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Self-efficacy Facilitated Sleep, Physical Activity, Towards Regulating BMI of Permanent 12-hour shift Registered Nurses

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This is to certify that the doctoral dissertation by

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Abstract

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Veronica Brock

MS, University of Maryland, 2011

BS, Towson State University, 1994

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health – Epidemiology

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Abstract

Shift workers with obesity-related comorbidities have reduced health and lifespan. Registered nurses (RNs) are ranked fifth among the most obese professionals in the United States, according to recent studies. Researchers have not examined the relationship between self-efficacy, physical activity, sleep, and 12-hour night shift RNs despite demonstrating that self-efficacy inspires confident health habits in the general population. For this quantitative study, the social cognitive theory was applied to study the interrelationships among the independent variables, sleep self-efficacy, self-efficacy for physical activity, and body mass index (BMI), with multiple dependent demographic variables, quality and quantity of sleep, and the level and quantity of exercise. How much does BMI affect the connection between sleep self-efficacy and the amount and quality of sleep for RNs who work 12-hour shifts? Additionally, can sleep self-efficacy and the shift worked predict the amount and quality of sleep, and can self-efficacy for physical activity and shift worked predict participation in physical activity among RNs? Using a cross-sectional, correlational design, a survey generated valid responses from 266 largely African American RNs. Regression results showed that self-efficacy alone does not ensure compliance with health regimens within this population. Significant negative relationships were discovered between sleep self-efficacy and quality of sleep, exercise self-efficacy and exercise adherence, and exercise self-efficacy and BMI. The insights gained from this investigation can help individuals and organizations promote healthy habits among night shift nurses.

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Dedication

I dedicate this work to my parents, and two sisters who unfortunately were not able to see it completed. To Yvonne and Swen, my children, know that anything that lies within you can be manifested into actuality.

Acknowledgments

First and foremost, I want to express my gratitude to my Almighty God for granting me the strength, patience, and wisdom that I needed throughout this journey. Without His divine support, I wouldn't have had the perseverance, resilience, expertise, or emotional stability to achieve success.

Secondly, would like to express my heartfelt appreciation to my sister Lucy, and my children, Swen, and Yvonne, for their unwavering support throughout my journey. You have been a constant basis of strength, providing me with emotional support that has been a valuable source of endurance, motivating me to persevere even during the most challenging times. Your patience and understanding have been greatly appreciated, and I am truly grateful for your presence in my life.

I am indebted to several friends and colleagues who cooperated with me on this study. Without their assistance, this study would not have been possible. Thank you for understanding the importance of my work on this study and for your help in disseminating the survey. I hold you all in high regard and am grateful for your contributions.

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Introduction

In his call to action in 2001, the Surgeon General referred to obesity as the most important new health challenge (U.S. Department of Health and Human Services, 2001). At that time, the Nutritional Examination Survey (NHANES) reported a 34% prevalence of obesity for adults between the ages of 20 to 74 in the United States (Mitchell et al., 2011). The year 2015 to 2016 showed a prevalence of 39.6% (Hales et al. 2017). Despite controlling obesity among the adolescent population since the 1900s, obesity among adults continues to escalate. This trend is especially notable in the top five most obese professions: truck drivers, transport services, police officers and firefighters, cleaning services, and nurses and orderlies (Bonauto et al., 2014). A notable commonality amongst these professions was shiftwork.

Poor sleep and lack of physical activity (PA) increase shift workers' risk for elevated body mass index (BMI) (Braveman & Gottlieb, 2014; Reed et al., 2018). Shiftwork alters the natural sleep-wake cycle of workers and influences these workers' personal and social lives. Night shift workers tend to gain weight and have a more challenging time losing weight than workers who only work daytime shifts (Wang et al., 2018). Adequate sleep and PA are essential for weight loss. Some researchers have determined that self-efficacy, or an individual's confidence in adjusting to change, may influence that individual's capacity to maintain healthy PA and sleep regimens (Atkinson et al., 2008; Fanning et al., 2017).

Shiftwork disrupts the normal daily family routine, leading to a lack of time to exercise. In addition to the lack of time, circadian disruption promotes daytime sleepiness and drains the shift workers' energy decreasing the desire to engage in PA (Grandner et al., 2020). Shiftwork alters the natural sleep-wake cycle of workers and influences these workers' flexibility to maintain a normal life cycle.

Self-efficacy, or an employee's confidence in adhering to recommended sleep and PA levels, is adversely impacted by shiftwork (Fanning et al., 2017). Working nightshifts impacts every facet of an individual's private personal life, including, but not limited to the relationship with spouses or significant others, childcare, attendance to and scheduling of children's activities, scheduling and preparing meals, and completing home chores (Shiffer et al., 2018; Skoufi et al., 2017). Sleep and PA are often neglected in place of more pressing daily duties.

Self-efficacy is so essential in successful weight control and weight loss that it has become the basis of effective modern weight loss programs such as NOOM, CoreLife, and the Mayo Clinic (Chandler et al., 2019; CoreLife, 2020; Kim et al., 2017). Studies supporting self-efficacy as a motivational resource in successfully inspiring the general population to better exercise regimens are plentiful (Faghri et al., 2016: French et al., 2014). Fewer studies are dedicated to applying self-efficacy-inducing PA patterns of the 12-hour shift worker (John et al., 2020; Raney & Zanten, 2019). After an exhaustive search, I was unable to locate studies in which researchers examined the impact of self-efficacy in sustaining a healthy sleep schedule within the night shift population, and none

addressing the direct utilization of self-efficacy in sleep promotion within the night shift population.

