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Examining the Relation of Psychological Distress to Shift Work in Firefighters

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This is to certify that the doctoral dissertation by

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Abstract

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Abstract

Firefighters experience stressful job demands. Many of them work in shifts that can extend to 96-hour rotations. Firefighters also tend to suffer from poor sleep quality and psychological distress; however, there are conflicting findings on how these factors may relate to each other. The purpose of this quantitative survey study was to examine the relation between symptoms of depression, anxiety, posttraumatic stress disorder (PTSD), and alcohol abuse to shift duration in firefighters who work 24-hour shifts compared to those who work 48-hour shifts, with sleep quality as a mediating variable. The repair and restoration theory of sleep was the theoretical framework. One hundred forty-three adult firefighters employed in the midwestern region of the United States completed a demographic questionnaire, the Pittsburgh Sleep Quality Index, and the Psychiatric Diagnostic Screening Questionnaire using an online survey to help ensure anonymity. The results of a multivariate analysis of covariance indicated that anxiety [F (1, 140) = 4.042, p = .042; F (1, 140) = 4.521, p = .035] and alcohol abuse [F (1, 140) = 12.497, p = .001; F (1, 140) = 12.686, p =.001] were both significantly related to shift duration before and after controlling for sleep quality, with individuals in the longer shifts reporting more distress. PTSD was not significantly different between the groups; however, a trend emerged for longer shifts to be related to more distress after controlling for sleep quality. The findings of this research may be used to promote social change by improving the lives of firefighters and the communities they serve, as well as educating decision makers with information needed to address potential mental health burdens of shiftwork in this population.

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Dedication

Thanks be to God, as I can do all things through Him who strengths me. This dissertation is dedicated to my family, as many have endured this process with me. To my children, let this inspire greatness in you. To my mother, I have fulfilled my educational dream. To my father and grandfather, whom could not be here to share with me, this is to honor you. To the rest of my family, your support is amazing, and my accomplishments are yours to share, as without your support the outcome would be unknown.

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Kathryn, I would like to express my gratitude for all the support, encouragement, guidance, and education you showered me with. You are truly one of a kind.

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To the many other individuals who have touched my life, as friends, mentors, and family, please know that your imprintation on my journey will never be forgotten. You have encouraged humility, integrity, courage, optimism, and responsibility from me. Thank you.

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Chapter 1

Introduction to the Study

Firefighters have stressful job demands that impact their physical and mental health (Mitani, Fujita, Nakata, & Shirakawa, 2006). Researchers have found that anxiety, depression, posttraumatic stress disorder (PTSD), alcohol abuse, and sleep disturbances are prevalent in firefighter populations (Riolli & Savicki, 2012; Sawhney, Jennings, Britt, & Sliter, 2017; Stanley, Hom, Hagan, & Joiner, 2015). Fire service professionals encounter occupational stressors such as repeated exposure to life threatening events and medical emergencies that may or may not involve death (Henderson, Van Hasselt, LeDuc, & Couwels, 2016). Firefighters are also at increased risk of exposure to injuries to self and coworkers, hazardous materials, vulnerable victims, and death (Sawhney et al., 2017). Sixty eight percent of fire service professional calls involve aiding in medical emergencies such as vehicle extrications and hazardous material incidents, while 25% are fire related calls (National Fire Protection Association, 2014).

Repeated exposure to traumatic events is inevitable in the firefighter population (Wagner, McFee, & Martin, 2009), which in turn elevates the risk of these individuals developing PTSD (Corneil, Beaton, Murphy, Johnson, & Pike, 1999; Tiesman et al. 2015), depression and anxiety disorders (de Barros, Martins, Saitz, Bastos, & Ronzani, 2013), alcohol abuse disorders (Haddock et al., 2012; Murphey, Beaton, Pike, & Johnson, 1999), and sleep disorders (Carey, Al-Zaiti, Dean, Sessanna, & Finnell, 2011). Approximately 37% of firefighters report symptoms of PTSD (Del Ben, Scotti, Chen, & Fortson, 2006), and 80% endorse symptoms of alcohol abuse (Carey et al., 2011). Saijo,

Ueno, and Hashimoto (2008) reported that 21.1% of the firefighters in their sample endorsed symptoms of depression. Sawhney et al. (2017) examined psychological distress symptoms in firefighters and reported outcomes consisted of elevated levels of distress symptoms including PTSD, anxiety, and depression compared to the general population. Given these consistent and alarming findings, it is important to investigate potential risk factors for mental health issues in firefighters (Gulliver et al., 2016).

Along with the exposure to stressors inherent in their profession, firefighters frequently work long shifts of varied duration. Most common shift work includes 24-hour or 48-hour shifts, but encompasses 10-hour, 12-hour, and 96-hour shifts as well (Barger, Lockley, Rajaratnam, & Landrigan, 2009). For example, shifts may consist of four 10 or 12-hour day/evening shifts over the course of a seven-day week, or 48 consecutive hour shifts with 72 consecutive hours off duty over a five day rotation. Many fire stations implement a nine-day rotation of 24-hours on duty, 24-hours off duty, 24-hours on duty, 24-hours off duty, 24-hours on duty, and then 96-hours off duty. A majority of fire stations implement shift work of 24-hour rotations or longer in order to provide continuous service to their communities (Patterson, Suffoletto, Kupas, Weaver, & Hostler, 2010). It is not known if any particular shift is optimal for the physical or mental health of firefighters. Researchers who have focused on other populations who work in shifts have suggested that shift work leads to sleep disruptions, which in turn negatively impact psychological health (Patterson et al., 2010; Stanley, Hom, & Joiner, 2016).

Little is known about the prevalence of sleep disturbance in firefighters; however, Carey et al. (2011) acknowledged firefighters report sleep disturbances as a primary

stressor, followed by symptoms of PTSD, alcohol abuse, and depression. Billings and Focht (2016) reported that between 59% and 70% of firefighters working in major metropolitan areas suffer from sleep deprivation compared to 37% of the general population. There is significant data documenting the presence of sleep deprivation and psychological distress symptoms in firefighter populations (Billings & Focht, 2016; Carey et al., 2011); however, a majority of the research that has been conducted with this population has assessed symptoms of depression, anxiety, PTSD, alcohol use, and sleep quality while overlooking the possibility that these variables may interact with each other in more complex ways (Meyer et al., 2012; Sawhney et al., 2017). This study sought to investigate if shift duration (24 or 48-hour shifts) is related to psychological distress through a mediated relation with sleep quality.

This quantitative survey study has the potential to positively affect society given the role of firefighters as emergency responders within their communities. If shift duration, through sleep quality, is related to psychological distress symptoms, there may be direct implications for actions that may lead to positive changes for individual firefighters, their families, and the communities they serve. The findings may indicate a need to test changes in shift duration as a possible method to address the mental health needs of firefighters and may lead to increased attention on finding ways to improve assessment and treatment of psychological distress in this population.

This chapter includes background information on the topic, a statement of the problem, and description of the purpose of the study. Specific research questions and hypotheses are presented followed by a description of the theoretical framework for the

study. I will define the terms used in the research and describe the assumptions and limitations associated with the study. The chapter concludes with details on the significance of this study and a description of potential implications for positive social change.

Background of the Study

Occupational tasks of firefighters are strenuous due to high levels of risk and stress encountered on the job (Carey et al., 2011). This high-risk occupation exposes individuals to traumatic conditions that affect their psychological well-being (Riolli & Savicki, 2012). Riolli and Savicki (2012) found that exposure to high levels of stress was associated with psychological maladjustment in firefighters. There is a lack of consistent information on mental health symptoms and sleep quality in this population. A meta-analysis by Jones (2017) reported that only 12 studies have examined the behavioral health concerns in career and volunteer firefighters in the United States. Some researchers have concentrated on the firefighter population in general, while others have focused on this population following single traumatic events such as 9/11. Jones reported a majority of research on first responders, including firefighters, focused on PTSD, and the studies that assessed other psychological distress symptoms are not comprehensive. Although there is no consistent data regarding the prevalence rates of mental health symptoms in career firefighters, a majority of researchers indicate elevated symptoms are present in this population compared to the general population (e.g., Carey et al., 2011; Haddock et al., 2012). Along with distress symptoms, a majority of this population also experiences acute and chronic sleep deprivation (Billings & Focht, 2016; Haddock,

Poston, Jitnarin, & Jahnke, 2013). A summary of the current literature regarding the variables of interest for this study is provided below and will be presented in detail in Chapter 2.

Depression

Research on the prevalence of clinical depression and symptoms of depression in the firefighter population has yielded conflicting results. Multiple authors reported depression is highly prevalent in this population, but results have been inconsistent. For example, Carey et al. (2011) reported 11% of the firefighters in their sample endorsed symptoms of depression, while Harvey et al. (2016) reported 5% endorsed moderate levels of depressive symptoms. Hom et al. (2016) reported 39.6% of career firefighters reported clinically significant symptoms of depression. Researchers who conducted a similar study in Japan reported 21.1% of the firefighters in their sample reported symptoms of depression (Saijo et al., 2008).

Anxiety

Although multiple authors have suggested firefighters suffer from high levels of anxiety (e.g., Carey et al., 2011; Sawhney et al., 2017), there is little empirical evidence to validate this conclusion. Only one published study to date has focused on anxiety in firefighters. Meyer et al. (2012) reported that 4.2% of firefighters met the criteria for a moderate to severe anxiety disorder, compared to 2.9% of the general population (Bandelow & Michaelis, 2015). In addition, Carey et al. (2011) suggested alcohol use may be a coping mechanism to relieve symptoms of anxiety in the firefighter population,

but this conclusion was drawn from correlative data, which leaves such causal conclusions suspect.

Alcohol Abuse

Research on the prevalence of alcohol abuse in firefighters suffers from methodological flaws and inconsistent definitions of problematic drinking. Several researchers have indicated that substance use is a significant maladaptive coping mechanism in firefighters (e.g., Carey et al., 2011; Haddock et al., 2012). Carey et al. (2011) expressed concerns that depression may influence substance use patterns, primarily alcohol, in this population, stressing a need to further investigate the prevalence of both depression and alcohol use in this population.

One of the problems with the literature on alcohol use in this population is that researchers are inconsistent with definitions of substance use and abuse terms. Some authors reported assessing for binge drinking defined as three or more drinks for women and four or more drinks for men, while others assessed hazardous drinking, which is defined as two or more binge drinking episodes per week (Carey et al., 2011). Furthermore, authors use the broad term substance abuse when screening only for alcohol use patterns.

The National Institute on Alcohol Abuse and Alcoholism (2017) reported that 6.2% of the general population 18 years or older meet the criteria for an alcohol use disorder. In research conducted over 20 years ago, the authors indicated that 25% to 30% of firefighters exhibited symptoms of alcohol abuse (Boxer & Wild, 1993). In a more recent study, Carey et al. (2011) reported that 58% of the firefighters in their sample

reported binge drinking, and 14% engaged in hazardous drinking. Haddock et al. (2012) found that 58% of the firefighters in their sample were prone to binge drinking, while Harvey et al. (2016) reported that 4% of the firefighters they surveyed engaged in heavy drinking and 24% reported consumption of four or more drinks per day. Meyer et al. (2012) reported problematic alcohol abuse in 25.4% of firefighters, and Stanley, Bofa, Hom, Kimbrel, and Joiner (2017) reported significant levels of alcohol use among career firefighters.

Given the methodological inconsistencies, the use of different terms, and a focus on different alcohol use patterns in the previous literature on alcohol abuse in firefighters, it is difficult to evaluate the extent to which this issue is a problem in the firefighter population. In addition, assessment methods have been inconsistent. Several researchers have used the CAGE questionnaire or the CAGE-AID questionnaire, which consists of four questions assessing for lifetime problematic alcohol or substance use (Mayfield, McLeod, & Hall, 1974). It is considered a valid and reliable measurement for assessing alcohol abuse; however, it may not accurately reflect current use, as individuals with a previous but not current alcohol problem could honestly answer the CAGE items and be identified with problematic alcohol use. The lack of consistency and methodological issues in the research warrants the need for further investigation on alcohol abuse in firefighter populations.

PTSD

Outcomes reporting the estimated prevalence of PTSD in firefighters vary significantly. For example, Del Ben et al. (2006) reported a prevalence rate of PTSD in

firefighter populations at 37% compared to a prevalence rate of 3.5% to 5.6% in the general population. Corneil et al. (1999) reported that firefighters scored 15% to 18% higher in ratings of PTSD symptoms when compared to nonfirefighter professions. In addition, a meta-analysis done by Berger et al. (2012) concluded that 7% of firefighters suffer from PTSD. Harvey et al. (2016) reported that 13% of the firefighters in their sample endorsed symptoms of PTSD, while Mitani et al. (2006) found that 18.6% of their sample was at high risk of developing PTSD. Published outcomes have varied, and this may be the result of differences in the definition and measurement of PTSD, as some researchers have investigated the percentage of firefighters who qualify for this diagnosis while other researchers have investigated high risk or symptomology in firefighter populations. Although inconsistent findings have been reported, it is evident that PTSD is more prevalent in firefighter population than in the general population (Del Ben et al., 2006).

Sleep Disturbances

Carey et al. (2011) reported that 59% of the firefighters in their sample met criteria for sleep deprivation and 21% reported poor mental well-being. Henderson et al. (2016) reported in their review that firefighters report sleep disturbance more frequently than other psychological distress symptoms. Sleep disturbances are often related to shift work (Haddock et al., 2013).

According to Billings and Focht (2016) between 59% and 70% of firefighters working in major metropolitan areas suffer from sleep deprivation compared to 37% of the general population. The authors administered the Pittsburgh Sleep Quality Index

(PSQI) to measure sleep disturbances in firefighters with a minimum shift duration of 24 consecutive hours and reported that 73% of the firefighters scored in the range that suggested poor sleep quality. This information is comparable to other studies conducted on sleep quality of firefighters. For example, Hom et al. (2016) reported 52.7% of career firefighters reported clinically significant symptoms of sleep disturbances. Firefighters have listed sleep disturbances in the top five job stressors for decades (Murphy, Beaton, Pike, & Johnson, 1994).

The information available to date suggests firefighters report poor sleep quality; however, there is limited information available regarding the relation of sleep quality to specific shift duration or to mental health issues in this population. This study contributes to the literature by investigating the relation of sleep disturbance and psychological distress symptoms to shift duration, with consideration of sleep quality as a mediating variable.

Shift Work

Approximately 15% of the full-time workforce is comprised of shift workers (Barger et al., 2009). Shift work often involves a disruption in circadian rhythms (Patterson et al., 2010), and overall reduces sleep time by two or more hours, which adversely affects sleep quality (Harrington, 2011). Within the fire service, the structure of shift work varies throughout the United States, often comprised of 24-hour and 48-hour shifts and extending to 96-hour shifts (Barger et al., 2009). A majority of stations implement shift work of 24-hour rotations or longer in order to provide continuous service to their communities (Patterson et al., 2010).

Although shift work may entail a period of 24 hours or more, firefighters do not typically work the entire time they are on duty (Haddock et al., 2013). Firefighters are allowed to sleep while on duty, whether it consists of napping between calls in the day or sleeping at night between calls. Due to the lack of structure provided with shift work, physiological problems have been linked to the inability to eat and sleep on a routine schedule (Harrington, 2011). The amount of calls disturbing nighttime sleep schedules varies significantly from one department to the next (Haddock et al., 2013). The human body's endogenous alertness is lowest during the night, further reducing effectiveness (Barger et al., 2009).

Haddock et al. (2013) found that firefighters working 48-hour shifts had significantly higher rates of sleep disturbances than those working 24-hour shifts. This study was the first study to examine the severity and prevalence of sleep deprivation among firefighters. A brief eight-item self-administered questionnaire was administered to measure the likelihood of falling asleep across different daily situations. Measures of depression and stress were also examined. Results indicated that excessive daytime sleepiness varied considerably. Many participants scored in similar ranges to the general population; however, firefighters reporting excessive daytime sleepiness were among those who worked 48-hour shifts. Excessive daytime sleepiness was significantly associated with depressive symptoms.

