benefits of the job, such as the opportunity to serve the community, the sense of camaraderie among firefighters, and job stability, the fire

service can attract new members and retain experienced employees. This would also include a need for shift work management.

The research conducted can inform how shift work is managed by the fire service. This includes designing schedules that balance operational needs with employee well-being. In addition, providing flexibility in scheduling as well as ensuring adequate staffing levels to prevent burnout. However, with any of this, comes training and education.

Training and education can be provided to firefighters on the importance of sleep hygiene, management of stress, as well as other aspects of health and wellness. Empowering firefighters to take a proactive role in managing their own health and well-being on the job will produce an overall healthier and more satisfied employee. Utilizing employee's feedback on their experiences with shift work can provide valuable insight for the fire service into what works well and what could be improved. This feedback can guide future initiatives and policies to better support the workforce.

The research conducted gave a vision on how firefighters view their occupation. The advantages discovered should be utilized for recruitment. Knowing the contributing factors that bring firefighters into the fire service and retain them is valuable. With the workforce attempting to attract and retain employees, significant information can be gained by the legacy members. The advantages are explained to know the areas of shift work firefighters enjoy and what attracts them to an occupation that works these types of schedules. This will in turn shed light on potential new members so that they too can experience these advantages.

Limitations

The impact of shift work on firefighters is an extensive study. Throughout the country, there are various shifts that firefighters could possibly work. In order to do the most effective

research that is the best fit when it comes to firefighters' health, all shifts would have to be explored. However, in this study, there were several limitations that hindered the opportunity for a complete analysis of how shift work impacts firefighters.

This research explored three shifts 24/48, 24/72, and 24/48/24/96-hour rotation. As stated, there are many other shifts in the fire service. The shift within this research that seems most beneficial to the firefighters is the 24/72-hour tour of duty. It helps the firefighter rest the first off-duty day, and then have the next two days to enjoy. What was uncovered in interviewing the participants from Pittsburgh, many of the members who were employed there before 2005, each of those members agreed they preferred their previous shift schedule of 4-day shifts (7 am - 5 pm) and 4-night shifts (7 pm - 7 am).

The limitations to this study included an appropriate sample size that would provide additional information to support the data collected. With only interviewing three departments, a full decision cannot be fully known as to what shift provides the most advantages and disadvantages. The timeframe for this research did not allot the time to see which of these shifts has the best outcome for firefighters' health. In addition, a full scope of the entire department that was interviewed could be obtained, by only utilizing five from each.

Implications and Recommendations to the Field

Many lessons were learned through conducting research with firefighters and how they viewed their current shift. Through this research, key recommendations are important to address the research results. The recommendations that are suggested following this study is as follows.

The first recommendation would be regarding the sleep work cycle. One key factor that was learned is that recovery time dictates how a firefighter views their work schedule. Following a busy shift, the firefighter's activity level is typically low, especially during the morning and

early afternoon. They require this time to rest and recover. Recovery from a rough shift takes at least two days, with the second day being particularly challenging. Based on the participants' responses, the lesson learned is that the longer the recovery days between work shifts, the greater the job satisfaction. It is recommended that the fire service allow members more than 48 hours to recover.

A second recommendation would be the key factor regarding sleep patterns. Most shifts in the fire service members must remain on duty for a minimum of 24 hours. This can cause erratic sleep patterns over time. The firefighters acknowledge the challenges of adjusting to shift work, particularly in terms of maintaining consistent sleep patterns and balancing work with other responsibilities. They mention the difficulty of transitioning between day and night shifts and the potential impact on their energy levels. The recommendation for this is to have open rest periods. What this means is, that outside of station duties and training, firefighters are allowed to sleep at any hour of the day. Based on this statistic alone, there is a need to devise interventions to manage and mitigate the adverse health effects of sleep deprivation that lead to depression, cardiovascular disease, post-traumatic stress syndrome, and a host of other ailments.

The third recommendation is for all fire departments to have an employer-led sleep hygiene education program. Some previous studies have suggested that there is a need to encourage employers to implement policies that would improve sleep-related disorders. These studies address specific interventions employers could initiate to improve sleep thus increasing productivity, reducing absenteeism, improving overall health, and other conditions associated with sleep deficiency disorders. Interventions focusing on sleep hygiene practices, such as maintaining a consistent sleep schedule and creating a conducive sleep environment, have been effective in improving sleep quality among shift workers in various professions.