As PA and sleep are replaced by extended workdays and complex lifestyle demands, obesity can ultimately increase, resulting in debilitating and deadly health conditions. Permanent night shift workers are 29% more likely to be obese than rotating shift workers (Sun et al., 2018). Shift work is characterized by conditions under which obesity is expected to increase, subjecting the night shift population to comorbidities that increase the propensity for morbidity and mortality. Developing effective strategies to facilitate healthy behaviors demands interventions that promote sustained sleep, and PA habits within the nightshift work population are needed to curtail the increasing prevalence of obesity. With no noted successful national interventions in more than three decades (Ng et al., 2014), Registered nurses (RNs) are in an excellent position to effect lifelong changes in the health-promoting behaviors of sleep and PA amongst their peers and within the general population.

Individual-level interventions are necessary to empower RNs assigned to 12-hour nightshifts to establish a heightened awareness of the importance of sleep and PA for their sustained health. These workers can use proper planning to adjust schedules and implement strategies to incorporate the recommended amounts of both sleep and exercise. Strategies to regulate these activities involve first equipping the RNs with validated knowledge regarding the effectiveness of regulating sleep and PA in weight control and weight loss. Proper rest and PA could result in the health care worker plan strategies for assessing and disseminating information throughout their workforce and

community. Preventing weight gain within the 12-hour nightshift population may have the same equitable implications for long-term weight management as seen within the general population.

It is unknown if the levels of self-efficacy for sleep and exercise are different in 12-hour night nurses than for nurses working other shifts. It is unknown if working 12-hour shifts alters the worker's confidence in maintaining a healthy exercise and sleep schedule. I expounded on the current level of self-efficacy for PA and sleep self-efficacy among night-shift workers and the application of these levels in predicting if impacting their current levels of self-efficacy would translate into positive sleep and exercise habits among these workers. With this foundation, it would be easier to formulate proactive goals toward improving or enhancing health practices that impact longevity within 12-hour shift workers.

Background

As society evolves and businesses become more competitive, this results in the need for continuous services. Many companies have converted to a 24-hour workday to accommodate consumers' needs, manifesting in workers' adverse social, environmental, biological, and medical well-being (Khan et al., 2018; Schnall et al., 2009; Von Treuer et al., 2014). It is well documented that lack of sleep and PA potentiates the risk for elevated BMI (Dennis et al., 2016; Liu et al., 2022; Qian et al., 2013). Numerous researchers have examined the impact of shiftwork on health maintenance, emphasizing diet, PA, and sleep (Brum et al., 2015; Kecklund & Axelsson, 2016; Kulkami et al., 2020). Less studied is the influence of self-efficacy on the 12-hour night shift workers'

adherence to endorsed sleep and PA recommendations and that relationship to an individual's BMI while working the 12-hour night shift.

More than 2.7 million individuals were employed in the United States as of May 2015 (U.S. Bureau of Labor Statistics, 2021), with RNs making up the largest workforce in the nation. Over half the nurses in this workforce are estimated to be obese or overweight (Williams, 2017). As with most shift workers, nurses working the 12-hour night shift are particularly vulnerable to the weight gain associated with variations in PA and hours of sleep. Additionally, a cause of obesity or excess weight gain among RNs is the failure to maintain a healthy lifestyle when assigned to night shift work (Bakhshi et al., 2015; Miranda et al., 2015). Scheduling issues with balancing demands of family and daily tasks may interfere with shift-workers' ability to include sleep and exercise in their daily routine. Poor sleep hygiene and inadequate physical training predispose shift workers to health practices known to increase the propensity for obesity cancer (Anbazhagan et al., 2016; Chellappa et al., 2019; Marinache, 2016; Vallieres et al., 2014).

Best practice dictates that the workplace is the optimal venue for promoting PA. Employee health is also essential for organizational success (Baxter et al., 2016). Initiating and maintaining healthy behaviors reduces the susceptibility to developing life-threatening diseases and improves the overall quality of life by lowering workplace-related illnesses and injuries incurred through obesity-related conditions such as hypertension and congestive heart failure (CHF) (Kokkinos, 2014). The need for a healthy workforce has compelled many employers to alter work environments and

implement intervention programs to foster engagement in and maintenance of health-promoting behaviors among employees (Caperchione et al., 2015; Mackison et al., 2016). These interventions are often focused on healthy eating as part of a general health regimen (Mackison et al., 2016) but do not address PA or proper and adequate sleep.

Problem Statement

Nightshift work negatively impacts health behaviors and other factors contributing to obesity, causing obesity to remain a significant health problem among health care workers (McHill & Wright Jr, 2017; Sun M. et al., 2018). Although research on the cause and consequences of obesity abounds, there is little evidence examining self-efficacy's role or impact on PA and sleep habits to maintain a healthy BMI when working 12- hour night shifts. Multiple biological, physiological, and sociological systems are adversely impacted by shiftwork (Kervezee et al., 2020). Preventing weight gain within the 12-hour night-shift population may have equitable implications for long-term weight management among other persons employed in shiftwork.