Patterson et al. (2010) surveyed a convenience sample of emergency medical services professionals who engaged in shift work to examine effects of fatigue. The self-report instruments used assessed demographics, health, sleep quality, and mental and

physical fatigue. Results indicated poor sleep quality was significantly higher than the average healthy adult. The majority of the sample (61.5%) reported consuming moderate levels of alcohol. Symptoms of depression were elevated in this sample compared to the general population. Patterson et al. (2010) identified an association between poor sleep quality and mental health symptoms in emergency medical technician (EMT) personnel; however, this research has not been extended to other emergency responders who work in shifts such as firefighters.

No published research to date has examined whether the length of shift is related to psychological or behavioral symptoms in firefighters. There is a gap in the literature on the relation of shift work to sleep disturbance and mental health symptoms in this population. This study aimed to fill this gap by exploring the relation of psychological distress symptoms in firefighters working 24 consecutive hours compared to those who work 48 consecutive hours, allowing policy makers the ability to make better informed decisions that may affect the firefighter population.

Statement of the Problem

The problem investigated in this study was a lack of knowledge as to how shift work, mediated by sleep quality, relates to psychological distress in firefighter populations. Sleep deprivation and psychological distress within the firefighter population is an ongoing and prevalent problem documented by researchers (e.g. Billings & Focht, 2016; Carey et al., 2011); yet, a gap is distinguished as information regarding the association between the two variables is lacking. Exposure to repeated occupational stressors is something that cannot be avoided in firefighting work; however, changes in

shift work and sleeping patterns are possible in this profession. Shift work, which causes a deviation from a routine schedule, has been linked to physiological problems (Harrington, 2011). Identification of potential relations among these variables may lead to change that could impact individuals, their families, and society in general in a positive direction.

This study examined differences between the shift duration worked by career firefighters (the independent variable) on measures of anxiety, depressive symptoms, alcohol abuse, and PTSD symptoms (the dependent variables). Sleep quality was used as a mediating variable to control for individual sleep differences and assess the degree to which it may be responsible for the relation between the independent variable and the dependent variables. The research may provide useful information for prevention and intervention tactics that may aid in addressing psychological distress in career firefighters.

Purpose of the Study

The purpose of this quantitative survey study was to examine the relation between symptoms of depression, anxiety, PTSD, and alcohol abuse to shift duration among career firefighters who work 24-hour shifts compared to those who work 48-hour shifts. The dependent variables in this study were depression, anxiety, PTSD, and alcohol abuse. The independent variable in this study was duration of shift work, with two comparison groups. One group contained career firefighters that worked 48 consecutive hours and then are off duty for 96 consecutive hours, as a consecutive six-day rotation, and the other group contained career firefighters who worked 24 hours on/24 hours off/ 24 hours

on/ 24 hours off/24 hours on/ 96 hours off, as a consecutive nine-day rotation. Sleep quality was used as a mediating variable, as my hypotheses assumed that these associations will be accounted for by sleep quality.

Research Questions

1. RQ1: Is there a significant difference in depression scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on depression scores controlling for sleep quality.

2. RQ2: Is there a significant difference in anxiety scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on anxiety scores controlling for sleep quality.

3. RQ3: Is there a significant difference in PTSD scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on PTSD scores controlling for sleep quality.

4. RQ4: Is there a significant difference in scores determining alcohol use between groups of career firefighters who work 24 consecutive hours

compared to those who work 48 consecutive hours, while controlling for sleep quality?

H_0: There will be no significant effect of shift duration on alcohol abuse scores controlling for sleep quality.

Theoretical Framework

The theoretical base for this study was the repair and restoration theory of sleep (RRTS), developed by Ian Oswald in the 1960's (Oswald, 1973), and further revised with his colleague Kristine Adam in the 1980's (Adam & Oswald, 1983). The RRTS posits that body and brain functioning is restored through periods of sleep, and specifically that brain functions are repaired during REM sleep and bodily functions are repaired during slow wave sleep (Adam & Oswald, 1983). Inadequate amounts of sleep theoretically lead to a breakdown of brain and bodily functions, causing the occurrence of mental health issues. Growth and renewal of the body is dependent upon protein synthesis. The research completed on protein synthesis suggests a majority of synthesis and restoration takes place during periods of sleep (Adam & Oswald, 1983). Oswald's RRTS relates to the identified study as it lends evidence to the deterioration of mental health functions as the amount of sleep decreased. When the body is not adequately rested, symptoms occur.

The independent variable in this study was duration of shift work, with two levels: one group working durations of 24 consecutive hours on duty and the second group working 48 consecutive hours on duty. It was assumed that these groups had differences in sleep quality and that sleep quality is responsible for the relation between psychological distress and shift. In order to take individual differences in sleep quality

into account, this variable was measured and used as a mediating variable in the analysis. According to the RRTS, the body is in need of solid periods of sleep in order to restore the body and brain functioning, and without psychological symptoms will be elevated compared to the general population in both groups. As applied to this study, the RRTS would predict an increase in mental health symptoms of depression, anxiety, PTSD, and alcohol use as shift duration increases, thus the 48-hour shift group was hypothesized to have significantly increased psychological distress symptoms compared to the 24-hour shift group. It was further hypothesized that the relation between the independent and dependent variable would be accounted for by sleep quality. It was predicted that shift duration would be significantly related to sleep quality, and that sleep quality would be related to psychological distress; however, there may have been participants in either group with variable sleep quality depending on life circumstances and personality characteristics.

Nature of the Study

This study was a quantitative survey approach. A survey design was chosen for this research as it allows the research to obtain a large amount of information directly from participants in a timely, cost efficient, and flexible manner (Creswell, 2014). A survey design was utilized to collect anonymous data through questionnaires administered online, including the Psychiatric Diagnostic Screening Questionnaire (PDSQ), the Pittsburgh Sleep Quality Index (PSQI), and a demographic questionnaire. The PDSQ includes subscales to assess the dependent variables of depression, anxiety, PTSD, and alcohol abuse. The PSQI was used to rate sleep quality, which was used as a

mediating variable in the analysis. All of the variables that were measured in this study can be quantified reliably and by instruments with demonstrated validity, thus a quantitative design was the most appropriate way to address the research questions.

A Multivariate analysis of covariance (MANCOVA) was conducted to investigate significant differences between the adjusted means. The results from this study will contribute to field by identifying if there is a relation between depression, anxiety, PTSD, and alcohol use in relation to shift duration, and whether that relation is mediated by sleep quality. Demographic information was collected for descriptive purposes, and also to assess the comparability of the groups. No identifying information was requested, and participation was anonymous to encourage honest responses, as researchers have suggested that firefighters tend to respond in a manner that underrepresents their symptoms (Henderson et al., 2016). The PDSQ was administered to assess the dependent variables.

Definition of Terms

Career firefighter: A firefighter who is a full-time paid employee (Billings & Focht, 2016).

Shift work: Nontraditional work shifts outside the typical 9 to 5 schedule (Giovanni 2003) consisting of extended rotating shifts exceeding eight consecutive hours (Carey et al., 2011; Barger et al., 2009). Shift work increase the number of hours per day and decrease the amount of days worked (Bambra et al., 2008)

Sleep disturbances: A disruption of the natural sleep cycle causing disturbances in in many basic bodily functions (Sallinen & Kecklund, 2010).

Sleep quality: The quantitative aspects of sleep, such as sleep latency, sleep duration, and number of arousals during sleep (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989).

Substance abuse: A significant quantity and duration in the use of alcohol or drugs which causes impairment in daily functioning (Zimmerman & Mattia, 2001). The DSM 5 indicates a substance use disorder is based on a pathological pattern of behaviors related to the use of the substance and can range in severity from mild to severe.

Assumptions

My first assumption was that all participants were able to understand the survey and assessment questions. It was assumed that the PSQI and PDSQ are accurate measures of symptoms, and that each participant answered the questions in an honest manner as well as to the best of their ability.

Scope and Delimitations

There are several delimitations specific to this study that could pose limitations on the transferability of the study. The population is career firefighters who work shifts of 24-hours or 48-hours, which excludes firefighters who are either considered volunteer staff or those who work any other shift duration. A second delimitation was that the study was to originally take place in a specific geographic location that covers a large number of fire stations in the Midwest United States. It is also likely that other measures or assessments may have proven useful; however, the measurements chosen for this

research have a high degree of reliability and validity. In addition, it can be difficult to identify mental health issues using survey data, because without including a clinical interview mental health disorders cannot be diagnosed, and symptoms of mental health disorders often overlap. These factors may reduce the generalizability to all firefighters, including those who work in other locations or different shift durations; however, it is unknown as to how much impact that would have. The original geographic location chosen for this study incurs a large call volume in comparison to other fire stations throughout the United States. It is likely that results from this study will not generalize to stations with less call volumes, those who employee shift durations of less than 24 hours, and those outside of the geographic area of the study. Finally, it is possible that demographics such as age and experience may have an effect that could be examined with exploratory post hoc testing.

Limitations

There are a number of limitations in this study. This study aimed to assess depression, anxiety, PTSD, and alcohol use in relation to shift work; however, it cannot be known if participants are experiencing symptoms related to other life circumstances. Intrapersonal variables, specific to the individuals, are likely to play a role in the overall mental health of participants. This is not the focus of the study, as the researcher chose to focus on shift work. Surveys and questionnaires cannot be used to diagnose individuals, and this study assessed symptoms but did not assess for psychological diagnoses. Furthermore, symptoms of one mental health disorder often influence symptoms of another mental health disorder. There may have been a complicated relation between the

variables in the study that may not have been identified by the analysis. Some mental health diagnoses are linked to heredity, which was not assessed in this study. Finally, work dissatisfaction may have been another confounding variable, which was not assessed and could likely have increased symptomology.

The design of the study is quantitative; thus, subjective experience of psychological distress and sleep quality was assessed and measured, but no context or elaboration was available for analysis. In addition, the data was collected anonymously through the use of questionnaires, so no diagnoses were assigned or concluded. The study design limited the information that was gathered; however, it also enabled me to recruit a large sample size and encourage honest responses through providing the participants with anonymity.

A final limitation was the possible reluctance of this population to complete the questionnaires in a way that accurately reflected current symptomology. Firefighters report feeling stigmatized when admitting to mental health problems, which diminish the likelihood of seeking help and increases the likelihood of suicide (Henderson et al., 2016). Norwood and Rascati (2012) explain firefighters are unlikely to discuss mental health symptoms as it is viewed as a sign of weakness, vulnerability, and failure. Furthermore, it may depict them as unstable in the line of duty (Violanti, Castellano, O'Rourke, & Paton, 2006). It was hoped that the anonymous nature of the data collection encouraged honest responses.

Significance of the Study

The examination of psychological distress symptoms by shift duration in firefighters may contribute to the field by promoting awareness about the need for continued research and for policy makers to take action. The research has the potential to promote positive social change given the role of firefighters as emergency responders in their communities. The work of these individuals has the potential to impact all citizens. Results may be used to improve the lives of firefighters and their families, and to educate decision makers about the potential mental health burdens of firefighters and to increase awareness for improved prevention and intervention strategies to meet the needs of this population.

Policy decision makers are individuals or group of individuals that possess the authority to influence or determine a course of action, strategy, or formalized plan (Compton, 2009). Examples of a policy decision maker may include a fire chief, city manager, board, or commissioner delegated to make judgments that impact the strategic and operational actions of employees and volunteers charged with responding to and mitigating fire, rescue, or medical emergencies in their jurisdiction.

Identifying the role of shift duration and sleep quality in psychological distress symptoms in firefighters will allow policy makers the ability to make informed decisions in regard to the safety and well-being of the firefighter population. Reducing or eliminating risk factors may help firefighters function better so that they can continue protecting society, as they are the individuals who save the lives of the public in emergency situations.

Summary and Transition

Firefighting is a profession that encompasses rigorous job tasks and high occupational stress, including but not limited to responding to fires, vehicle extrications, and medical emergencies. A number of researchers have suggested that firefighters are a population that exhibit elevated psychological distress, which indicates that it is important to understand and meet the needs of this population in regard to mental health needs. Psychological distress in this population is detrimental not only to firefighters, but those in the communities in which they serve. This quantitative study aims to examine the relation of psychological symptoms to shift duration and sleep quality in firefighters working different shifts. Chapter 2 discusses the strategies applied to uncovering data, a rationale for the chosen theoretical foundation, and information pertinent to the literature of this topic.

Chapter 2: Literature Review

Introduction

Researchers have documented both sleep deprivation and psychological distress in firefighters (Billings & Focht, 2016; Carey et al., 2011). A majority of this research has been descriptive in nature and the findings have been inconsistent, with some authors reporting significant psychological symptoms in this population (e.g., Carey et al., 2016; Hom et al., 2016) and others reporting findings consistent with reports in the general population (e.g., Harvey et al., 2016). This indicates that there may be a more complex relation among the variables of sleep, psychological symptoms, and behavioral issues including sleep and addiction. Gaining an understanding of the relation between sleep and psychological symptoms may help researchers understand the contradictory findings of researchers in this population. The purpose of this study was to examine the relation of the symptoms of depression, anxiety, PTSD, and alcohol abuse to shift worked in firefighters who work 24-hour shifts compared to those who work 48-hour shifts, using sleep quality as a mediating variable.

Although the idea that firefighters suffer from psychological distress has been prevalent for decades (Billings & Focht, 2016; Carey et al., 2011), there are contradictory research findings regarding psychological distress in this population, and no researchers have examined how psychological distress may relate to sleep quality in firefighters. Several researchers have reported that symptoms of depression, anxiety, PTSD, and alcohol abuse are elevated in firefighters compared to the general population, but the supportive data regarding several of those constructs is either lacking or conflicting (e.g.,

Carey et al., 2011; Haddock et al., 2012; Sawhney et al., 2017). The methodology employed in the published research has been inconsistent, with some researchers focused on the assessment of psychological symptoms in the firefighter population in general, and others focused on specific traumatic events such as 9/11 and their impact on firefighters (Wagner et al., 2009; Violanti et al., 2006). No published research to date has examined whether duration of shift or sleep quality is related to psychological distress symptoms in this population.

In this chapter, I will discuss the search strategies used for the literature review. I will also provide a discussion of the RRTS and summarize the major research that contributes to the related variables and identify gaps from this research that lends support for the current study. The chapter concludes with a summary and rationale for the chosen study.

Literature Search Strategy

The method I used for researching the literature involved searching the following: PsycINFO, PsycArticles, PubMed, Walden Dissertations, and the National Fire Protection Association website, with a focus on research published from 2008 to the present. Older scholarly sources included information gathered on the theory used to support this study as well as the assessment instruments that were used in gathering the data. Terms used in the searches were: fire fighter, firefighter, first responders, depression, anxiety, PTSD, substance abuse, mental health, sleep, sleep quality, REM sleep, risk factors, trauma, and symptoms. Peer reviewed articles from scholarly sources were selected for review. Other sources included psychology textbooks, scholarly

websites such as the Pittsburgh Sleep Quality Index webpage, and websites geared toward fire service personnel.

Theoretical Framework: The Restoration Theory of Sleep

Much of the research regarding psychological distress in firefighters that has been conducted utilizes trauma-based theories (e.g., Harvey et al., 2016; Jones, 2017). In this study, the focus is on psychological distress and its relation to shift duration in firefighters. The theoretical framework that was used for this research is the repair and restoration theory of sleep (RRTS), initially developed by Ian Oswald in the 1960's (Oswald, 1966). The RRTS posits that physical and mental health functions are restored through sleep (Adam & Oswald, 1983). The main assumption of this theory is that brain functioning is repaired during REM sleep, while bodily functions are repaired during non-rapid eye movement (NREM) or slow wave sleep through the process of protein synthesis (Oswald, 1966). Oswald considered REM sleep to be core sleep, while NREM sleep was considered optional sleep not necessary for functional purposes, as bodily functions are also restored during periods of rest even when individuals are awake. According to the theory, inadequate amounts of REM sleep lead to a breakdown of brain and bodily functions, causing psychological distress (Oswald, 1966). When sleep is disrupted, the result is poor mood and impaired functioning (Bonnet, 1985).