The fourth and final recommendation is that the fire service move to a gradual alerting system. The participants from Ocean City Fire discussed the changes in their alerting system that made a tremendous difference in sleep quality. According to them, this system has proven to reduce response time and stress for firefighters through streamlined communications and the delivery of reliable alerts. With this system, firefighters are notified with red lights, a natural-sounding voice, and monitors to display call information including the type of call, the address of the emergency, and the units responding. This system reduces stress for firefighters through zone-specific alerts that are heart-friendly. This system progressively increases in sound to bring the firefighter to a gradual wake. This alert should be mandated throughout the fire service.

Recommendations for Future Research

In considering recommendations for future research, research should focus on multiple departments with varying shifts that represent a diverse range of geographical locations, operational contexts, as well as demographics. The perspective needs to be broader in relation to the number of shift systems within the fire service. Focusing on departments or members who have had the opportunity to work different shifts is a valuable way to determine the benefits and challenges of shift work in terms of firefighter performance, health, and overall well-being.

In addition to departmental research, it is imperative to select a sample that is representative of each department for the study. The target should be diversity in terms of gender, age, rank, years of service, job roles, and parents versus members with no children. Following this could ensure that the findings will be applicable to a broad range of members in the fire service.

While this research study focused on the qualitative method, utilizing a mixed-method approach would capture more comprehensive data. In this, interviews with the firefighters were

used to understand how firefighters view their experiences and perceptions of multiple shift schedules. However, adding the quantitative data would include factors such as fatigue levels, injury rates, sleep deprivation, and overall health outcomes.

Due to the time constraints in this study, this study would need to be conducted over several months to a year. Collecting data over an extended period of time would give the ability to track changes in health outcomes that are associated with various shift schedules. While this may be challenging, it could prove to provide more reliable and robust findings in the future.

Finally, engaging key stakeholders such as leaders in the fire service, union leaders, policymakers, and healthcare professionals is imperative. Not only will their input add value to the study, but their input and assistance on implementing changes in the fire service is critical. And based on the research findings, implementing the necessary changes could lead to retaining a healthier workforce.

Conclusion

In conclusion, this research has provided comprehensive insights into the multifaceted impact of shift work on firefighters' overall well-being, rest/sleep patterns, job satisfaction, and job performance. Through semi-structured interviews conducted with firefighters from various backgrounds and tenure lengths across three different shift schedules, the study aimed to address three key research questions.

First, regarding research question 1, the findings revealed that firefighters perceive shift work as having both positive and negative effects on their overall well-being. While shift work offers flexibility, opportunities for personal and professional development, and predictability in the work schedule, it also poses significant challenges. Many firefighters described experiencing fatigue, stress, and difficulty balancing work and personal life due to irregular sleep patterns and

long shifts. The demanding nature of shift work, characterized by high call volume and the need to remain alert during overnight shifts, was found to impact firefighters' physical and mental well-being, highlighting the importance of addressing these issues to support their overall health and satisfaction.

Second, in response to research question two, firefighters identified various challenges related to sleep and rest due to shift work. Sleep deprivation emerged as a common theme, with firefighters often experiencing erratic sleep patterns and poor sleep quality as a result of being on call or responding to emergencies during their shifts. Many expressed difficulties in maintaining a consistent sleep schedule and mentioned the stress of being awakened by calls from other stations, which disrupted their rest. Additionally, firefighters highlighted the impact of shift work on their ability to spend time with family and engage in social activities, further underscoring the importance of addressing sleep-related challenges to support their well-being.

Lastly, regarding research question three, the study identified that shift work can significantly impact job performance and job satisfaction among firefighters. While some firefighters appreciated the opportunities for personal and professional development afforded by shift work, others struggled with fatigue and stress, which affected their performance on the job. Many firefighters expressed concerns regarding the impact shift work has on their relationships with family, friends, and colleagues, as well as their overall job satisfaction. The findings suggest that addressing the challenges associated with shift work, such as sleep deprivation and work-life balance, is crucial for maintaining high levels of job performance and satisfaction among firefighters.

This research underscores the importance of recognizing the complex interplay between shift work, well-being, job performance, and job satisfaction among firefighters. By addressing

the challenges associated with shift work and implementing strategies to support firefighters' overall health and satisfaction, fire departments can create a work environment that fosters success and resilience among their personnel. Moving forward, further research and intervention efforts are required to better understand and mitigate the adverse effect of shift work on firefighters and promote their well-being in the fire service.

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APPENDIX A: APPROVAL LETTERS



Greetings,

First, let me thank you for participating in this study that I am currently undertaking in which you were randomly selected. To provide some background, I am finishing up the Executive Fire Officer (EFO) course and conducting the capstone on the impacts of shift work on Firefighters, good and bad. The interviews are being done with three departments that work different shifts to obtain different perspectives.