With continued trends in the rate of obesity, it is estimated that by the year 2030, 48.9% of the U.S. population will be obese, with nearly 1 in 4 adults calculated to be severely obese (Ward et al., 2019). Among the general population, obesity is associated with cardiovascular disease (CVD), hypertension, diabetes, and an increase in overall morbidity and mortality (Jokinen, 2015; Kwagyan et al., 2015; Masakazu et al., 2014; Randall et al., 2014).

The impact of shift work on sleep and PA levels results in higher levels of obesity among these workers. PA and the proper amount of sleep are essential factors in

successfully controlling BMI and weight loss within the general population (Armitage et al., 2014). The National Sleep Foundation recommends that adults ages 18 to 64 get 7 to 9 hours of sleep per night (Hirshkowitz et al., 2015), as well as 150 minutes of moderate-intensity PA per week to maintain optimal health (Garber et al., 2011). Working at night can negatively affect sleep patterns by interrupting the normal sleep cycle and decreasing the opportunity for achieving PA levels, thus negatively affecting BMI (Brum et al., 2020; Singer et al., 2016; Takahashi, 2014). Scheduling issues with balancing demands of family and daily tasks may interfere with the shift worker's ability to include sleep and exercise in their daily routine. This predisposes the shift worker to health practices that increase the propensity for obesity.

Notwithstanding the effects of shiftwork on the employee and the knowledge gained, there is a lack of evidence on how shiftwork relates to RNs self-efficacy to adhere to recommended sleep and exercise regimens. Despite the indication that there is a relationship between sustained PA sleep recommendations, there is a lack of information on levels of self-efficacy for exercise and self-efficacy for sleep among hospital nurses working 12-hour shifts. In this quantitative study, I examined the relationship between sleep and exercise self-efficacy among RNs working 12-hour night shifts. I assessed the participant's age, gender, ethnicity, the shift worked, and cohabitation status and analyzed that relationship.

Purpose of the Study

I addressed the following purposes in this study:

1. Purpose 1: To assess the association between demographic variables and self-efficacy for sleep (adhering to 7-9 hours of sleep per night) and PA self-efficacy for adherence (150 minutes of moderate-intensity PA per week) among RNs working a 12-hour shift engaged in direct patient care
2. Purpose 2: To evaluate the relationship between BMI and self-efficacy for sleep with self-reported quantity and quality of sleep among RNs working a 12-hour shift
3. Purpose 3: To establish whether there is a difference in the measured self-efficacy for sleep and reported quantity of sleep per day among RNs who work different shifts (i.e., day and night shifts).
4. Purpose 4: To identify the relationship between exercise self-efficacy and the amount of reported level of exercise among shift workers by shift worked (i.e., day shift and night shift).

I assessed the independent variable, self-efficacy, with the dependent variables, the self-reported amount of PA, the quantity of sleep, quality of sleep, and BMI among RNs who work in direct patient care. To operationalize self-efficacy, I evaluated the concepts of self-control, self-efficacy in overcoming barriers, self-efficacy expectations, and outcome self-efficacy in terms of which phenomenon within these concepts could accurately be measured to determine their applicability in improving or maintaining the 12-hour night-shift workers' health. I examined self-efficacy for sleep and exercise and obesity factors among major ethnic groups.

Research Question(s) and Hypotheses

The research questions which guided this study were:

Research Question 1 (RQ1): What is the association between sleep self-efficacy and self-efficacy for PA, PA adherence, and BMI and the demographic variables age, gender, race/ethnicity, shift worked, and cohabitation status among RNs working a 12-hour shift?

Null Hypothesis ($H_0$1): There is no association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working a 12-hour shift.

Alternative Hypothesis (H_a1): There is an association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working a 12-hour shift.

Research Question 2 (RQ2): To what extent does BMI mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts?

Null Hypothesis ($H_0$2): BMI does not mediate the association between sleep self-efficacy, quantity of sleep, and quality of sleep among RNs working 12-hour shifts.

Alternative Hypothesis (H_a2): BMI does mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts.

Research Question 3 (RQ3): To what extent do self-efficacy for PA and BMI predict PA adherence among RNs working 12-hour shifts?

Null Hypothesis ($H_0$3): There is no predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

Alternative Hypothesis (H_a3): There is a predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

Research Question 4 (RQ4): To what extent do sleep self-efficacy and the shift worked predict the quantity of sleep among RNs?

Null Hypothesis ($H_0$4): There is no predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.

Alternative Hypothesis (H_a4): There is a predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.

Research Question 5 (RQ5): To what extent do sleep self-efficacy and the shift worked predict the quality of sleep among RNs?

Null Hypothesis ($H_0$5): There is no predictive relationship between sleep self-efficacy and the shift worked and quality of sleep among RNs.

Alternative Hypothesis (H_a5): There is a predictive relationship between sleep self-efficacy and the shift worked and quality of sleep among RNs.

Research Question 6 (RQ6): To what extent does self-efficacy for PA and shift worked predict participation in PA among RNs?

Null Hypothesis ($H_0$6): There is no predictive relationship between self-efficacy for PA and shift worked and participation in PA among RNs.

Alternative Hypothesis (H_a6): There is a predictive relationship between self-efficacy for PA and shift worked and participation in PA among RNs.