Sleep Research

The human body is set up to run on a 24-hour cycle monitored by an endogenous circadian pacemaker located in the hypothalamus, which regulates the body's functions and cycles (Barger et al., 2009). Sleep deprivation can result in central nervous system

impairment (Patterson et al., 2010). Cognitive and psychomotor abilities cannot maintain healthy functioning when individuals become fatigued. de Barros et al. (2013) reported that sleep disturbances are associated with increased psychological distress. Many individuals in high stress occupations exhibit symptoms of sleep disturbances (Gulliver et al., 2016). Disrupted sleep over time leads to a variety of other health risk factors including but not limited to: decreased vigilance and mental performance; an increase in fatigue and poor life quality; and increased risk for cardiovascular problems, digestive disorders, obstructive sleep apnea, obesity, diabetes, and altered immune response (Elliot & Kuehl, 2007).

Many body cycles such as cell division, temperature, respiratory rate, urinary secretion, and hormone production are regulated by exogenous factors including social climate, light-dark cycles, and work schedules (Harrington, 2001). The frequent sleep interruptions firefighters encounter during their shifts prevent proper sleep cycles (Billings & Focht, 2016) and induce disruptions in body cycles (Harrington, 2011). Napping during the day may provide some benefits; however, it is not an appropriate substitution for sound sleep (Joffe, 2006). A minimum of two days, and up to four days, is needed to restore normal circadian rhythm once it is significantly disrupted (Joffe, 2006).

The National Sleep Foundation (n.d.) recommends the average adult accrue seven to nine consecutive hours of sleep per 24 hours, which is unlikely in the firefighter profession due to their job requirements and shift work. Sleep loss can result in work accidents, motor vehicle accidents, and medical errors, which has led to federal

regulations for time off in jobs that require operating a motor vehicle (Patterson et al., 2010). A review by Bambra, Whitehead, Sowden, Akers, and Petticrew (2008) documented negative health effects due to sleep deprivation including mood changes, short-term memory loss, slower reaction times, and reduced alertness in the short term; with cardiovascular problems, gastrointestinal impairments, obesity, and immune deficits in the long term.

Individuals are capable of performing tasks when sleep deprived; however, reaction times are slower, and mistakes are more frequent (Oswald, 1966). Sleep deprived individuals often experience dreamlike states or excessive drowsiness including hallucinations, irrational thinking, and paranoia. After multiple nights of sleeplessness people become incoherent, irrational, and are able to slip into a light sleep or "microsleep" very quickly and repetitively (Oswald, 1966). When repetitive in nature, "microsleep" can become a learned behavior, interfering with mental capacity and skilful behaviours.

Research on the function of sleep has been an ongoing topic of study. Rechtschafen, Bergmann, Everson, Kushida, and Gilliland, (1989) reported that rodents die when totally deprived of sleep over the course of one to three weeks. Loprinzi and Joyner (2017) found that achieving an average of eight hours of sleep per night reduced the risk of depression. The human body has an endogenous circadian pacemaker that regulates all body cycles (Barger et al., 2009). In the evening, the body naturally produces an increased amount of melatonin, which is a hormone associated with sleep (Samson, Montserrat, Emerson, & Steven, 2015). An average of eight hours of sleep a

night reduces the risk of psychological distress as well as mortality risks such as cardiovascular disease (Samson et al., 2015; Loprine & Joyner, 2017). Individuals who achieve an average of eight hours of sleep per night have 20% increased motor speed (Walker, Brakefield, Morgan, Hobson, & Stickgold, 2002) and 40% better memory recall (Walker, 2009) compared to sleep deprived individuals.

Since the development of the RRTS, researchers have identified substantial support for this theory. A review by Palagini and Rosenlicht (2011) concluded that interrupted and reduced REM sleep puts individuals at risk for psychiatric illness, specifically depression and anxiety disorders. Tompa (2015) studied sleep deprivation in adolescents and reported eight to ten hours of sleep a night is imperative for restoring mental and physical function as a requirement for a healthy life style. Habukawa et al. (2007) found that reduced and interrupted REM sleep was prominent in patients with PTSD, with significant correlations between severity of trauma and REM interruptions. Habukawa et al. (2018) found interrupted REM sleep was prevalent in patients with PTSD and Major Depressive Disorder, with significantly more interruptions in PTSD patients.

The occupational expectations of firefighters include physically exerting tasks, and sleep researchers have identified an increase in hormone production during sleep in men who engage in strenuous work and exercise (Adamson, Hunter, Ogunremi, Oswald, & Percy-Robb, 1974; Wolkow, Aisbett, Reynolds, Ferguson, & Main, 2016). This supports the need for sleep following physical exertion in order for the body to rejuvenate. A review by Peever and Fuller (2017) identified the amount of REM sleep

needed is related to brain and body mass as well as developmental age, with infants spending a larger portion of sleep in REM stages compared to adults. Research on sleep patterns in relation to shift work is sparse. In one such study, Chung et al. (2012) found that shift workers slept significantly less than regular day time employees. Bjorvatn et al. (2015) reported that shift work was associated with REM-related parasomnia.

There is a gap in the literature on how shift work, mediated by sleep, relates to the mental health of firefighters. Firefighters working 24 consecutive hours or more are not guaranteed eight hours of consecutive sleep time while on duty, supporting the need for research in this area. The RRTS guided this research study, as it lends evidence for the need for sleep in order to rejuvenate the body and brain and also predicts elevated psychological distress when appropriate levels of sleep are not obtained.

The RRTS guided the choice of variables and hypotheses. The independent variable was shiftwork with two levels: one group of firefighters were working shifts of 24 consecutive hours and a second group of firefighters were working of 48 consecutive hours. Sleep was used as a mediating variable. The RRTS predicted that there would be differences in sleep quality between the two groups, with lower sleep quality and more psychological distress in the 48-hour shift. It is further assumed that psychological symptoms (the dependent variables) would be elevated in both groups compared to established norms, with higher psychological distress scores in the group working 48-hour shifts compared to those working 24-hour shifts. Because sleep quality can vary for various reasons in addition to shift duration, a sleep questionnaire was also used to assess this variable for use as a mediator between shift duration and psychological distress.

Sleep Research in Firefighters

A number of authors have studied psychological distress and sleep disturbances in firefighter populations. Billings and Focht (2016) examined sleep quality in 109 career firefighters who worked one of three schedules: 24 hours on/48 hours off (n = 31), 48 hours on/96 hours off (n = 38), and the Kelly rotation of 24 hours on/24 hours off/24 hour on/24 hours off/24 hours on/96 hours off (n = 40). Individuals from all three shifts suffered from poor sleep quality, and 73% of all of the firefighters reported significant sleep disturbances. There were no differences in sleep quality between the 24 hours on/48 hours off group and the 48 hours on/96 hours off group. The firefighters on the Kelly rotation; however, reported significantly higher sleep disturbance than the other two groups. Information from this study supports the assumption that firefighters working 24 consecutive hours or more per shift experience poor sleep quality; however, the authors did not investigate the relation of psychological symptoms to sleep quality.

Haddock et al. (2013) examined the prevalence and severity of sleep disturbances in 458 career firefighters. Questionnaires and interview were used to screen for potential sleep disorders, depression symptoms, and problematic alcohol use. Firefighters who reported excessive daytime sleepiness experienced significantly higher rates of depression, lending support for the RRTS although a causal relation could not be established. Although this study provided evidence supporting the relation between sleep disturbances and depression in firefighters, it did not investigate other symptoms of psychological distress. The authors also reported that firefighters working 48-hour shifts demonstrated significantly higher degrees of sleep disturbance than those working 24-

hour shifts. This lends support to the study in regard to the groups being compared: it was expected that group differences in sleep will be similar to those found by Haddock et al., and that differences in psychological functioning will also be associated with shift duration, which in turn will be accounted for by differences in sleep quality.

The RRTS provides a framework to explain psychological distress symptoms in individuals who lack adequate amounts of sleep. Firefighters frequently endure sleep disturbances due to their occupational requirements. This study built upon previous research by recruiting a population with sleep disturbances inherent to their work and investigating the relation between shift work and psychological distress, as mediated by sleep quality.

PTSD in Firefighters

Meyer et al. (2012) examined the prevalence of PTSD in 142 trauma exposed career firefighters in the Northeast United States using a diagnostic interview. The secondary goal of this study was to examine predictors of symptoms of depression, anxiety, and alcohol abuse, which will be discussed later in this chapter. Participants completed self-report questionnaires and structured clinical interviews. The authors reported that 4.2% of the sample met the criteria for PTSD using the diagnostic interview, and 6.4% scored in the diagnostic range on the questionnaire. Low perceived social supports, as well as high levels of self-blame and occupational stress, were significant predictors of PTSD symptoms. The findings of PTSD prevalence were comparable to the general population, which Del Ben et al. (2006) reported as between 3.5% and 5.6%.

Mitani et al. (2006) investigated factors that were predictive of job related stress and burnout in 231 Japanese firefighters. Participants completed self-report measures to assess for PTSD, occupational stress, and burnout. The measure for burn out assessed three categories: emotional exhaustion, depersonalization, and personal accomplishment. In this sample 17.7% of the participants met the criteria for PTSD, 18% indicated significant levels of occupational stress, and 15.7% indicated significant levels of burnout. Mitani et al. noted that both emotional exhaustion and depersonalization were significantly related to PTSD and job stressors. Those who met the criteria for PTSD reported higher job stress, emotional exhaustion, and depersonalization as well as lower low levels of social support in comparison to those who did not meet the criteria for a diagnosis. Information from this study suggests that a diagnosis of PTSD or symptoms of PTSD are related to emotional exhaustion, depersonalization, job stress, and low social support in Japanese firefighters.

PTSD can lead to significantly impaired functioning and burnout if not addressed and treated (Mitani et al., 2006). Wagner et al. (2009) opined that exposure to traumatic events can result in an array of negative symptoms including flashbacks, disrupted sleep cycle, and a corrupted worldview. The impact of PTSD symptoms may range from minimal to severe physical and psychological impairment. This diagnosis also tends to occur in conjunction with substance abuse and is related to high risk of suicide (Bernert & Joiner, 2007; Henderson et al., 2016).

Individuals with PTSD symptoms are six times more likely to endorse suicidal ideation compared to the general population (Gulliver et al., 2016). Stanley et al. (2016)

reported a lack of research specifically examining the relation between PTSD and suicide in firefighters. Tiesman et al. (2015) found that repeated exposure to high-stress occupational tasks increases the likelihood of PTSD in service workers. This, along with reserve in seeking counseling, increases the likelihood of suicide ideation in this population. The Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health (2014) reported that firefighters are three times more likely to die from suicide than in the line of duty. The prevalence of suicide attempts in firefighters is 15.5%, compared with an estimated range of 1.9% to 8% in the general population (Henderson et al., 2016). Stanley et al. (2015) reported 46.8% of firefighters admitted to suicidal ideation and 19.2% had a plan for suicide in place. This alarming information warrants further investigation into the cause of suicidal ideation and attempts in firefighters.

Riolli and Savicki (2012) examined the relation between exposure to stress and perceived stress as well as physical and psychological maladjustment in 102 firefighters from a major U. S. city. Fifty participants had been involved in the 9/11 search and rescue operations of the World Trade Center (they were considered the trauma group) and the other 52 participants had not (these individuals served as the control group). In both groups, high stress exposure was related to high levels of perceived stress and psychological maladjustment. Exposure to trauma was related to increased levels of physical and psychological maladjustment, with the trauma group reporting significantly higher perceived stress than the control group. Personality traits (hope [optimism], neuroticism, and conscientiousness) moderated the relation between type of stress and

psychological symptoms and seemed to provide a buffer against negative outcomes. In the control group, hope was inversely related to psychological maladjustment, meaning as hope increased psychological maladjustment decreased. The opposite was true for the trauma group; as hope increased so did psychological symptoms. The authors suggest this odd relation may be due to disillusionment over devastating assumptions or outcomes.

Firefighters are a population at risk for PTSD (Meyer et al., 2012). When left untreated, PTSD can lead to negative effects on an individual's mental and physical health (Mitani et al., 2006). PTSD is related to emotional exhaustion and depersonalization (Mitani et al., 2006), as well as social support, self-blame, and occupational stress (Meyer et al., 2012). Data on the prevalence of PTSD and its symptoms in firefighters is inconsistent, with one author reporting similar rates to the general population (e.g., Meyer et al., 2012) and others reporting significantly higher prevalence (e.g., Mitani et al., 2006). Inconsistencies may be due to the location in which the participants were located, differences in data collection processes and assessments, or different research purposes. For example, Meyers et al. engaged in face to face interviews while Riolli and Savicki used anonymous measures. Meyers et al. (2012) suggests resiliency may be a factor contributing to inconsistent rates of PTSD or sampled participants may have lower rates of trauma exposure do the nature and location of their work.

When combined with the research on sleep quality in firefighter populations, there is a gap as to whether there is a relation between PTSD and sleep quality as it relates to shift work. Further investigation of PTSD symptoms in firefighter populations is

warranted to understand the prevalence and immediacy of the problem. This study contributed to the literature by investigating if such a relation exists.

Occupational Stress, Psychological Distress, and Alcohol Use in the Firefighter Population

Saijo et al. (2008) surveyed 1301 Japanese career firefighters who worked 24-hour shifts and assessed job stress in relation to depression symptoms and job dissatisfaction. A self-report depression inventory, job stress questionnaires, and a demographics questionnaire that included items regarding sleeping habits were administered. The authors reported that less sleep time was significantly related to higher depression scores and job dissatisfaction. Intense work load such as responding to heavy call volumes and expectations of quick response time to disasters was also related to job dissatisfaction. Conflict in the work place, such as disagreements between coworkers and lack of support from supervisors, was related to both depressive symptoms and job dissatisfaction.

Carey et al. (2011) investigated psychosomatic well-being consisting of sleep problems, depression, substance use (alcohol, caffeine, and tobacco), social bonding, and quality of life in 112 professional firefighters from six different firehouses. The authors found significant sleep disturbances (59.8%) and binge drinking behavior, defined as an excess of 10 alcoholic beverages per week (58.3%), in this sample of firefighters. Both of these prevalence rates are significantly higher than both the general population, as well as results of previous studies with this population**.** An average of 6.2% of adults aged 18 years of age and older in the general population meet the criteria for an alcohol use

disorder (National Institute on Alcohol Abuse and Alcoholism, 2017). The authors found significant associations between depressive symptoms, sleep problems, and hazardous drinking in the firefighters in their study, which signifies a need to further research these variables. Mental health diagnoses often have overlapping symptoms and tend to impact each other, making primary diagnoses hard to identify. Carey et al. (2011) did not examine the role of shift duration in this research, and this remains a significant gap in the literature regarding the firefighting population.

As reviewed above, Meyer et al. (2012) reported that 3.5% of their sample of 142 firefighters suffered from moderate to severe depression and 4.2% of participants reported moderate to severe anxiety, which was comparable to a community sample. Problematic alcohol use was reported by 22.5% of participants, which was consistent with previous research. Meyer et al. assumed resilience and high cohesion were responsible for the psychological distress scores, while high occupational stress and additional life stressors contributed to problematic alcohol use. Self-blame and using alcohol to cope were the two maladaptive coping mechanisms identified as predictors for problematic alcohol use.

One of the problems with the research on use of alcohol in this population is that the terms used to investigate maladaptive alcohol use have been inconsistent, with some researchers investigating binge drinking (e.g., Haddock et al., 2012) and others investigating hazardous drinking (e.g., Carey et al., 2011). The terms that are used have different meanings and are not comparable, and also are not the same as substance use disorder. This makes the research difficult to interpret; however, researchers have

consistently reported more problematic drinking behavior in firefighters than in the general population.

Piazza et al. (2014) studied alcohol consumption in 160 career firefighters working in Florida. Each participant anonymously completed a short survey on various health behaviors. Eighty nine percent of firefighters reported consuming alcohol and 34% reported binge drinking within the last month. The authors concluded that alcohol consumption within firefighter populations represents a behavioral health concern, and that further investigation is warranted. Haddock, Day, Poston, Jahnke, and Jitnarin (2015) conducted a recent study on alcohol use from a national cohort of U. S. career firefighters. Nearly 1000 firefighters were evaluated in this study, and 85% reported consuming alcohol. Among those who consumed alcohol, 44.7% reported binge drinking and 50.2% reported episodic drinking, which was defined as significant alcohol consumption in a short period of time with the intent of becoming intoxicated multiple days per week. Furthermore, of the 50.2% of firefighters who reported episodic dinking, 72.5% reported multiple episodes within the last month.