I have attached a time schedule that you can choose from, which will aid in determining your availability. Also, I have attached an informed consent form. Please sign and return it. If it would be better, I will be more than happy to send this to you in DocuSign.

Thank you again for participating, and I look forward to your interview!

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APPENDIX B: CONSENT FORM

Interview Consent Form

Interview Consent Form

Identification of Investigators & Purpose of Study

You are being asked to participate in a research study conducted by Chad Thomas from the National Fire Academy (NFA) and Columbia Southern University. The purpose of this study is to develop a better understanding of a critical issue in the fire and emergency services. This study will contribute to the researcher's completion of their final project for the Executive Fire Officer program.

Research Procedures

Should you decide to participate in this research study, you will be asked to sign this consent form once all of your questions about the study have been answered to your satisfaction. The study consists of an interview that will be administered to individual participants. You will be asked to provide answers to a series of questions related to your experience within a particular community. **An [audio/video] recording of the interview will be taken for transcription purposes. The [audio/video] file will be deleted at the conclusion of the study and will not be shared with anyone other than the researcher.** You may turn off your camera if you do not wish to be filmed.

Time Required

Participation in this study will require approximately 30 minutes of your time.

Risks

The investigator does not perceive more than minimal risks from your involvement in this study (that is, no risks beyond the risks associated with everyday life).

The NFA, Columbia Southern University, and its contractors take no responsibility for the actions or outcomes of the research study.

Benefits

There are no direct benefits to the participant; however, information from this study may benefit you, and other communities, in the future.

Incentives

There are no incentives (financial or otherwise) associated with participation in this study.

Confidentiality

The results of this research will be presented to NFA and Columbia Southern University program faculty and students. The results of this project will be coded in such a way that the respondent's identity will not be attached to the final form of this study. The researcher retains the right to use and publish non-identifiable data. While individual responses are confidential, aggregate data will be presented representing averages or generalizations about the responses as a whole. All data will be stored in a secure location accessible only to the researcher. Upon completion of the study, all information that matches up individual respondents with their answers (including audio and/or video recordings) will be destroyed. Final aggregate results will be made available to participants upon request.

Participation & Withdrawal

Your participation is entirely voluntary. You are free to choose not to participate. Should you choose to participate, you can withdraw at any time without consequences of any kind.

Questions about the Study

If you have questions or concerns during the time of your participation in this study, or after its completion, or you would like to receive a copy of the final aggregate results of this study, please contact:

Chad Thomas
Student
National Fire Academy
cdthomas@atlantaga.gov

Dr. Mary Lannon
Faculty Advisor
Columbia Southern University
Mary.Lannon@ColumbiaSouthern.edu

Giving of Consent

I have read this consent form, and I understand what is being requested of me as a participant in this study. I freely consent to participate. I have received satisfactory answers to my questions. The investigator provided me with a copy of this form. I certify that I am at least 18-years of age.

- ☐ I give consent to be filmed and audio recorded during my interview. _____ (interviewee initials)
☐ I give consent to be audio recorded during my interview. _____ (interviewee initials)

Interviewer Signature		Date:	
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Interviewee Signature		Date:	
Interviewee Signature		Date:	

APPENDIX C: INTERVIEW QUESTIONS

Interview Questions

1. What is your current shift work schedule?
 - a. What other shifts, if any, have you worked on?
2. How would you describe your activity level in the first 24 hours following your shift?
3. How does shift work impact your time and interactions with family, friends, and/or colleagues?
4. How would you describe your sleep pattern while on shift?
 - a. How does this differ from when you are not on shift?
5. What do you consider to be the benefits of your current work shift?
6. What do you consider to be the challenges of your current work shift?
7. How does shift work impact your time off shift?
8. How would you describe your typical workday on shift regarding activity and energy level?
9. How would you describe the average call volume at your station?
 - a. How does this impact your sleep while on shift?
10. If you could choose, what would be your ideal work shift/schedule?
11. What work shift/schedule would you least prefer?
12. What steps do you take to get adequate sleep/rest while on shift?
13. What steps do you take to get adequate sleep/rest while off shift?
14. How long, if at all, does it take you to recover in terms of sleep/rest after your shift has ended?

15. What, if anything, do you do to help recover in terms of sleep/rest after your shift has ended?
16. How does your current work shift impact your job satisfaction?
17. Would your current work shift ever influence your decision to consider leaving your department/fire service? Why or why not?
18. What information would you add that hasn't been asked pertaining to the advantages/disadvantages of shift work?