I measured the variables sleep and PA in hours per week and level of exercise, respectively. Nurses from all shifts were recruited and compared to nurses working 12-hour day and night shifts. Twelve-hour night and day shift workers were considered those nurses working a predominantly permanent 72-hour week schedule, rotating less than three shifts a month and working at least 3 days a week. The bridge 8-hour shift is not included in the analysis.

Theoretical Framework

Since Bandura's introduction of the social cognitive theory (SCT) in 1977, the self-efficacy component of this theory has been applied to several health-hazardous behaviors. In the early 80s, the construct of self-efficacy was successfully used to assist smokers in quitting (DiClemente, 1981). More recent studies have supported those findings and shown that self-efficacy influences smoking cessation (Shadel et al., 2017). After successfully applying the self-efficacy concept to smoking cessation, this construct was used with interventions for other addictive behaviors such as alcohol abuse and eating disorders (Diclemente, 1986).

Current studies highlight the engagement of self-efficacy in regulating pain and enhancing sleep and exercise. Bandura (1994) defined self-efficacy as a person’s assessment of their ability to formulate a plan of action and their beliefs about their ability to adhere to that plan to affect the desired outcome. This theory differs from other health behavioral theories because it correlates directly to the behavior. In theories such

as the theory of planned behavior (Ajzen, 1991), the focus is on the traits affecting successful execution and intention, whereas the SCT reflects directly on the behavior. In the theory of planned behavior, the focus is on the complexity of the task, not the executor's capability to overcome that task. The predictive capabilities of the SCT were also found to be more effective than other theories, for example, the theory of reasoned action, in predicting exercise behavior (Dzewaltowski, 1989).

Much like self-efficacy for PA, various current studies evaluate the incorporation of self-efficacy to improve the quality and quantity of sleep. Problems associated with sleep conditions such as obstructive sleep apnea, insomnia, and nightmares were mitigated or resolved through modulation of the patient's self–efficacy for sleep beliefs, increasing the quality and quantity of sleep for patients suffering from these sleep-related problems (Adegbola, 2015; Bihlmaier & Schlarb, 2016; Rutledge et al., 2013; Schlarb et al., 2015). In a 12- month ecological momentary assessment study designed to evaluate the factors associated with relapse after intentional weight loss, Burke et al. (2014) found that both quality and quantity of sleep are proportionally related to the participant's level of self-efficacy and that partakers' beliefs about their ability to overcome barriers which prevented these research participants from getting enough sleep. From this study, the researchers concluded that persons with higher self-efficacy might have a poor night's sleep one day but take measures to correct this over the next few days. A later study involving 60 to 75-year-old participants supported these findings across the elderly population (Nazan et al., 2014).

Chapter 2 includes a discussion of how the SCT was a practical framework to measure the effect of sleep self-efficacy on the quality and quantity of sleep and self-efficacy for PA amongst nurses working the 12-hour night shift. Enhancing self-efficacy effectively promotes PA and sleep behaviors (Baron et al., 2017; French et al., 2014; Warner et al., 2014). Understanding the mitigating effects of self-efficacy on the behaviors of 12-hour day and night shift workers could assist these workers in designing therapeutic interventions to enhance or improve PA and sleep practices.

Nature of the Study

In this study, I used an intuitive quantitative, correlational study design. I used a cross-sectional structure and included RNs working in direct patient care. The cross-sectional design is an efficient and inexpensive method for evaluating specific conditions within the immediate patient care population (Mainder, 2016). Because my goal was to use the information to motivate workers to improve sustainable self-care behaviors and as a foundation for policy and practice interventions, the cross-sectional design was a suitable method for collecting and analyzing these data. According to studies, cross-sectional design is the most practical technique for studying, collecting, and analyzing survey data related to this problem (Mann, 2003; Sedgwick, 2014).

I assessed the independent variable, self-efficacy for exercise, using the dependent variable, the self-reported amount of PA. I also evaluated self-efficacy and reported quantity of sleep, quality of sleep, and BMI among RNs who work in direct patient care. I collected this information through a 56-question questionnaire. The survey was distributed throughout the nursing population through email and social networks directly

linked to the questionnaire. This correspondence included a description of the study and the research goals.

Several intervening limiting characteristics of the nurse practices impact self-efficacy for overcoming barriers and, therefore, could have potentially affected the results of this study (Miller et al., 2019; Reid et al., 2010). These limiting characteristics included the demographic variables: gender, age, and cohabitation status. Additional related characteristics included the number of hours of sleep, the amount of exercise, the shift worked, the number of years on the shift, the number of shifts worked simultaneously, and the current height and weight.

I analyzed the data from the questionnaire using multiple regression analysis. I divided the participants into cohorts, including 12-hour dayshift, 8-hour day, 8-hour night, 8-hour overnight, and 12-hour nightshift workers. I analyzed the variable self-efficacy using the survey results for the exercise self-efficacy scale (ESE) for PA, self-efficacy for sleep scale (SE-S) to measure sleep quantity, and Pittsburgh Sleep Quality Index (PSQI) to measure sleep quality, in addition to calculated BMI.

Definitions

The key terms used in this study included:

Body Mass Index: The mathematical division of a person's weight in kilograms divided by the square root of the height in meters and used to screen for weight categories that may lead to disease (CDC, 2015).