Sawhney et al. (2017) completed a mixed methods study with two goals. The first goal was to identify and develop a measure of work recovery strategies used by firefighters. The second was to evaluate the buffering effect of those recovery strategies on the relation between occupational stress and mental health symptoms. A sample of 268 U.S. firefighters was recruited, and each participant completed phone interviews and self-report measures of psychological symptoms. Seven recovery strategies were identified: work-related talks, stress talks, time with coworkers, exercise, recreational

activities, relaxation, and mastery experiences. Although psychological distress scores weren't reported by the authors, they did find that occupational stress was positively related to PTSD, depression, and anxiety symptoms, consistent with previous research. All seven work recovery strategies were negatively related to work-related stress. Occupational stress and psychological distress were reduced when participants engaged in social and physical activities that required minimal effort.

Stanley et al. (2017) investigated differences in psychiatric symptoms and barriers to obtaining mental health care in 204 volunteer firefighters and 321 career firefighters. Participants completed a 30 minute online self-report questionnaire inquiring about alcohol consumption, depression, suicidality, insomnia, PTSD, and perceived stigma. Results showed volunteer firefighters endorsed significantly higher rates of depression, PTSD, suicide ideation, and structural barriers to mental health care compared to career firefighters. The two groups were not compared to a general population group or established norms. Career firefighters endorsed significantly higher rates of alcohol consumption compared to their volunteer counterparts. Significant rates of insomnia and reported stigma (causing harm to reputation) were reported by both volunteer and career firefighters in this sample. The authors suggest higher levels of psychological distress reported by career firefighters may be due to stigma that coincides with admitting to weakness and potential employment repercussions, despite the fact that the study was conducted through an anonymous survey.

Firefighters are a population who endorse symptoms of depression and anxiety (Meyer et al., 2012), excessive use of alcohol as a maladaptive coping mechanism (Carey

et al., 2011; Meyer et al., 2012; Piazza et al., 2014), and insomnia (Stanley et al., 2017). Saijo et al. (2008) found a relation between reduced hours of sleep, depression, and job dissatisfaction in a general population sample. Carey et al. (2011) found an association between depressive symptoms, sleep problems, and hazardous drinking. Researchers have found a positive relation between occupational stress and symptoms of PTSD, depression, and anxiety (Sawhney et al., 2017). Identified risk factors for psychological distress in firefighters are reduced sleep time, intense work load, and conflict in the work place (Saijo et al., 2008) while social and physical activities have been found to be protective factors (Sawhney et al., 2017). Meyer et al. further assumes high cohesion and resilience are contributing protective factors. Overall, there are inconsistent data on the rates of psychological distress symptoms and contributing risk factors in firefighter populations, inferring a complex relation between protective factors and risk factors. With all the indicators of prevalent psychological distress and concerning sleep quality in firefighter populations, a gap still remains as to whether shiftwork or sleep quality is a potential risk factor of psychological distress symptoms in firefighter populations.

Inconsistencies in Reporting and Outcomes

There is a conflict in the findings that psychological distress in firefighters is not consistently elevated and the findings that suicide rates among fire fighters is relatively high (Stanley et al., 2015). Stanley et al. (2015) conducted a national survey of 1027 U.S. firefighters to assess their behavioral and mental health. Volunteer, career, and retired firefighters ages 18 to 82 years were surveyed to investigate the career prevalence of suicide ideation, plans, attempts, and non-suicidal self-injury. The authors reported that

46.8% of the sample reported suicidal ideation at some point within their career, 19.2% reported having a plan, 15.5% reported previous attempts, and 16.4% reported non-suicidal self-injurious behaviors. These prevalence statistics are higher than the general population, which is 5.6% to 14.3% for lifetime suicide ideation, 1.9% to 8.7% for previous attempts, 3.9% for having a suicide plan, and 5.9% for reported non-suicidal self-injurious behaviors (Nock et al., 2008).

Suicide is the leading cause of preventable death in the United States (World Health Organization, 2014), and efforts are needed to identify risk factors for suicide in firefighters. The Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health (2014) identified that firefighters are three times more likely to experience death from suicide in comparison to death in the line of duty. This is a population responsible for the emergency care of society, and by better understanding their needs, treatment and preventative measures can be implemented to improve their overall health and enable them to perform their work. Understanding the relation between shift work and mental health in this population may add to the research literature on this topic to allow professionals to address the preventative and rehabilitation needs of this population.

Henderson et al. (2016) identified firefighters report feeling stigmatized upon admitting to mental health problems, which diminishes the likelihood of help seeking behaviors in this population to alleviate symptoms. Kim et al. (2018) found that South Korean firefighters with more severe PTSD symptoms had the most fear of potential stigma as being perceived as weak and vulnerable. Norwood and Rascati (2012) further

propose firefighters are unlikely to discuss psychological distress as it is viewed as a sign of weakness, vulnerability, and failure. There is a concern that they may be perceived as unstable in the line of duty (Violanti et al., 2006). This lends an explanation for the lack of or inconsistent data among psychological distress in this population, as alcohol use is a means of self-medicating (a maladaptive coping strategy) for reducing emotional distress (Bacharach, Bamberger, & Doveh, 2008). A second proposed explanation for the inconsistency in results was discussed by Wagner and Martin (2012) in their study on proactive coping. Wagner and Martin found that firefighters ranking high in emotional intelligence reported lower levels of PTSD symptoms. Firefighters who prepare themselves for responding to potentially traumatic events are better equipped to control impulses, regulate mood, and maintain clear thoughts when at work. There are many potentially complex relations among these variables to explore; however, given what we know about sleep and the fact that firefighters typically work shifts and are sleep deprived examining the potential interactions between shift work and psychological symptoms appears to make sense given the research reviewed above.

Further investigation is needed to understand protective factors and risk factors that contribute to the overall mental health in firefighter populations. The aim of this study was to investigate if shift work, mediated by sleep quality, is a potential risk factor for psychological distress in firefighter populations. As stigma and fear of repercussions in the work place have been identified in the literature as confounding factors (Henderson et al., 2016; Kim et al., 2018), the current study surveyed participants anonymously in order

to lessen the likelihood of socially desirable responses and obtain accurate data regarding psychological distress within this population.

Summary and Conclusions

Researchers have examined sleep quality, alcohol use, and symptoms of depression, anxiety, and PTSD in firefighters. Taken together, data is inconsistent with some researchers supporting the claim that firefighters are a population that experience psychological distress (Billings & Focht, 2016; Meyer et al., 2012; Riolli & Savicki, 2012) and some researchers reporting few elevated psychological distress symptoms in this population (Meyer et al., 2012). There is; however, consistency in the findings that this population tends to engage in problematic drinking **(**Carey et al., 2011; Piazza et al., 2014) and commit suicide at rates that are higher than the general population (Stanley et al., 2015).

It has been established that sleep deprivation is associated with psychological distress in firefighters (Carey et al., 2011; Haddock et al., 2013). Sleep is a recurrent state of inertia and unresponsiveness needed for optimal health (Oswald, 1966). REM sleep is considered necessary for the repair and restoration of mental functioning, and optimal levels of restoration occur after an average of eight hours of sleep per night (Loprinzi & Joyner, 2017), which is needed to reduce the risk of psychological distress and increase motor speed and memory recall (Loprine & Joyner, 2017; Samson et al., 2015). Support for the RRTS was provided by Palagini (2010), who found that interrupted and reduced REM sleep put individuals at risk for psychiatric illness.

Psychological distress and sleep disturbances affect firefighter populations (Riolli & Savicki, 2012; Sawhney et al., 2017; Stanley et al., 2015); however, the relation, if any, between shiftwork and psychological distress is unknown. Given previous research findings, it is clear that the development of psychological distress in this population is not entirely predictable and both risk and resiliency factors are involved. Researchers have examined a number of risk factors associated with the mental health of firefighter populations such as exposure to traumatic events, job satisfaction, burn out, occupational stress, and quality of life. Sleep quality, alcohol use, and symptoms of depression, anxiety, and PTSD have also been looked at descriptively in this population. No study to date has investigated the relation of psychological distress in relation to shift duration, and how this relation may be mediated by sleep. This is an important line of inquiry because a relation of sleep to psychological distress has been established that may prove useful in this population. Shift duration is a factor that can be changed, and if it is demonstrated to have an impact on the psychological health of firefighters, changing shift duration is one possible means of preventative health care that may be easily managed.

Several authors have reported that firefighters experience elevated rates of mental illness (Harvey et al., 2016; Meyer et al., 2012; Stanley et al., 2015) and suicide ideation (Stanley et al., 2015). More research is needed to understand the prevalence and risk factors (Meyer et al., 2012; Harvey et al., 2016; Stanley et al., 2015). Current research lacks consistency and there have been methodological problems that signal a need for further investigation. Researchers have examined the symptoms of psychological distress and sleep deprivation in firefighter populations descriptively (Billings & Focht, 2016;

Meyer et al., 2012; Riolli & Savicki, 2012), and the research aims to add to that literature by using sleep as a mediating variable between the variables of psychological distress and length of work shift. Chapter 3 will provide detail regarding the methodology and research design.

Chapter 3: Research Methods

Introduction

The purpose of this quantitative survey study was to examine symptoms of depression, anxiety, PTSD, and alcohol abuse in relation to shift work in career firefighters who work 24-hour shifts compared to those who work 48-hour shifts. Sleep quality was used as a mediating variable to control for individual sleep differences. This chapter will provide detailed information regarding the research design and rationale, sampling strategy, target population, procedures for recruitment, description of the instruments as well as their reliability and validity, and data collection. I will include detailed information on the assessments used for research, threats to validity, and ethical considerations. The chapter will conclude with a summary.

Research Design and Rationale

The independent variable in this study was shift duration, with two groups: 24 consecutive hour shift and 48 consecutive hour shift. One group contained career firefighters that worked 48 consecutive hours and then were off duty for 96 consecutive hours in a six-day rotation. The second group contained career firefighters who worked 24 hours on/24 hours off/ 24 hours on/ 24 hours off/24 hours on/ 96 hours off in a nine-day rotation. Sleep quality was used as a mediating variable, as assessed by the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). The dependent variables were symptoms of depression, anxiety, PTSD, and alcohol abuse, as assessed by the Psychiatric Diagnostic Screening Questionnaire (PDSQ; Zimmerman & Mattia, 2001).

The use of surveys allows researchers to acquire a large amount of data in a relatively short period of time. Survey research is cost efficient and convenient for participants (Creswell, 2014). I administered a demographic questionnaire, the PDSQ, and the PSQI online via the Surveymonkey.com website. Using this approach, I was able to ensure that the data set was complete, as Surveymonkey can be set to not allow participants to skip questions. A quantitative survey design was chosen for this study as it allows for generalization of results to other firefighter populations (Creswell, 2014). According to Creswell (2007), the survey method allows for the examination of potential relations among variables as well as for the testing or verification of the chosen theory. Survey research also allows researchers the ability to obtain subjective participant information (Frankfort-Nachmias, Nachmias, & DeWaard, 2015).

I used a descriptive quantitative survey design to answer the four research questions:

1. RQ1: Is there a significant difference in depression scores between groups of firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on depression scores controlling for sleep quality.

2. RQ2: Is there a significant difference in anxiety scores between groups of firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

H_0: There will be no significant effect of shift duration on anxiety scores controlling for sleep quality.

3. RQ3: Is there a significant difference in PTSD scores between groups of firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on PTSD scores controlling for sleep quality.

4. RQ4: Is there a significant difference in scores determining alcohol use between groups of firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on alcohol abuse scores controlling for sleep quality.

Methodology

Population

The planned target population for this study was firefighters working in a large metropolitan area in a Midwestern city who worked either 24 or 48 consecutive hours and who had been actively working for at least six months prior to the study. This fire department implements both 24 and 48-hour shift durations throughout the city. An adequate sample is available for both shifts, as the department employs 391 firefighters who engage in shift work, consisting of three deputy chiefs, 18 battalion fire chiefs, 103 fire captains, 95 motor operators, and 172 firefighters.

Sampling and Recruitment Procedures

This study utilized convenience sampling to recruit the sample, and all firefighters who met the inclusion criteria were invited to participate in the study (Daniel, 2012). This method allows researchers to select participants who have experience in relation to the problem being studied (Daniel, 2012). The inclusion criteria consisted of participants who were professional firefighters and worked either a 24 or 48 consecutive hour shift, and they also must have been actively working for the past six months. Any firefighters who have been on leave from work for any reason in the previous six months were excluded from the study.

All participants were invited to participate in the study by receiving a link through an email invitation from the fire chief (See Appendix A). Invitations were sent to all firefighters in the department. Informed consent was explained before participants were directed to the first page of the survey, and participants confirmed that they understood the scope of the research, understood the voluntary nature of the study, and agreed to participate before completing any forms. It was clearly articulated in the email invitation that participation was voluntary and has no relation to employment or evaluations. The anonymous nature of participation made it impossible to determine who did and did not complete the online survey. Participants were informed that the approximate time for their participation would be 25 to 35 minutes. After clicking on the consent link, participants were routed anonymously to the Surveymonkey site to complete the questionnaires. IP addresses were not collected.

Power Analysis

Considerations for a power analysis involve effect size, alpha level, the number of analyses to be performed, and power level when deciding on an appropriate sample size. Using *G*Power*, I entered an alpha level of .05, a power level of .80, and an estimated effect size of .10. A low effect size was chosen due to the inconsistency in findings from previous research. Given four predictors and the number of regression equations planned, the appropriate sample size was calculated to be 126 participants. The goal was to recruit 132 participants to account for attrition and invalid response sets. The plan was to include two links to the survey on the email invitation, one for firefighters who work 24-hour shifts, and the other for firefighters who work 48-hour shifts. Upon reaching a sample size of 66 participants for each group, the surveys were to be closed.

Data Collection Procedures

The original planned called for the fire chief to email the invitation to the survey to all firefighters employed in the metropolitan area (See Appendix A). Clicking on the link to the survey served to indicate consent after participants were informed about the study, including the voluntary nature of their participation, the anonymous nature of the data collection, and the risks and benefits of participation. Participants were informed that all data was collected anonymously and no IP addresses were collected. It was also clear that no one would know who participated and who did not, and that participation has no relation to their employment status or evaluations. After completion of the surveys, participants were thanked and asked to contact me if completing the questionnaires

results in psychological distress. I was prepared to provide them with appropriate referrals should one be needed.

Instrumentation

Demographic Form

Demographic information including age, race, sex, level of education, length of current employment, and shift duration was collected and used for descriptive purposes as well as to assess the comparability of the groups (See Appendix B). No identifying information was collected to encourage honest responses, as researchers have suggested that firefighters tend to respond to questionnaires in a manner that is symptom minimizing (Henderson et al., 2016), and data collection associated with identifying information may result in a loss of valid data. The demographic questionnaire took approximately less than five minutes to complete.

Pittsburgh Sleep Quality Index

The PSQI was developed by Daniel Buysse and associates in 1988 as to provide a reliable, valid, and standardized self-report measure of sleep quality (Buysse et al., 1988). It consists of 19 items, which are grouped into seven component scores used to produce a global score (Buysse et al., 1989). Questions are answered based on a Likert scale, each equally weighted on a 0-3 scale. Global scores range between 0 and 21; higher scores indicating worse sleep quality (Buysse et al., 1989). The PSQI has established high internal consistency and convergent validity when compared to other self-report sleep measures (Barclay et al., 2010). The PSQI is deemed a valid measure of sleep quality

used in clinical assessment to aid in identifying sleep quality. The estimated time to complete this survey was 5 to 10 minutes (See Appendix C).