Comorbidity: Two or more disorders or illnesses occurring in the same person with or without regard to timing (National Institute on Drug Abuse, 2018)

Congestive Heart disease: The build-up of fluid around the heart causing it to beat ineffectively (Tuttolomondo et al., 2020).

Coronary Artery Disease (CAD): A disease affecting the arteries that supply blood and oxygen to the heart (Malakar et al., 2019).

Demographics: Measurement of a participant's gender, race or ethnical origin, religion, income, education, and place of the domain (Fu et al., 2019).

Exercise self-efficacy: Exercise Self-efficacy is the belief and conviction that one can successfully perform a given activity despite obstacles (Fletcher & Banasik, 2001).

Morbid Obesity: BMI of 40 or higher (Centers for disease control and prevention, 2016).

Obesity: BMI >30 (Centers for disease control and prevention, 2016)

Outcome self-efficacy: The belief that an act will result in or fail to result in a given outcome (Maddux et al., 1982).

Physical Activity: 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity activity, or a mixture of both (Centers for disease control and prevention, 2018).

Self–efficacy: The confidence one has in their ability to maintain and accomplish the activity and sleep recommendations despite working the 12-hour night shift (Przepiorka et al., 2019).

Self-efficacy for sleep: Maintenance of health-promoting behaviors related to sleep and the concepts of perception of the risk to health regarding outcome expected from intervention (Weaver et al., 2003).

Self-efficacy in overcoming barriers: A person's confidence in their ability to overcome barriers and perform a given task (Rogers et al., 2006).

Self-efficacy in overcoming impediments: The confidence a person has in their ability to overcome barriers when changing behaviors (Sharma M., 2017).

Self-efficacy expectations: An individual's confidence in their ability to organize and execute a plan of action to reach the desired goal (Stumpf et al., 1987).

Sleep Quality: Sleep is a reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment (Carskadon & Dement, 2011).

Sleep Quantity: Total number of hours of sleep per 24-hour period (Banks & Dinges, 2011).

Assumptions

A few assumptions are associated with this study regarding the individual participants and the methodology. I assumed that the population studied perceives that their weight is an issue that needs changing. A few assumptions are associated with this study regarding the individual participants and the methodology. I assumed that the population studied perceives their weight as an issue that needs changing. Therefore, assuming the participant fails to act could be misinterpreted as a lack of self-efficacy. The presence or absence of self-efficacy was therefore not considered the cause of a respondent's failure to participate in PA and suggested sleep behaviors but a contributing factor to their lack of engagement in these activities. This knowledge could be comprehensively and thoroughly reviewed using quantitative research.

Another assumption is that the population studied would answer honestly the questions related to sleep and exercise. Many of the concepts are contingent upon interpretation. The assumption is that the questions were intuitively clear. Although defined for this study, these definitions may not translate to the participants answering the survey. The answers were limited, and some survey takers may feel that none of the responses fit their lifestyle.

Scope and Delimitations

This study speaks to the impact of obesity on the night-force community and the potential for minimizing the lifelong adverse effects of this condition through the institution of sustained suitable sleep and PA habits. The concentration of this investigation spotlights the less considered areas of sleep and PA, which have been shown to affect weight, irrespective of dietary limitations, adversely (Kim et al., 2018; St-Onge et al., 2016). Current studies support a synergistic relationship between diet, sleep, and PA on weight gain and weight management. While numerous studies highlight the effects of shift work on diet, fewer studies factor in the impact of sleep and PA.

The population for this study focused on bedside RNs employed in direct patient care within hospitals. The demographics of this population make it ideal because the diversity of the ethnicity and chronology of the employees enhanced the potential for generalizing the results of this study to other establishments (Alshebli et al., 2018; Nielsen et al., 2017). A reminder call was used at selected intervals throughout the study to counteract this potential limitation and motivate participation. This process enhanced participation in the study.

Applying a self-efficacy based theoretical framework enhances external validity by enforcing the likelihood that nurses in other environments would perform the same way as those in this study. The selection of this population for non-probability sampling increases the accuracy of the results, provided the number of responses is adequate (Keiding & Louis, 2018). The focus of this study is the RNs working the 12-hour shift. Although other shifts were included and analyzed in the process, this information was used to compare concepts. Follow-up emails were made throughout the process of collecting responses to ensure that enough participants from each category answered the survey and issues related to validity were averted.

Limitations

The population of interest in this study needed to be expanded. Cross-sectional sampling enhanced the probability of getting a representative number of respondents from each group. This method of participant selection is used to ensure adequate representation for each social area of interest. Direct patient care nurses encompass most of the nursing workforce, increasing the likelihood of a more diverse sample (Freeman et al., 2015). A larger workforce increases the probability of acquiring a representative pool of participants comparable to the general population. Cultural practices that impact obesity and limited access to information evaluating these characteristics in the sample population may also threaten external validity due to differences in attitudes, beliefs, and behaviors within these populations.

This study did not examine every contributing cause of obesity. This analysis also does not claim that the higher BMI is solely due to shift work. BMI is also affected by

home, environment, or disease. Additional causes include endocrinological, genetic, and drug-related diseases where obesity is not a direct cause of shiftwork. Endocrine diseases such as but not limited to Cushing's syndrome, hypogonadism, and hypothyroidism are not disclosed in this study. Biological and genetic disorders such as android obesity found in Asian individuals (Karam & McFarlane, 2007) may be over or underrepresented in this study but were not addressed in this exploration. Medications such as steroids, antidepressants, hypertensive medications, antipsychotics, and seizure medications can also contribute to increased BMI (Davis et al., 2018). Limiting the study questions to demographics and habits does not disclose these secondary causes of obesity and perpetuates bias.