Psychiatric Diagnostic Screening Questionnaire (PDSQ)

The PDSQ was developed by Mark Zimmerman and published in 2001 (Zimmerman & Mattia, 2001). It is a self-report scale with 125 yes/no items designed to screen for the most common mental health symptoms encountered in an outpatient mental health setting (Zimmerman & Mattia, 2001). There are 111 number items, with two items having multiple parts. There are 13 subscales: Major Depressive Disorder, Posttraumatic Stress Disorder, Bulimia/Binge-Eating Disorder, Obsessive-Compulsive Disorder, Panic Disorder, Psychosis, Agoraphobia, Social Phobia, Alcohol Abuse/Dependence, Drug Abuse/Dependence, Generalized Anxiety Disorder, Somatization Disorder, and Hypochondriasis. The scores on the subscales Major Depressive Disorder, Posttraumatic Stress Disorder, Alcohol Abuse/Dependence, and Generalized Anxiety Disorder subscales will be used to evaluate the dependent variables in the study. The Major Depressive Disorder subscale consists of 21 items; The Posttraumatic Stress Disorder subscale consists of 15 items; the Alcohol Abuse/Dependence subscale consists of six items; and the Generalized Anxiety Disorder subscale consists of ten items. Items specific to each subscale are designed to assess diagnostic criterion defined in the DSM-IV.

The PDSQ has excellent levels of discriminant, convergent, and concurrent validity, as well as internal consistency and test-retest reliability (Zimmerman & Mattia, 2001). It is deemed a reliable and valid assessment used to aid clinicians in diagnosing,

assessing severity and level of risk, and treatment planning (Zimmerman & Mattia, 2001). According to Zimmerman and Mattia (2001) internal consistency and test-retest reliability was .81, which is good to excellent. Cronbach's alpha for all subscales was .85. Discriminant and convergent validity showed significant correlations from a sample of 394 subjects. The estimated time to complete this survey was 15 to 20 minutes (See Appendix D). (See Appendix E for permissions of PSQI and Appendix G for permissions on PDSQ).

Data Analysis Plan

Before hypothesis testing, I examined the data needed to determine if it met the assumptions of the analysis. I used a scatterplot matrix with LOESS lines to examine the data for a linear relationship between dependent variables and the covariate and each dependent variable. Box's M test of Equality of Covariance Matrices was also employed to test for homogeneity of regression slopes and homogeneity of variances and covariances. Standardized residuals were used to test for outliers. Finally, the Shapiro-Wilk test of normality was used to test for multivariate normality. Violations of assumptions were addressed with whatever transformation of the variables was appropriate given the violation to be addressed. Demographic variables were compared between groups using the appropriate two-group comparison tests (*t*-tests for continuous variables, nonparametric testing for categorical variables) to determine if there were differences on any of these variables between groups. If such differences were found, the plan was to take them into account as covariates in the hypothesis testing.

The Statistical Package for the Social Sciences (SPSS) software (V.21) was used to perform the analyses of the study. The data was collected anonymously through Surveymonkey.com. I conducted a MANCOVA to determine if there were statistically significant differences between the adjusted means on depression, anxiety, PTSD, and alcohol abuse in career firefighters working either 24 or 48-hour shift durations, using sleep quality as a covariate. A MANCOVA allows for control of confounding factors while investigating variance explained by each IV in each DV. Exploratory Post Hoc testing was also conducted to determine if demographic variables such as age or years of service were related to psychological variables; however, such exploratory data analysis was conducted only to inform future research and explore the possibility of a type I error in the proposed study.

Threats to Validity

In this section I present threats to internal and external validly. The chosen design was made primarily for descriptive purposes rather than causal inferences. Nonexperimental designs have higher levels of external validity than internal validity (Daniel, 2012).

External Validity

Threats to external validity encompass generalizability to those not include in the sample (Creswell, 2014). The sample chosen for this nonexperimental research design did not allow for causal inferences to all firefighter populations, as the sample may not have been representative of the population. Each fire station is unique as far as scheduled

shifts and call responses, which was likely to impact sleep quality and psychological distress. Finally, this study utilized a non-structured online environment.

Internal Validity

Potential threats to internal validity (degree of control of the experiment) may include selection and response bias (Creswell, 2014). Utilizing a convenience sample does not ensure participants are representative of the target population (Daniel, 2012). Participants need to meet certain criteria in order to be involved in the study, such as being actively employed for at least six months prior to the study at the designated fire house, and work either a 24-hour or 48-hour shift. Secondly, firefighter populations may be concerned about stigma or appearing weak or vulnerable if they endorse psychological symptoms; thus, participants may not accurately endorse symptoms of psychological distress (Henderson et al., 2016). Responses were collected anonymously to minimize this effect. Internal validity may have been threatened due to the instrumentation (length of survey, nature of questions). The questions on the survey may be considered sensitive, as they regard symptoms of psychological distress. Finally, participants may have preexisting conditions that may have attributed to psychological distress or sleep quality; however, the chosen measure utilizes a specific time frame for symptoms.

Ethical Procedures

Ethical risk for this study was minimal, as the study made use of self-report methods and anonymous data collection. There was a risk of minor psychological distress or stress due to the nature of the questions and time it takes to complete the survey. Participants were allowed to withdraw from the study at any time and were given my

contact information for any questions or concerns. Participants were invited to contact me should psychological distress occur as they complete the questionnaires, and I had a list of providers to refer participants to should they have contacted me with a need to seek professional assistance. Informed consent was obtained before accessing the first page of the questionnaire, and participants indicated that they understand the risks and benefits of participation prior to completing the survey.

Upon approval from the Walden University Institutional Review Board (# 08-31-18-0540578), all data was collected anonymously. It was made clear to the participants that although the invitation to participate was emailed from the fire chief's office they were in no way obligated to participate in the study and no one would know if they did or did not participate. The information is being stored online and on my personal computer, and both the dataset and my computer are password protected. I am the only person who has access to the computer and the data, and IP addresses were not saved. The data will be stored for seven years, and then will be destroyed. I will also email a summary of the findings to the fire chief. Participants were invited to contact me via email to receive results from the study. An email address established exclusively for this study was used to gather the contact information of individuals who would like to receive the study results, and all email addresses will be deleted after the information is distributed.

Summary

This chapter provided detailed information for the chosen quantitative, nonexperimental survey research design and rationale. I provided information regarding the target population of actively employed firefighters working one of two shifts, and

recruitment methods. I discussed the sampling strategy of using a convenience sample and the proposed sample size. A detailed description of the data collection process was provided. Specific information regarding the reliability and validity of the chosen assessments was provided. Finally, threats to validity and ethical concerns were discussed. Information ensuring participant confidentiality was provided as well as information regarding length and removal of collected data.

Chapter 4: Results

Introduction

The purpose of this quantitative survey study was to examine the relation between symptoms of depression, anxiety, PTSD, and alcohol abuse to shift duration in career firefighters who work 24-hour shifts compared to those who work 48-hour shifts. Sleep quality was used as a mediating variable to control for individual sleep differences. The goal of the study was to provide useful information that may inform potential prevention and intervention tactics to address psychological distress and/or sleep issues in career firefighters. In this research study, I used quantitative analysis and measures that have been validated to address the research questions.

In this chapter, I will present the data collection procedures that were outlined in Chapter 3, describe the statistical analysis of the data, explain the discrepancies in the data collection process that deviated from the original plan discussed in Chapter 3, and present the results of the analyses. The results will be summarized in the final section of this chapter.

Data Collection

The data for this study was collected via the Internet with the use of Surveymonkey.com. The instruments included the PSQI, the PDSQ, and a demographics questionnaire. The survey was open for exactly five months.

Discrepancies in the Data Collection Process

The original plan proposed to invite participants from one fire station in the Midwest who employed both 24- and 48-hour shifts; however, not enough participants

responded. I was able to recruit from fire stations across the United States who were interested in the research, and the operations chiefs agreed to allow their staff to participate. The Walden IRB granted permission to extend participant recruitment to an additional four fire stations across the United States who employed either 24- or 48-hour shifts. The operations chief at each fire station sent an email invitation to participate in the research to all fire staff. The email invitation included the link to the study on Surveymonkey.com. The invitation explained that participation in the study was voluntary and would not affect their work status in any manner.

Results

Descriptive Statistics

One hundred sixty-three individuals responded to the online survey. The data was reviewed for consent, demographics, and survey completion. A total of 143 participants (87.7% of the respondents) completed the entire survey. The 20 incomplete surveys were excluded from analyses. Of the 143 respondents, 71 worked 24-hour shifts and 72 worked 48-hour shifts. The overall sample consisted of 130 males and 13 females. The mean age was 42.8 years, with a standard deviation of 8.7. The groups were compared with a *t*-test on age and Chi Square analyses on the categorical variables to determine if they were comparable. Cells were condensed to three categories do to under populated groups. Years of service was the only variable with significant results ($\chi^2(2) = 8.669$, $p < .013$). Examination of the residuals revealed that the difference lay in the distribution of years of experience in the entire group: both groups had a disproportionate level of 10

plus years of service compared to the other categories of experience. There was no difference between the two groups in years of experience.

The analysis plan included a post hoc examination of the dependent variables by any demographic variable that significantly differed by group, and that analysis will be discussed later in the chapter. Table 1 presents the complete demographics information.

Table 1
Demographics for Sample

Demographic Information (N = 143)	Overall	24-hr Shift (n=71)	48-hr Shift (n=72)
Age: Mean (SD)	42.8 (8.7)	41.9 (8.8)	43.7 (8.9)
Sex			
Male	130 (91 %)	65	65
Female	13 (9%)	6	7
Years of Service*			
>1	4 (2%)	4	0
1 to 3	13 (10%)	8	5
3 to 5	10 (7%)	7	3
5 to 10	23 (16%)	14	9
10+	93 (65%)	38	55
Race			
White	124 (86.7 %)	60	64
Black /African American	6 (4.2%)	4	2
Native American/American Indian	2 (1.4%)	1	1
Asian/Pacific Islander	4 (2.8%)	2	2
Multiple/Mixed Race	7 (4.9 %)	4	3
Education			
HS Diploma	1 (<1%)	1	0
Some College/No Degree	15 (10%)	8	7
Vocational/Technical/Trade School	13 (10%)	8	5
Associate's Degree	38 (27%)	17	21
Bachelor's Degree	58 (41%)	29	29
Post Graduate Degree	18 (13%)	8	10

* significant difference p< .02

Because the demographic characteristics of the target population (firefighters in the United States) are unknown, it is impossible to determine how representative the

sample was in relation to the target population. A majority of the sample population identified as Caucasian (87%) and male (91%). These demographic statistics may be representative of the target population; however, the limited diversity in race and sex requires future research validation to determine representativeness.

Data Cleaning

Prior to conducting the analyses, the data was reviewed for assumption testing. I used a scatterplot matrix with LOESS lines to examine the data for a linear relationship between dependent variables and the covariate and each dependent variable. Box's M test of Equality of Covariance Matrices was also employed to test for homogeneity of regression slopes and homogeneity of variances and covariances. Standardized residuals were used to test for outliers. Finally, the Shapiro-Wilk test of normality was used to test for multivariate normality and was significant (p=.000). The data violated multiple assumptions, so a log transfer was conducted and the four outliers were retained. Outliers often provide valuable information that may be lost if they are removed (Larson-Hall, 2015). Furthermore, Gochfeld and Burger (2011) suggest participants who are often dismissed as outliers are often the most at risk and in need of protection.

Tests of Normality

The data for all for dependent variables violated the assumption of normality. Kraska (2010) states that parametric tests are robust when pertaining to tests of multivariate normality when large data sets are used, specifically when the violation is due to skewed data rather than outliers; therefore, a MANOVA and MANCOVA were still computed.

Homogeneity of Variance

Levene's Test of Equality of Error was conducted to determine if the error variance of the four dependent variables (depression, PTSD, alcohol abuse, and anxiety) and sleep quality were equal across the independent variable (shift duration). Results indicated a non-significant value for all four dependent variables, thus suggesting the assumption of homogeneity of variance was met.

Homogeneity of Variance-Covariance Matrices

After transforming the data, Box's M test of Equality of Covariance Matrices was conducted to examine the assumptions of homogeneity of variance-covariance to determine if the distributions of the four dependent variables (depression, PTSD, alcohol abuse, and anxiety) and sleep quality were equal across the two levels of the independent variable (shift duration). Results were non-significant (p = .731). This value indicates the use of Wilk's Lambda in determining the homogeneity of regression slopes. The Wilk's Lambda was non-significant (p = .821), suggesting the assumption of homogeneity of regression slopes was also met.

Analysis

Using the latest version (25) of SPSS (IBM Corp., 2017), I conducted a Multivariate Analysis of Variance (MANOVA) to test for differences between endorsed symptoms of depression, PTSD, alcohol abuse, and anxiety in firefighters working 24-hours verses those working 48-hours, using the transformed variables. The results of the MANOVA indicated there was a statistically significant effect of shift work on the dependent variables [F (4, 137) = 4.210, p = .003]. Tests of between-subjects effects

indicated there were statistically significant differences on the variables of alcohol abuse [F (1, 140) = 12.497, p =.001], and anxiety [F (1, 140) = 4.042, p = .042]. Although mean PTSD scores were higher in the 48-hour shift group, these differences were not statistically significant with F (1, 140) = 2.103, p = .149. Depression scores were non-significant but revealed a trend of increased symptoms in the 48-hour shift group with F (1, 140) = 3.164, p = .077.

A MANCOVA was conducted to determine if there was a statistically significant difference between the shifts on the transformed values of depression, PTSD, alcohol abuse, and anxiety controlling for sleep quality. The results of the MANCOVA indicated there was a statistically significant effect of shift work on the dependent variables when controlling for sleep quality [F (4, 137) = 4.634, p = .002]. There was an overall significant effect of sleep quality on the dependent variables [F (4, 137) = 13.39, p = .000].

Pairwise comparisons were run to determine the impact of sleep quality on the relation between shift duration and psychological symptoms. The significant relation between alcohol abuse and shift duration remained after controlling for sleep quality [F (1, 140) = 12.686, p =.001], as did the relation between anxiety and shift duration [F (1, 140) = 4.521, p = .035], indicating that shift was related to these variables regardless of sleep quality. A trend emerged for differences in PTSD symptoms [F (1, 140) = 3.398, p = .067], with 48-hour shift workers reporting more symptoms, indicating that sleep quality influenced this relation, but not in a strong enough manner to be significant. Although mean depression score was higher in the 48- hour shift group, the trend for a

difference between the groups disappeared once sleep quality was taken into account [F (1, 140) = 2.618, p = .108].

Research Questions

1. RQ1: Is there a significant difference in depression scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on depression scores controlling for sleep quality.

The null hypothesis for RQ1 was retained. Although a trend in symptoms of depressions was revealed, the results were not statistically significant after controlling for sleep quality.

2. RQ2: Is there a significant difference in anxiety scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on anxiety scores controlling for sleep quality.

The null hypothesis for RQ2 was retained as the results of the statistical analysis determined there was a significant effect of shift duration on anxiety scores before and after controlling for sleep quality.

3. RQ3: Is there a significant difference in PTSD scores between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

H_0: There will be no significant effect of shift duration on PTSD scores controlling for sleep quality.

The null hypothesis for RQ3 was retained. The results of the statistical analysis determined there was a trend of shift duration on PTSD scores after controlling for sleep quality; however, the results were not statistically significant.

4. RQ4: Is there a significant difference in scores determining alcohol use between groups of career firefighters who work 24 consecutive hours compared to those who work 48 consecutive hours, while controlling for sleep quality?

   H_0: There will be no significant effect of shift duration on alcohol abuse scores controlling for sleep quality.

The null hypothesis for RQ4 was retained as the results of the statistical analysis determined there was a significant effect of shift duration on alcohol abuse scores before and after controlling for sleep quality.

Means (unadjusted and adjusted for sleep quality) and standard deviations for the dependent variables between groups are presented in Table 2. Results indicated a higher mean score for all four dependent variables for the 48-hour shift group.

Table 2
Means of the Dependent Variables by Group

Dependent Variable	Duration of Shift	Unadjusted Mean	Std. Deviation	Adjusted Mean	N
Depression	24 Hour Shift	0.4559	0.32681	.457	71
	48 Hour Shift	0.5419	0.37936	.540	72
	Total	0.4992	0.35562		143
PTSD	24 Hour Shift	0.5828	0.30016	.584	71
	48 Hour Shift	0.6748	0.31828	.674	72
	Total	0.6291	0.31176		143
Alcohol*	24 Hour Shift	0.1847	0.26607	.185	71
	48 Hour Shift	0.3486	0.28786	.348	72
	Total	0.2672	0.28827		143
Anxiety*	24 Hour Shift	0.3397	0.34873	.341	71
	48 Hour Shift	0.4637	0.38755	.463	72
	Total	0.4022	0.37272		143

* significant difference $p < .05$

Exploratory Post Hoc Testing

Exploratory Post Hoc testing was also conducted to determine if demographic variables were related to the psychological variables as a means to inform future research and explore the possibility of a type I error. Due to an overwhelming percentage of white males in the sample, I was unable to compare the dependent variables by race or sex. The variable years of service demonstrated a difference in that both groups had a large percentage of participants who endorsed working 10 or more years as a firefighter.