The study population is scattered throughout various institutions in different nursing units with varying activity levels. Certain nights of the week are always busy on some nursing units, resulting in a higher activity level than other units, which are less active. This activity variability is why the 1980 U.S. Census Bureau Classification Code renders the nursing profession unclassifiable (Van Domelen et al., 2011). Variations in sedentary to active time occur from unit type to unit type and day to day. Traditional medical-surgical units care for relatively medically stable patients who adhere to more conventional sleep schedules and are less likely to require excessive assistance throughout the night.

Conversely, patients in Intensive Care Units are medically unstable and require closer monitoring and more nursing interventions, resulting in less sedentary time. Because these nurses interact more intensely with patients, activity levels can change

from hour to hour and day to day, depending on the population's needs. These situational variations hinder efforts to classify a unit type as sedentary or active. This study focused on self-efficacy and the will to exercise. This limited focus would lessen any analysis of the impact of the kind of worked unit on the study question.

Recall bias has been a long-standing debate in self-reported height and weight values studies. Compared to measured values, self-reported height and weight disparities have produced an underestimation of BMI when assessed by some studies (Bowring et al., 2012; Maukonen et al., 2018). In both studies, Bowring et al. (2012) and Maukonen et al, have determined that while these studies underestimate weight, obesity is accurately identified using self-reported height and weight.

Another variable subjected to recall bias was the number of hours of sleep. Hours of sleep recall correlate only moderately with actigraphy-measured sleep, with the length of sleep often over-reported (Lauderdale et al., 2008; Reid et al., 2018). Aside from objective measures of sleep (e.g., actigraphy), the optimal method for accurately tracking The number of sleep hours is measured using a sleep log or more modern actigraphy methods. Neither of these methods is appropriate for this study.

Alternative methods for increasing the internal validity of recall information are selecting a structured and validated evaluation tool and limiting disclosure of the hypothesis. An investigation by Hassan (2005) and Sedwick (1012) has established that recall bias in reported hours of sleep could be minimized using a standardized evaluation tool and limiting participator knowledge of the analysis hypothesis. The SE-S scale and the Pittsburg Sleep Quality Index scored Cronbach's alpha of 0.85 or better for internal

reliability when measured concurrently against sleep diaries and other non-invasive monitoring rest/activity cycles (Edinger et al., 2007). These methods help taper off the threat presented by recall bias associated with the recall of the number of hours slept and were used for this study.

Significance

The results of this study added to the existing knowledge base related to the influence of self-efficacy in managing health-enhancing behaviors. The current knowledge of self-efficacy and its impact on weight management and sleep habits among 12-hour shift workers is broadened through this analysis. Evaluating the constructs of self-control, self-efficacy in overcoming barriers, expectations, and outcome self-efficacy within the nursing population could provide insight into applying these constructs in policies aimed at weight management within the work environment. This study may give practitioners a deeper understanding of the complex process of weight management when the environment is stressed by multiple lifestyle barriers that influence and hamper weight control.

The social implications of this study are not limited to the individual but have practicality for the clients served by these clinicians. Understanding self-efficacy and how the determinants of this construct relate to the individual would assist health workers in designing individualized and realistic interventions for controlling BMI. Because shiftwork is the social norm, a basic understanding of the physical, psychological, and environmental factors that might be included in interventions is required to assist these workers in achieving and maintaining optimal health. Successful application of these

constructs in this limited population aids in creating effective interventions that could be extrapolated to other disciplines. Shiftwork is a proven component in contributing to the adverse effects on the health of these workers (Cheng & Drake, 2019; Ganesan et al., 2019; Lim et al., 2020). This information could be extrapolated to interventions to aid workers in other fields or professions engaged in overnight shiftwork.

Social Impact

An elevated BMI is potentiated through immobility, and insufficient sleep has personal and societal implications. Improving either of these areas ensures the health and well-being of all workers. An intervention balancing the social need for a 24-hour labor force with an individual mental and physical health market is essential to establishing continuity and well-being within the working community. Better health translates into less time lost from work, fewer chronic health conditions, improved mental well-being, and a thorough, more focused employee. The healthcare industry has conferred interest in modifying adverse obesity-associated sleep and PA habits among nurses.

Both quality and quantity of sleep are essential to the social well-being of night shift workers. Working nontraditional hours potentiates obesity by disrupting several biological systems, culminating in physical conditions that accentuate the prospect of morbidity and mortality (De Nobrega et al., 2020; Zhang et al., 2016). Sounder sleep heightens the total daily energy expenditure (Markwald et al., 2013). Enhancing sleep quantity reduces accidents and improves health conditions such as diabetes, heart disease, cancers, and hypertension (Chattu et al., 2019; Cirelli & Benca, 2020). Sleep enhances favorable physical conditions by suppressing social withdrawal and loneliness (Simon &

Walker, 2018). The social benefits of adequate sleep are both physiological and psychological.

The propagation of PA has renowned physical and psychological social implications. PA enhances sleep quality and improves overall physical and mental health (Wang & Boros, 2019; Wunsch et al., 2017). Routine PA augments overall health and attenuates obesity, enhancing cardiovascular health, glycemic control, and hypertension. Workers who routinely exercise are more productive, have better health, and use fewer sick days (Hafner et al., 2019; Robroek et al., 2013). Physical inactivity is a social burden that negatively impacts the night-shift community and dictates the need for intervention.

An intervention balancing the social need for a 24-hour labor force with the individuals' need for mental and physical health is imperative to establishing continuity and well-being within the working community (Magnavita & Garbarino, 2017; Schulte et al., 2015). Decelerating the rise in BMI or the more upstream approach to maintaining BMI remains the most effective way to mitigate the present threat of a progressively obesogenic society. Insufficient or ineffective sleep and the lack of exercise accentuate the prevalence of obesity among RNs working the night shift (Buchvold et al., 2019; Gwen, 2017). A sounder understanding of these factors heightened awareness, and operative interventions are required to avert continued obesity trends within this population. A self-efficacy-guided intervention may effectively overcome barriers encountered when assigned to the 12-hour night shift. Insights gained through this study could aid companies in designing strategies to support their employees' sleep and

exercise requirements. Practical approaches can then be disseminated throughout other agencies assisting professionals in weight and BMI control issues.

Summary

Working outside the traditional 9-5 schedule has negatively affected shift workers' social and physical health. This chapter highlights some of the cardiovascular and biological effects of shiftwork. With the continued escalation in obesity, especially among this demographic, it is crucial to maintain an efficient, consistent, vigorous, and health-conscious workforce.

Work-based programs have historically been proven to be the venue to stimulate interest in and foster a conscientious awareness of the effects of elevated BMI on health and introduce methods for providing interventions for these workers. Managing weight through proper sleep and PA regimens could decrease the cost incurred by employers because of the comorbidities associated with or exacerbated through obesity. This quantitative study contributes to the existing knowledge of BMI control by adding to the current knowledge related to applying and valuing self-efficacy as a theoretical framework for augmenting shift workers' participation in these behaviors.

This chapter introduced the association between shiftwork and concepts that initiate or augment interventions to assist workers in weight control. This study examined whether these associations remain consistent among RNs engaged in shiftwork associated with direct patient care. The applicability of self-efficacy within the SCT is a concept with proven efficacy in initiating or heightening interventions designed to assist workers in weight control is also highlighted. Chapter Two further weighed these concepts by

evaluating existing literature and defining and applying them to weight management within the night shift demographic.

Chapter 2: Literature Review

Introduction

I conducted this study to evaluate the effect of self-efficacy in enhancing practices related to participation in PA and enhancing the quality and quantity of sleep-in RNs working 12-hour night shifts. In a 24-hour society, there are demands for access to facilities that function on a 24-hour schedule. Services such as postal, delivery, emergency care, lab, and security services are among many that necessitate around-the-clock access to these services. Shift workers are at risk for several diseases and adverse health conditions accented through obesity, such as coronary heart disease (CHD), hypertension, hyperlipidemia, and some cancers (van Drongelen et al., 2011). Specifically, shiftwork adversely affects sleep and PA (Boivin & Boudreau, 2014; Cook & Gazmararian, 2018; Ogilvie & Patel, 2017; Wickwire et al., 2017). Both CHD and the propensity for selective cancer are averted or limited through recommended durations, PA intensities, and adequate sleep (Liu et al., 2017; Paguntalan & Gregoski, 2016). These conditions are alternatively prevented by controlling BMI (Mury et al., 2017; Silveira et al., 2021; Tralongo et al., 2017). Despite falling short, shift-workers need to maintain healthy habits.

Workers not assigned to traditional 9-to-5 shifts are predisposed to conditions potentiating obesity. Although a few researchers concluded that there is no relationship between shift work and obesity (Bekkers et al., 2015; Gomez-Parra et al., 2016), most researchers have noted a significant connection between studies citing shift work as associated with the disease (Furman et al., 2019; Moore-Ede & Richardson, 1985; Rivera

et al., 2020; Schulte et al., 2007; Yu et al., 2016). Conditions such as CHD, diabetes, hypertension, and other physiological conditions related to obesity have been consistent for decades (Furman et al., 2019; Moore-Ede & Richardson, 1985; Rivera et al., 2020; Schulte et al., 2007; Yu et al., 2016). Both the Bekkers et al., 2015 and the Gomez-Parra et al., 2016 studies are limited in scope and study population. The Furman et al. (2019), Moore-Ede & Richardson (1985), Rivera et al. (2020), Schulte et al. (2007), and Yu et al., 2016 studies are robust systemic analyses spanning decades. Furman et al. (2019), Moore-Ede & Richardson (1985), Rivera et al. (2020), Schulte et al. (2007), and Yu et al., 2016, demonstrated that shift workers, particularly night shift workers, are at risk for obesity and the numerous comorbidities associated with obesity.

Working nightshifts adversely affect workers' abilities to consistently get quality sleep and exercise routinely (Agarwal et al., 2014; Kalmbach et al., 2018; Querstret et al., 2020;). Adjusting to altered sleep-wake cycles and navigating daily duties involving family, housekeeping, and general affairs make finding time for exercise difficult. Jobsite programs and self-efficacy effectively enhance the health-promoting habits of night shift employees despite environmental barriers.