Due to the distribution of years of service, an independent samples *t*-test was conducted to compare the psychological variables (depression, anxiety, PTSD, and alcohol abuse) in two groups: firefighters who endorsed working one to nine years of

service (n =51) and those who endorsed working 10 or more years of service (n = 92). There was no difference in the scores between those groups on depression [t (141) = -.595, p = .553] or anxiety [t (141) = -1.88, p = .062]. There were significant differences in the scores between the groups on PTSD [t (141) = -2.09, p = .038] and alcohol abuse [t (141) = -2.27, p = .025], with those with 10 or more years of experience scoring higher than those with less experience.

A one-way between subjects ANOVA was conducted to compare the effect of education level on the dependent variables (depression, anxiety, PTSD, and alcohol abuse) in firefighters who endorsed no college degree, vocational schooling, Associate's degree, Bachelor's degree, and post-graduate degree. There were no differences between the educational groups on any of the dependent variables (all p values were 0.55 or more).

A simple linear regression was calculated to predict the relation of age to the dependent variables (depression, anxiety, PTSD, and alcohol abuse). The regression equation was not significant, and age did not predict any of the dependent variables.

Summary

This purpose of this study was to determine if there was a difference between scores of depression, PTSD, alcohol abuse, and anxiety between firefighters who work either a 24- or 48-hour shift, after controlling for sleep quality. Prior to statistical analyses, I assessed for assumption violations. Due to violations, data was transformed. The results of the MANOVA were statistically significant with F (4, 137) = 4.210, p = .003, as were the results of the MANCOVA with F (4, 137) = 4.634, and p =.002.

Follow up analysis revealed that anxiety scores and alcohol abuse scores were statistically significant between the groups, and depression scores demonstrated a trend. The trend for a group difference in depression scores disappeared when sleep quality was taken into account, and a trend for a difference in PTSD scores emerged, but no other statistical differences were affected. Scores on all four dependent variables (depression, anxiety, PTSD, and alcohol abuse) were lower in the group of firefighters who worked a 24-hour shift compared to those firefighters who worked a 48-hour shift.

Results from the exploratory Post Hoc testing indicated there was a significant amount of participants working 10 or more years in both the 24-hour and the 48-hour group. There were no significant indicators that age or level of education resulted in an effect on the psychological variables; however, a significant increase in symptoms of PTSD and alcohol abuse in participants who endorsed working 10 or more years as a firefighter was found. Chapter 5 will provide an interpretation of the findings, limitations of the study, and recommendations for future research. I will also discuss implications of the findings for promoting social change.

Chapter 5: Discussions, Conclusions, Recommendations

Introduction

The purpose of this study was to examine the relation between symptoms of depression, anxiety, PTSD, and alcohol abuse to shift duration among career firefighters who work 24-hour shifts compared to those who work 48-hour shifts, incorporating sleep quality as a mediating variable. This study utilized a quantitative survey approach, which allowed for a large amount of information directly from participants in a timely, cost efficient, flexible, and anonymous manner.

Firefighters from four fire stations within the United States received an email invitation from their chief with the link to the survey. One hundred sixty-three individuals responded to the online survey; however, 20 surveys were excluded from the analyses due to incomplete or missing information. MANOVA results indicated a statistically significant difference between the groups. Follow-up analysis of variance (ANOVAs) identified statistically significant differences in the symptoms of anxiety and alcohol abuse, with firefighters who worked 48-hour shifts scoring higher on those scales compared to those who worked 24-hour shifts. A trend was also identified for depression symptoms, with 48-hour shift workers tending to report more symptoms than 24-hour shift workers. After sleep quality was taken into account, the only changes in the relations between the variables was that the statistical trend for a difference in depression score disappeared and a statistical trend for a difference in PTSD symptoms emerged. In this chapter, I will present a discussion of the research results and interpretation of the

findings. I will also note limitations of this study, provide recommendations for future research, and present implications for positive social change.

Interpretation

In order to address the four research questions that guided this study, firefighters from four fire stations within the United States that employed 24-hour and 48-hour shifts were invited to participate. The dependent variables were symptoms of depression, anxiety, PTSD, and alcohol abuse, and were assessed as using the PDSQ (Zimmerman & Mattia, 2001). The mediating variable, sleep quality, was assessed using the PSQI (Buysse et al., 1988). Previous researchers as discussed in Chapter 2 have investigated depression, anxiety, PTSD, alcohol abuse, and sleep quality as dependent variables in this population while overlooking the possibility that these variables may interact with each other in more complex ways (Meyer et al., 2012; Sawhney et al., 2017). The data collected from this study indicates that there is an association between shift duration and the psychological well-being of firefighters. Specifically, the symptoms anxiety and alcohol abuse were significantly elevated in individuals who work 48-hour shifts compared to those who work 24-hour shifts, even after sleep quality was taken into account. Prior to controlling for sleep quality, a trend was revealed for symptoms of depression; however, after controlling for sleep quality the statistical trend was no longer present. After controlling for sleep quality, a trend in symptoms of PTSD emerged between the groups, with the 48-hour group endorsing more symptoms.

Interpretation in Context of Literature Review

Researchers have consistently documented the presence of sleep deprivation and psychological distress in firefighters (Billings & Focht, 2016; Carey et al., 2011). Researchers have conducted mainly descriptive studies, and the findings have been inconsistent, with some authors reporting significant psychological symptoms in this population (e.g., Carey et al., 2016; Hom et al., 2016) and others reporting symptoms consistent with the general population (e.g., Harvey et al., 2016). This suggests that there may be a more complex relation among the variables of sleep, psychological symptoms, and addiction. Supportive data regarding this relation is either lacking or conflicting (e.g., Carey et al., 2011; Haddock et al., 2012; Sawhney et al., 2017). The methodology employed in the published research has also varied, with some researchers focused on the assessment of psychological symptoms in firefighters in general, and others focused on specific traumatic events such as 9/11 and their impact on firefighters (Violanti et al., 2006; Wagner et al., 2009). To date, no published research has examined whether duration of shift or sleep quality is related to psychological distress symptoms in the firefighter population.

The purpose of this research was to contribute to and expand on the literature regarding the relation of psychological distress and shift duration. I hypothesized there would not be a significant effect of shift duration on any of the four dependent variables (depression, anxiety, PTSD, and alcohol abuse) after controlling for sleep quality, suggesting that sleep disturbances may be the variable responsible for any significant relation among the variables. Prior to controlling for sleep quality, the MANOVA results

showed statistically significant effect of shift work on the dependent variables. Specifically, results of the tests of between-subjects effects indicated the statistical significance of group on symptoms of alcohol abuse and anxiety in the group of firefighters working 48-hour shifts. There was a trend for a difference in depression symptoms. After controlling for sleep quality, the MANCOVA results were similar, indicating symptoms of alcohol abuse and anxiety were still significant in the group of firefighters working 48-hour shifts. However, accounting for sleep quality resulted in the trend for a group difference in depression scores to disappear and trend for a group difference in PTSD to emerge.

This information suggests the possibility that shift duration itself may be responsible for elevated alcohol abuse and anxiety symptoms, or that variables related to shift duration other than sleep quality, such as time away from family, may influence symptoms. The findings also suggest that future research should be conducted on the relation of shift duration and sleep quality regarding symptoms of depression, as the trend in depression symptoms that was revealed prior to controlling for sleep quality was no longer present after accounting for sleep quality. Although the group difference never obtained a level of significance, this finding lends some degree of support for the hypothesis that sleep quality may be a contributing factor in symptoms of depression, as statistical trends may be clinically significant.

Interestingly, after controlling for sleep quality, a trend in PTSD symptoms emerged were no group difference was initially identified. More research is needed to confirm such findings, and will be discussed later in this chapter, as firefighters who

participated in this study endorsed higher levels of symptoms of PTSD, alcohol abuse, and anxiety then the published norms of the PDSQ (Zimmerman & Mattia, 2001).

Costa (2003) suggested that social relationships and support, physical health status, tolerance to shift work, and resiliency are variables that affect both sleep quality and symptom outcome. Shift work can significantly interfere with social functioning and is related to physical symptoms of workers (Stychno, Zaręba, Kulczycka, & Kosicka, 2018). There is also some evidence that irregular work schedules and work-life conflict are related to psychological distress (Schneider & Harknett, 2019). Furthermore, Vogel, Braungardt, Meyer, and Schneider (2012) indicated that the correlation between psychological distress and shift work is modulated by variables such as gender, type of shift, age, individual characteristics, lifestyle choices, and occupational tasks. The relation between shiftwork and psychological distress may be more complicated than one that is simply mediated by sleep disruption, and other variables may need to be assessed in future studies to investigate this complexity.

There were a significant number of participants in both shift groups who had 10 or more years of service as a firefighter. This may have influenced the scores of both groups, as Patterson et al. (2010) found that firefighters with more years of service endorsed worse sleep quality than those with less experience. In addition, researchers have reported that repeated exposure to trauma increases the likelihood of PTSD in firefighters (Haddock et al., 2013; Jahnke, Poston, Haddock, & Murphy, 2016). Although there was not a significant difference in symptoms of PTSD between groups, there was a trend indicating symptoms of PTSD were more prevalent in the 48-hour shift group after

accounting for sleep quality, and overall the sample of firefighters who participated in this research endorsed much higher levels of PTSD (3.39) then the normative data on the PDSQ (1.9).

Interpretation in Context of Theoretical Framework

Researchers have concluded that firefighters working 24 consecutive hours or more per shift experience poor sleep quality (Billings & Focht, 2016; Haddock et al., 2013), and firefighters frequently endure sleep disturbances due to their occupational requirements. No research to date has investigated the relation of psychological distress and sleep quality. Although the current study did not investigate the direct relation of sleep quality and psychological distress, sleep quality was used as a mediating variable to examine the relation between shift duration and shift duration. There were group differences identified between the shifts; however, sleep quality was not responsible for differences between anxiety and alcohol abuse.

The RRTS posits that physical and mental health functions are restored through sleep (Oswald, 1973). REM sleep is considered necessary for the repair and restoration of mental functioning, and optimal levels of restoration occur after an average of eight hours of sleep per night (Loprinzi & Joyner, 2017), which is needed to reduce the risk of psychological distress and increase motor speed and memory function (Samson et al., 2015; Loprine & Joyner, 2017). Support for the RRTS was provided by Palagini (2010), who found that interrupted and reduced REM sleep put individuals at risk for psychiatric illness.

Results from the current study indicated that after controlling for sleep quality, symptoms of anxiety and alcohol abuse were still significantly higher in firefighters working 48-hour shift durations compared to firefighters working 24-hour shift durations. There was a difference in sleep quality between the groups, with the 48-hour shift group reporting significantly poorer sleep quality than the 24-hour shift group; however, taking this difference into account had little impact on the relation between shift duration and psychological distress. The trend in symptoms of depression present prior to controlling for sleep quality was no longer present after controlling for sleep quality; however, a trend for symptoms of PTSD then emerged. Trends may indicate a clinically significant impact rather than a statistically significant one, so researchers should continue to investigate possible interactions of shift duration and sleep quality in regard to how they impact firefighters on an individual level. However, the null hypothesis was retained for all four research question, as sleep quality did not significantly impact the relation between shift duration and any of the four dependent variables. Results from this study do not lend support to the RRTS. The possibility should be considered that there is a more complex relation between these variables and sleep may only be one of the contributing factors.

Limitations

In this study, I investigated the relation of depression, anxiety, PTSD, and alcohol abuse to shift duration while controlling for sleep quality. There are multiple factors that may influence psychological distress and sleep quality in firefighters that were not taken into account in the current study. Haddock et al. (2012) reported sleep disturbances are

often greater for firefighters who are obese as well as those diagnosed with sleep apnea. I did not control for weight issues or medical diagnoses. Furthermore, it was not known if participants endorsing symptoms were affected by life circumstances outside of their employment, as interpersonal variable are likely to play a role in the overall mental health of such individuals. For example, having an infant or small children substantially impacts sleep quality (Richter, Kramer, Tang, Motgomery-Downs, & Lemola, 2019) as does having a second job (Haddock et al., 2013). Other such potentially confounding variables were not assessed, such as work satisfaction, physical health, and mental health diagnoses.

Symptoms of depression, anxiety, PTSD, and alcohol abuse were assessed using the PDSQ (Zimmerman & Mattia, 2001); however, no clinical interview was conducted to confirm the presence of symptoms or assign a diagnosis. Moreover, symptoms of mental health disorders are often influenced by and highly correlated with other mental health disorders (Gros, Price, Magruder, & Frueh, 2012). Specifically, Gros et al. (2012) found that individuals reported overlapping symptoms when being assessed for PTSD, depression, and anxiety. Thus, there may be complicated relations between endorsed symptoms.

It is not clear whether these results are generalizable to all fire stations in the United States, as the study design was a quasi-experiment utilizing a convenience sampling method. A quasi-experiment lacks random assignment of participants and reduces the internal validity of the study. In addition, an overwhelming majority of participants in this study were Caucasian males who were well-experienced in their

profession of firefighting, which severely limits the findings to one specific group of men. It is possible that the experience level of the participants in this research impacted the findings in a way that is not generalizable to firefighters with less experience. Furthermore, it is not known if the call volumes at participating fire stations are accurately reflective of all fire stations in the United States. Some stations may be prone to more calls and thus more disrupted sleep in that station's firefighters.

Researchers investigating the causality and trajectory of mental health diagnoses have showed poor sleep quality can lead to distress, which can contribute to multiple diagnoses (Haddock et al., 2013; Paterson et al., 2010). The use of a longitudinal design with participants randomized to shift groups would enable researchers to control for potentially confounding variables and establish the extent to which symptoms of depression, anxiety, PTSD, and alcohol abuse are present prior to being assigned to a specific shift duration. Causality cannot be implied from the current findings, and only a randomized controlled trial could determine if shift duration results in sleep disturbance and psychological distress. It is unknown if poor sleep quality contributes to psychological distress, if psychological distress contributes to poor sleep quality, or if there is a more complex relation between these two variables.

The study design limited the information that was gathered to subjective self-reported data; however, it also allowed for a large sample size and encouraged honesty by providing anonymity to participants. Nonetheless, Norwood and Rascati (2012) conveyed that firefighters are unlikely to discuss mental health issues as it is viewed as a sign of vulnerability, and they may remain reluctant to do so even in an anonymous survey.

They may feel that endorsing psychological symptoms depicts them as unstable in the line of duty, and deny these symptoms even to themselves (Violanti, Castellano, O'Rourke, & Paton, 2006).

Recommendations

Future research should be conducted with larger sample populations deemed representative to the U. S. firefighter population, with the inclusion of more fire stations across the United States. This would increase the ability to generalize findings to the firefighter population, and hopefully provide a more diverse population. To further improve the internal validity, researchers should include potentially confounding variables such as work satisfaction, physical health, the presence of other factors that may influence sleep quality, and mental health diagnoses. Given the current data, it appears that firefighters who work 48-hour shift durations may be at risk of an increase in anxiety and alcohol abuse compared to those who work 24-hour shifts. The also appear to have more symptoms of PTSD (although not to a statistically significant degree), after controlling for sleep quality. Both groups were heavily populated with experienced participants, and thus the association of shift duration to psychological distress is unclear. Due to the methodology of the study, cause and effect relations regarding whether working extended shift durations is detrimental to the mental health of firefighters, thus no recommendations for changing shift durations will be made.

Results of the Post Hoc exploratory analysis showed symptoms of PTSD were higher in participants who worked 10 or more years as a firefighter. Since both groups were heavily populated with firefighters who endorsed working 10 or more years of

service, in conjunction with the trend in increased shift duration, it is possible that this experienced population may have interacted with the results of the PTSD trend found in this study. As interrupted sleep from symptoms such as night terrors is already a symptom of PTSD, there is no clear information at this time as to how disrupted sleep from the nature of shiftwork impacts firefighters suffering PTSD. Future research should look at this interaction, as Mitinai et al. (2006) found that service workers with PTSD often exhibit less symptoms as they have had more years of experience on the job to learn effective coping strategies. This finding is inconsistent with the results from the current study, as I found that more experienced firefighters endorsed significant symptoms of PTSD.

Although there were no significant group differences in endorsed symptoms of PTSD and depression, trends were identified for both variables, and symptoms of alcohol abuse and anxiety were found to be significant prior to and after controlling for sleep quality. Overall, the sample population in this study endorsed much higher levels of PTSD (3.39/1.9), alcohol abuse (12.6/.9), and anxiety (4.5/2.7) then the published norms of the PDSQ (Zimmerman & Mattia, 2001). Future research should build on the current study and incorporate a diagnostic interview to determine true diagnoses. This method of research would also allow for researchers to identify and discuss potential discrepancies during the interview to strengthen or rule out diagnoses, if applicable.

There are other risk and resiliency factors that may interact with and affect the mental health of firefighters aside from shift work, such as exposure to trauma, years of service, or support networks. Not all of these factors are known. Future research should

explore such factors in a longitudinal design, incorporating baseline assessment at the beginning of a firefighter's career. Researchers might further consider a more in-depth exploration of demographic variables such as marital status, available supports, family lifestyle, and the effects of fitness and tolerance for shift work.

Researchers have suggested that firefighters may learn to adjust and cope with the occupational stressors and job demands that are linked to poor sleep quality and psychological distress (Mitani et al., 2006). For example, Billings and Focht (2016) and Costa (2003) found that there is individual variability and resiliency to shift work, and that as years of service increases firefighter learn coping mechanisms to reduce symptoms. This is inconsistent with the results of the current study, as exploratory post hoc testing found significantly higher PTSD and alcohol abuse symptoms in participants who endorsed working 10 or more years as a firefighter. Future research should investigate further the relation between years of service, sleep quality, and symptoms of PTSD and alcohol abuse to gain a more thorough understanding of this possibly complex relation. Specifically, future research should investigate the impact years of services on psychological distress and sleep quality in terms of resilience, prolonged effects, and coping skills.

The current research did not allow for a focus on causality; however, future research may be able to focus more on how symptoms develop using a true experimental design. Researchers should investigate baseline sleep disturbances and review sleep data for change at regular time intervals. This would aid in identifying the interaction of sleep disturbances and psychological distress in firefighter populations.

Implications for Social Change

Firefighters provide vital services to communities. They respond to calls for not only fires, but medical emergencies as well. Sleep deprivation is an important issue in this population and may impact the safety of firefighters as well as their ability to perform their job responsibilities. Psychological distress in firefighters is important to investigate in order to help these workers live fulfilling lives and work to the best of their abilities. Data from a recent study from a Denver fire station indicated that firefighters working 48-hour shifts endured significantly more injuries on day two of their shift, then on day one of their shift (Barger et al., 2009). Furthermore, researchers found that the two leading causes of death in firefighter populations were heart disease and motor vehicle accidents, both of which are associated with poor sleep quality (Barger et al., 2009).

Aside from disrupted sleep, shift work can have considerable effects on family and social functioning (Harrington, 2001). Harrington (2001) suggested such strains can cause or contribute to psychological distress and negatively impact quality of life. Implications for social change include encouraging future study regarding improving sleep quality and reducing psychological distress in firefighter populations by using prevention and intervention tactics. Educating firefighters on the implications of the current research and their risk factors for poor sleep quality and mental health symptomology may increase the likelihood of improved life quality and their ability to seek help when appropriate. Information collected by this and similar studies may also serve to educate leaders who make decision regarding scheduling the shifts that firefighters work. Overall, increasing the quality of life in firefighter populations will

likely lead to improved mental health in firefighters, and improved community safety outcomes as firefighters are a population who dedicate their lives to increasing the safety and well-being of their communities.

Proper shift scheduling needs to accommodate normal sleep patterns, taking into account sleep disruptions and sufficient amounts of time to restore circadian sleep rhythms that have been disrupted (Billings & Focht, 2016). Understanding the relationship between disrupted sleep and psychological distress may also help city employers develop a more thorough screening prior to hiring fire staff. The findings of this study may be useful to firefighters and their families when considering what type of shifts they may want to sign up for and should be considered by those in control of setting shift durations for firefighters.

Regardless of sleep quality, duration of shift and psychological distress appeared to be related in the present study. Results from this study did not provide enough information to conclude that working extended shift durations is detrimental to the mental health of firefighters, thus no recommendations for changing shift durations can be made. However, policy makers should focus on incorporating prevention tactics and early interventions for such problems. Policy makers should further ensure employees are aware of the implications of current research regarding, sleep quality, psychological distress, and shift duration.

Conclusion

Firefighters encounter stressful job demands that influence their physical and mental health (Mitani, Fujita, Nakata, & Shirakawa, 2006). Job expectations of

firefighters encompass many risks factors that contribute to higher rates of suicide such as repeated exposure to trauma including fatalities, lack of social support, and sleep disturbances (Riolli & Savicki, 2012). Furthermore, firefighters report feeling stigmatized when disclosing mental health problems, which reduces the likelihood for seeking help and increases the likelihood of suicide (Henderson et al., 2016) or other problematic behaviors. Norwood and Rascati (2012) explained that firefighters view discussing mental health symptoms as it is a sign of weakness and failure, and Violanti (2010) found they perceive that mental health problems may portray them as unstable in the line of duty (Violanti, 2010). This stigma may be a barrier firefighters need to overcome in order to participate in mental health interventions.

Researchers have consistently documented the presence of depression, anxiety, PTSD, alcohol abuse, and poor sleep quality in professional firefighters (Billings & Focht, 2016; Carey et al., 2011). I concluded that when controlling for sleep quality, symptoms of depression were not found to be significantly difference by shift duration; however, symptoms of alcohol abuse and anxiety were significantly higher in the 48-hour shift compared to 24-hour shifts before and after taking sleep quality into account. PTSD symptoms did not differ by group, but a group difference emerged as a trend after taking sleep quality into account. Post Hoc testing further indicated symptoms of PTSD were significantly higher for firefighters who have worked 10 or more years. It is imperative for future researchers to continue to investigate contributing factors to poor mental health and sleep quality in the firefighter population, as they are the individuals who are responsible for first line intervention for fire and medical emergencies within their

communities. It is also pertinent that policy makers take the mental health of these services workers seriously and continue to improve intervention and prevention methods.

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Appendix A: Email Inviting Participants to the Study

Dear Firefighters,

I am a doctoral student at Walden University working to complete my dissertation entitled, "Examining the Relation of Psychological Distress to Shift Work in Firefighters", and I am requesting the participation of career firefighters in my research. I am studying the relation between psychological distress and shift work in firefighters who work 24 and 48-hour shifts. This topic is very important to me. I have several family members who are career firefighters and I understand that your schedules can be very taxing. Learning more about how your schedules relate to mental health is important and may be used to inform policy to influence social change.

I am aiming to recruit a total of 132 firefighters for this study. Your participation should take 25-35 minutes and consists of anonymously answering questionnaires online. I will not be collecting names or any identifying information. I will also not be collecting IP addresses or any tracking information, and there will be no follow-ups to this survey. Your participation is completely voluntary and has no relation to your employment status. There is no way to keep track of who participates and who does not.

The survey will consist of demographic questions as well as those pertaining to sleep quality and psychological distress. A few sample questions:

1) During the past month, how long (in minutes) has that usually taking you to follow sleep each night?

2) During the past month, how often have you had trouble sleeping because you cannot get to sleep within 30 minutes?
3) In the past two weeks did you feel sad or depressed?

4) During the past six months did you worry a lot about embarrassing yourself in front of others?

By clicking on this link I agree to participate in this research, and understand that I can quit at any time, and am acknowledging that I am a professional fire fighter who works the shift selected. There are two links below. Please choose the link most appropriate to the shift you work. By clicking on this link

Here is the link to the survey.

https://www.surveymonkey.com/r/NP9L25C

Please contact me at lindsey8015@gmail.com if you have any questions, comments, or concerns. You may also contact me at this email if you would like to receive findings from this study.

Thank you in advance for willingness to participate in this study.

Sincerely,

Lindsey Lilly

Appendix B: Demographics Information

Please fill in or check the box most appropriate for you.

1. **Age**

2. **Sex**

   Male

   Female

3. **Please specify your race:**

   White

   Black of African American

   Native American or American Indian

   Asian/Pacific Islander

   Multiple or mixed race

   Other (please specify)

4. **What is the highest degree or level of school you have completed?**

   High school graduate, diploma or the equivalent (for example: GED)

   Some college

   Trade/technical/vocational training

   Associates degree

   Bachelor's degree

   Postgraduate degree

5. **How many years have you been employed as a professional firefighter in the city you currently work in?**

Less than 1 year
At least 1 year but less than 3 years
At least 3 years but less than 5 years
At least 5 years but less than 10 years
10 years or more

6. **What is the duration of your schedule shift?**

24-hours
48-hours

Appendix C: Pittsburg Sleep Quality Index

Subject's Initials_____ID#_____Date_____Time_____AM PM

PITTSBURGH SLEEP QUALITY INDEX

INSTRUCTIONS:
The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

   BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

   GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

b) Wake up in the middle of the night or early morning

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

c) Have to get up to use the bathroom

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

d) Cannot breathe comfortably

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

e) Cough or snore loudly

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

f) Feel too cold

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

g) Feel too hot

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

h) Had bad dreams

Not during the past month	Less than once a week	Once or twice a week	Three or more times a week

i) Have pain

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

j) Other reason(s), please describe

_____

How often during the past month have you had trouble sleeping because of this?

Not during the past month	Less than once a week	Once or twice a week	Three or more times a week

6 During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good

Fairly bad _____

Very bad _____

7 During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

8 During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

9 During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____

Only a very slight problem

Somewhat of a problem

A very big problem _____

10. Do you have a bed partner or room mate?

No bed partner or room mate

Partner/room mate in other room _____

Partner in same room, but not same bed _____

Partner in same bed _____

If you have a room mate or bed partner, ask him/her how often in the past month you have had

a) Loud snoring

Not during the past month Less than once a week Once or twice a week Three or more times a week

b) Long pauses between breaths while asleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

c) Legs twitching or jerking while you sleep

Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____

Appendix D: Psychiatric Diagnostic Screening Questionnaire

Name: Sample Age: 45 ID #: Sample

Date: 6-3-02 Gender: ☐ Male ☒ Female Education (Years Completed): 14

Ethnicity: ☒ Asian ☐ Black/African American ☐ Hispanic/Latino ☐ Native American ☐ Native Hawaiian/Other Pacific Islander ☐ White ☐ Other

PDSQ
TEST BOOKLET
Mark Zimmerman, M.D.
Published by
WESTERN PSYCHOLOGICAL SERVICES
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Publishers and Distributors

This form asks you about emotions, moods, thoughts, and behaviors. For each question, check the box in the *Yes* column if it describes how you have been acting, feeling, or thinking. If the item does not apply to you, check the box in the *No* column. **Please answer every question.**

Yes	No		DURING THE PAST 2 WEEKS...
☒	☐	1.	...did you feel sad or depressed?
☒	☐	2.	...did you feel sad or depressed for most of the day, nearly every day?
☒	☐	3.	...did you get less joy or pleasure from almost all of the things you normally enjoy?
☒	☐	4.	...were you less interested in almost all of the activities you are usually interested in?
☐	☒	5.	...was your appetite significantly *smaller* than usual nearly every day?
☐	☒	6.	...was your appetite significantly *greater* than usual nearly every day?
☐	☒	7.	...did you sleep at least 1 to 2 hours *less* than usual nearly every day?
☒	☐	8.	...did you sleep at least 1 to 2 hours *more* than usual nearly every day?
☐	☒	9.	...did you feel very jumpy and physically restless, and have a lot of trouble sitting calmly in a chair, nearly every day?
☒	☐	10.	...did you feel tired out nearly every day?
☒	☐	11.	...did you frequently feel guilty about things you have done?
☒	☐	12.	...did you put yourself down and have negative thoughts about yourself nearly every day?
☒	☐	13.	...did you feel like a failure nearly every day?
☒	☐	14.	...did you have problems concentrating nearly every day?
☒	☐	15.	...was decision making more difficult than normal nearly every day?
☒	☐	16.	...did you frequently think of dying in passive ways like going to sleep and not waking up?
☒	☐	17.	...did you wish you were dead?
☒	☐	18.	...did you think you'd be better off dead?
☒	☐	19.	...did you have thoughts of suicide, even though you would not really do it?
☐	☒	20.	...did you seriously consider taking your life?
☐	☒	21.	...did you think about a specific way to take your life?

☐	☐	22.	Have you *ever experienced* a traumatic event such as combat, rape, assault, sexual abuse, or any other extremely upsetting event?
☒	☐	23.	Have you *ever witnessed* a traumatic event such as rape, assault, someone dying in an accident, or any other extremely upsetting incident?
			DURING THE PAST 2 WEEKS...
☒	☐	24.	...did thoughts about a traumatic event frequently pop into your mind?
☒	☐	25.	...did you frequently get upset because you were thinking about a traumatic event?
☐	☒	26.	...were you frequently bothered by memories or dreams of a traumatic event?
☐	☒	27.	...did reminders of a traumatic event cause you to feel intense distress?
☐	☒	28.	...did you try to block out thoughts or feelings related to a traumatic event?
☐	☒	29.	...did you try to avoid activities, places, or people that reminded you of a traumatic event?
☐	☒	30.	...did you have flashbacks, where it felt like you were reliving a traumatic event?
☐	☒	31.	...did reminders of a traumatic event make you shake, break out into a sweat, or have a racing heart?
☐	☒	32.	...did you feel distant and cutoff from other people because of having experienced a traumatic event?
☒	☐	33.	...did you feel emotionally numb because of having experienced a traumatic event?
☐	☒	34.	...did you give up on goals for the future because of having experienced a traumatic event?
☐	☒	35.	...did you keep your guard up because of having experienced a traumatic event?
☐	☒	36.	...were you jumpy and easily startled because of having experienced a traumatic event?

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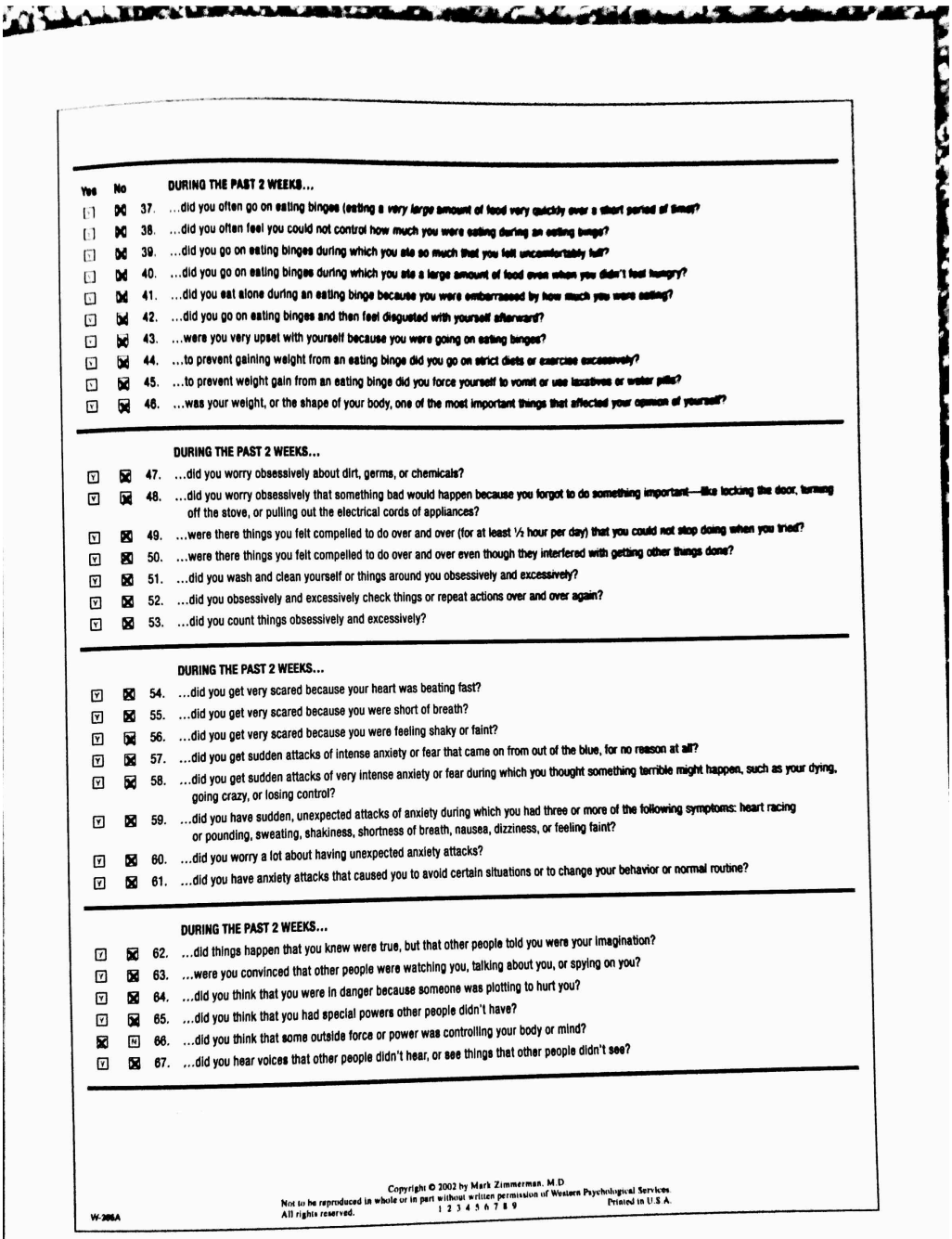

Yes	No		DURING THE PAST 2 WEEKS...
[Y]	[N]	37.	...did you often go on eating binges (eating a *very large* amount of food very quickly over a short period of time)?
[Y]	[N]	38.	...did you often feel you could not control how much you were eating during an eating binge?
[Y]	[N]	39.	...did you go on eating binges during which you ate so much that you felt uncomfortably full?
[Y]	[N]	40.	...did you go on eating binges during which you ate a large amount of food even when you didn't feel hungry?
[Y]	[N]	41.	...did you eat alone during an eating binge because you were embarrassed by how much you were eating?
[Y]	[N]	42.	...did you go on eating binges and then feel disgusted with yourself afterward?
[Y]	[N]	43.	...were you very upset with yourself because you were going on eating binges?
[Y]	[N]	44.	...to prevent gaining weight from an eating binge did you go on strict diets or exercise excessively?
[Y]	[N]	45.	...to prevent weight gain from an eating binge did you force yourself to vomit or use laxatives or water pills?
[Y]	[N]	46.	...was your weight, or the shape of your body, one of the most important things that affected your opinion of yourself?

			DURING THE PAST 2 WEEKS...
[Y]	[N]	47.	...did you worry obsessively about dirt, germs, or chemicals?
[Y]	[N]	48.	...did you worry obsessively that something bad would happen because you forgot to do something important—like locking the door, turning off the stove, or pulling out the electrical cords of appliances?
[Y]	[N]	49.	...were there things you felt compelled to do over and over (for at least ½ hour per day) that you could not stop doing when you tried?
[Y]	[N]	50.	...were there things you felt compelled to do over and over even though they interfered with getting other things done?
[Y]	[N]	51.	...did you wash and clean yourself or things around you obsessively and excessively?
[Y]	[N]	52.	...did you obsessively and excessively check things or repeat actions over and over again?
[Y]	[N]	53.	...did you count things obsessively and excessively?

			DURING THE PAST 2 WEEKS...
[Y]	[N]	54.	...did you get very scared because your heart was beating fast?
[Y]	[N]	55.	...did you get very scared because you were short of breath?
[Y]	[N]	56.	...did you get very scared because you were feeling shaky or faint?
[Y]	[N]	57.	...did you get sudden attacks of intense anxiety or fear that came on from out of the blue, for no reason at all?
[Y]	[N]	58.	...did you get sudden attacks of very intense anxiety or fear during which you thought something terrible might happen, such as your dying, going crazy, or losing control?
[Y]	[N]	59.	...did you have sudden, unexpected attacks of anxiety during which you had three or more of the following symptoms: heart racing or pounding, sweating, shakiness, shortness of breath, nausea, dizziness, or feeling faint?
[Y]	[N]	60.	...did you worry a lot about having unexpected anxiety attacks?
[Y]	[N]	61.	...did you have anxiety attacks that caused you to avoid certain situations or to change your behavior or normal routine?

			DURING THE PAST 2 WEEKS...
[Y]	[N]	62.	...did things happen that you knew were true, but that other people told you were your imagination?
[Y]	[N]	63.	...were you convinced that other people were watching you, talking about you, or spying on you?
[Y]	[N]	64.	...did you think that you were in danger because someone was plotting to hurt you?
[Y]	[N]	65.	...did you think that you had special powers other people didn't have?
[Y]	[N]	66.	...did you think that some outside force or power was controlling your body or mind?
[Y]	[N]	67.	...did you hear voices that other people didn't hear, or see things that other people didn't see?

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Figure 1 *(continued)*
Completed PDSQ Test Booklet and Summary Sheet

NOTE: MOST OF THE FOLLOWING QUESTIONS REFER TO THE PAST 6 MONTHS.

Yes	No		DURING THE PAST 6 MONTHS...
☐	☒	68.	...did you regularly avoid any situations because you were afraid they'd cause you to have an anxiety attack?
		69.	...did any of the following make you feel fearful, anxious, or nervous because you were afraid you'd have an anxiety attack in the situation?
☐	☒	a.	going outside far away from home
☐	☒	b.	being in crowded places
☐	☒	c.	standing in long lines
☐	☒	d.	being on a bridge or in a tunnel
☐	☒	e.	traveling in a bus, train, or plane
☐	☒	f.	driving or riding in a car
☐	☒	g.	being home alone
☐	☒	h.	being in wide-open spaces (like a park)
☐	☒	70.	...did you almost always get very anxious as soon as you were in any of the above situations?
☐	☒	71.	...did you avoid any of the above situations because they made you feel anxious or fearful?

			DURING THE PAST 6 MONTHS...
☒	☐	72.	...did you worry a lot about embarrassing yourself in front of others?
☒	☐	73.	...did you worry a lot that you might do something to make people think that you were stupid or foolish?
☐	☒	74.	...did you feel very nervous in situations where people might pay attention to you?
☐	☒	75.	...were you extremely nervous in social situations?
☐	☒	76.	...did you regularly avoid any situations because you were afraid you'd do or say something to embarrass yourself?
		77.	...did you worry a lot about doing or saying something to embarrass yourself in any of the following situations?
☐	☒	a.	public speaking
☐	☒	b.	eating in front of other people
☐	☒	c.	using public restrooms
☐	☒	d.	writing in front of others
☒	☐	e.	saying something stupid when you were with a group of people
☐	☒	f.	asking a question when in a group of people
☐	☒	g.	business meetings
☐	☒	h.	parties or other social gatherings
☐	☒	78.	...did you almost always get very anxious as soon as you were in any of the above situations?
☐	☒	79.	...did you avoid any of the above situations because they made you feel anxious or fearful?

			DURING THE PAST 6 MONTHS...
☐	☒	80.	...did you think that you were drinking too much?
☐	☒	81.	...did anyone in your family think or say that you were drinking too much, or that you had an alcohol problem?
☐	☒	82.	...did friends, a doctor, or anyone else think or say that you were drinking too much?
☐	☒	83.	...did you think about cutting down or limiting your drinking?
☐	☒	84.	...did you think that you had an alcohol problem?
☐	☒	85.	...because of your drinking did you have problems in your marriage; at your job; with your friends or family; doing household chores; or in any other important area of your life?

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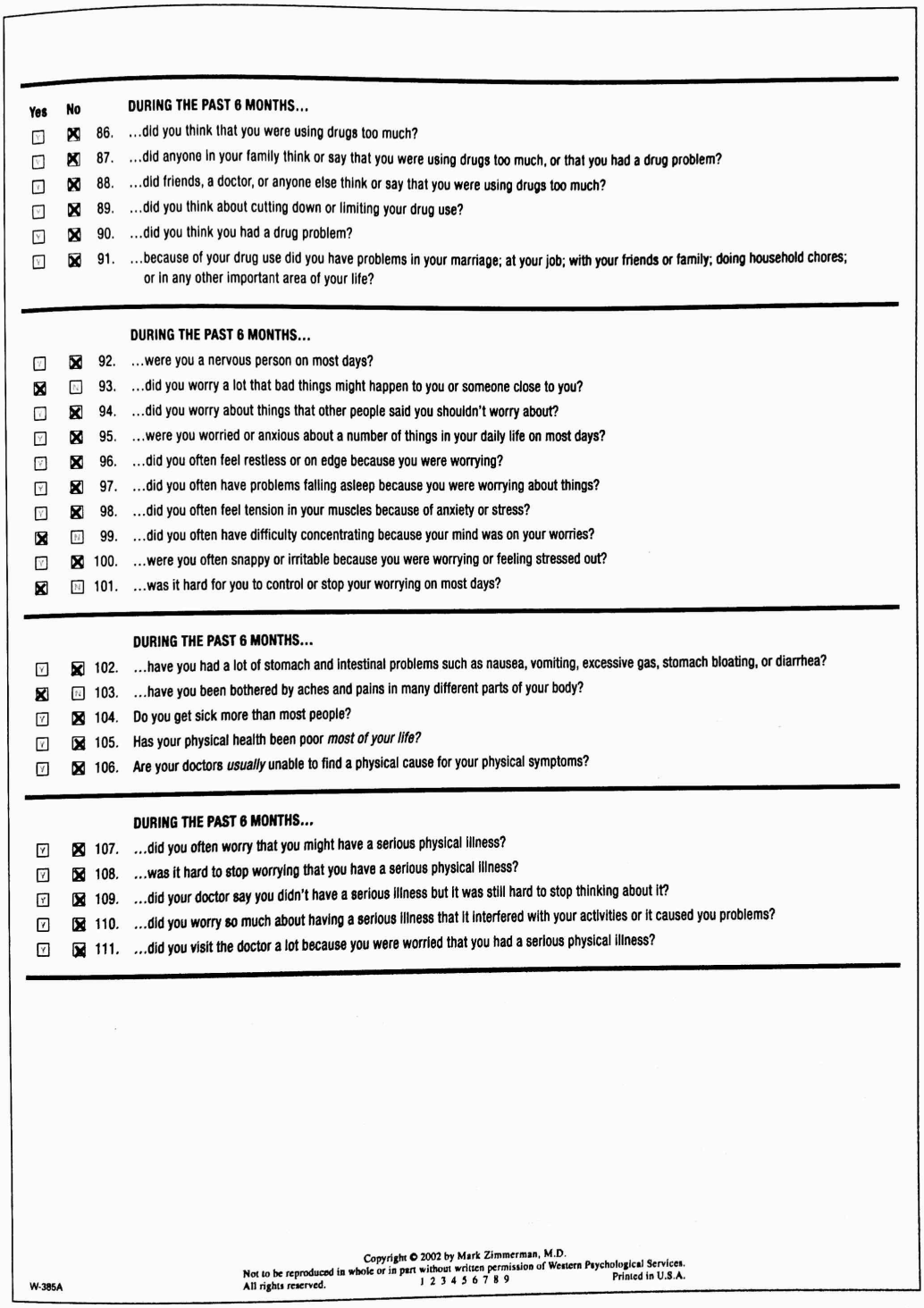

Yes	No		DURING THE PAST 6 MONTHS...
☐	☒	86.	...did you think that you were using drugs too much?
☐	☒	87.	...did anyone in your family think or say that you were using drugs too much, or that you had a drug problem?
☐	☒	88.	...did friends, a doctor, or anyone else think or say that you were using drugs too much?
☐	☒	89.	...did you think about cutting down or limiting your drug use?
☐	☒	90.	...did you think you had a drug problem?
☐	☒	91.	...because of your drug use did you have problems in your marriage; at your job; with your friends or family; doing household chores; or in any other important area of your life?

			DURING THE PAST 6 MONTHS...
☐	☒	92.	...were you a nervous person on most days?
☒	☐	93.	...did you worry a lot that bad things might happen to you or someone close to you?
☐	☒	94.	...did you worry about things that other people said you shouldn't worry about?
☐	☒	95.	...were you worried or anxious about a number of things in your daily life on most days?
☐	☒	96.	...did you often feel restless or on edge because you were worrying?
☐	☒	97.	...did you often have problems falling asleep because you were worrying about things?
☐	☒	98.	...did you often feel tension in your muscles because of anxiety or stress?
☒	☐	99.	...did you often have difficulty concentrating because your mind was on your worries?
☐	☒	100.	...were you often snappy or irritable because you were worrying or feeling stressed out?
☒	☐	101.	...was it hard for you to control or stop your worrying on most days?

			DURING THE PAST 6 MONTHS...
☐	☒	102.	...have you had a lot of stomach and intestinal problems such as nausea, vomiting, excessive gas, stomach bloating, or diarrhea?
☒	☐	103.	...have you been bothered by aches and pains in many different parts of your body?
☐	☒	104.	Do you get sick more than most people?
☐	☒	105.	Has your physical health been poor *most of your life?*
☐	☒	106.	Are your doctors *usually* unable to find a physical cause for your physical symptoms?

			DURING THE PAST 6 MONTHS...
☐	☒	107.	...did you often worry that you might have a serious physical illness?
☐	☒	108.	...was it hard to stop worrying that you have a serious physical illness?
☐	☒	109.	...did your doctor say you didn't have a serious illness but it was still hard to stop thinking about it?
☐	☒	110.	...did you worry so much about having a serious illness that it interfered with your activities or it caused you problems?
☐	☒	111.	...did you visit the doctor a lot because you were worried that you had a serious physical illness?

1 2 3 4 5 6 7 8 9 Printed in U.S.A.
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Figure 1 ***(continued)***
Completed PDSQ Test Booklet and Summary Sheet

Appendix E: Permission for Use of PSQI

From: Gasiorowski, Mary <GasiorowskiMJ@upmc.edu>
Sent: Friday, April 13, 2018 4:42:23 PM
To: Lindsey Lilly
Subject: Request to use the Pittsburgh Sleep Quality Index (PSQI)

Sent on behalf of Dr. Buysse

Dear Lindsey,

You have my permission to use the PSQI for your research study. You can find the instrument, scoring instructions, the original article, links to available translations, and other useful information at www.sleep.pitt.edu under the Research/Instruments tab. Please ensure that the PSQI is accurately reproduced in any on-line version (including copyright information). We request that you do cite the 1989 paper in any publications that result.

Note that Question 10 is not used in scoring the PSQI. This question is for informational purposes only, and may be omitted during data collection per requirements of the particular study.

Good luck with your research.

Sincerely,

Daniel J. Buysse, M.D.
Professor of Psychiatry and Clinical and Translational Science
University of Pittsburgh School of Medicine
E-1123 WPIC
3811 O'Hara St.
Pittsburgh, PA 15213
T: (412) 246-6413
F: (412) 246-5300
buyssedj@upmc.edu

From: uopscc@gmail.com [mailto:uopscc@gmail.com]
Sent: Tuesday, April 10, 2018 12:20 PM
To: marywpic@gmail.com; Gasiorowski, Mary <GasiorowskiMJ@upmc.edu>
Subject: Request to use the Pittsburgh Sleep Quality Index (PSQI): New respondent (#1003)

Request to use the Pittsburgh Sleep Quality Index (PSQI) has received a new response:

Date: **2018-04-10**
Name: **Lindsey Lilly**
Email Address: lindsey.lilly@waldenu.edu
Organization / Institution: **Walden University**
Name / Brief description of project: **Examining the Prevalence of Mental Health Symptoms of Firefighters in Relation to Shift Work**
Funding Source **Not Funded**
Other Funding Source (if applicable):
Modification Requested (if needed)
Additional Comments