In this review of the literature, I examined the results of studies addressing shift work and obesity among 12-hour night shift nurses and the use of determinants of the SCT as interventions for evaluating PA and sleep patterns as they relate to these night shift workers. Under this assessment I examined the impact of night shift work on the quality and quantity of sleep and PA variables. This evaluation compared the effects of working the 12-hour night shift and the worker's ability to get the recommended amount

and quality of sleep and exercise. This literature review lastly emphasized the known impact of self-efficacy on improving adherence to getting the recommended amount of PA and sleep and improving sleep quality for 12-hour night shift nurses.

Literature Search Strategy

This review of the literature was conducted using the Walden Library research databases. The databases searched included: Behavioral Studies and Psychology Database, SAGE Full Text, Health Sciences and Nursing Database, Medline Full Text, EBSCOhost, CINAHL, ERIC MEDLINE, Biomed Central, CINAHL & MEDLINE Simultaneous Search, PsycTESTS & Health and Psychosocial Instruments Simultaneous Search, General Science Collection, ProQuest Nursing & Allied Health Source, and PsycARTICLES. I conducted a comprehensive inventory of the literature without limiting the years in this search to capture historical information related to the variables.

Keywords used for this search included *obesity, shift work, obesity, body mass index (BMI), physical activity, exercise, registered nurses, self-efficacy, sleep, sleep quality, physical activity,* and *chronic diseases.* Combinations of the basic terms were also researched until saturation was evident. The advanced terms searched were *self-efficacy, self-efficacy and shiftwork, self-efficacy and sleep, self-efficacy,* and *physical activity.* I repeated these combinations for all the variables and the primary term words.

Online journals included in the search were the *International Journal of Obesity, BMC Public Health, Journal of Clinical Medicine, Occupational & Environmental Medicine, Applied Economics and Finance, American Journal of Public Health, Journal of Chronic Disease, Preventative Medicine, Journal of the American Medical*

Association, International Journal of Social Research, The Annals of Pharmacotherapy, and International Journal of Obesity.

The studies I collected and reviewed for this study concentrated on the nurses' work environment and health habits, focusing on PA and sleep studies. The most current studies were included in this examination. As needed, earlier studies were added to demonstrate historical trends or validate concepts' longevity.

Theoretical Foundation

There are numerous health models. For this dissertation, the SCT was the model that served as the foundation for this research because it encompasses the determinants of both self-efficacy and environmental barriers within its constructs. These determinants made the SCT the best and most applicable theory for this study. Shiftwork impacts every aspect of the individual's life. Kwasnicka et al. (2016) concluded in his study that the self-efficacy to continue in a task is bidirectional and may change between the initiation and maintenance of that task. Working 12-hour nightshifts disrupts the routine family and influences the worker's ability to achieve an essential quality and quantity of sleep. Working at night also impacts the ability to find time to exercise in addition to the drive or energy needed to participate in PA. Quality and quantity of sleep and participation in PA are all variables that can be enhanced by applying the SCT's self-efficacy component.

Although the SCT and the social learning theory (SLT) share the same foundation, there is a fundamental difference in applying these theories. While the SLT defines how a person learns to respond to a situation, the SCT seeks to explain the motivation to action. The SCT was developed in 1986 and expanded into the larger SLT

(Bandura, 1999). The SLT is based on the belief that learning occurs in a social context. Bandura (1997) postulated that people learn through observing, modeling, and mimicking. According to Bandura, learning occurs when the person watching the behavior perceives the outcome as favorable. The observer would then imitate or model the behavior in future analogous situations. The mirroring of behaviorism is contingent upon the observer's perception and that person's interpretation of what the observer considers a favorable outcome. If the observer concludes that the mirrored response produced a positive effect, that person is more likely to replicate the behavior in similar situations. This core concept is not the premise of the SCT (Bandura, 2001).

The complex nature of biological systems requires using a theoretical framework that is just as comprehensive. The bases of behavioral response contained in the SCT do not simply mirror a behavior. Multiple responses have been formulated by assessing intervening biological, environmental, and supportive factors. For this analysis I emphasized the causation model and use the reciprocal relationships between cognitive, personal, behavioral, and environmental factors. Within this theory, the outcome depends on the interaction between these factors and how these interactions influence behavior change. In the end, maintaining positive behaviors (as described by Bandura in 1989) is important. Applying the Social Cognitive Theory (SCT) to encourage behavioral change among night shift workers could lead to the development of constructive health habits, such as exercising regularly and getting better quality and quantity of sleep.

The SCT's wide-ranging properties enable its successful adaptation to develop interventions to change behaviors associated with adverse health conditions. Researchers

have applied the SCT as a robust framework in studies designed to understand the attraction to smoking and to develop effective smoking cessation interventions since the 1970s. Recently, the SCT has proven efficient in transforming health behaviors related to diabetes, depression, and physical inactivity (Joseph et al., 2013; Sirikamonsathian et al., 2013; Weightman et al., 2014; Young et al., 2014). Prior research supported historical stability, and the operative application of self-efficacy in transforming health beliefs and behaviors fortified this as the most appropriate concept to address health interventions in the 12-hour night shift population.

Multiple components within the SCT relate to altering health behaviors. These include observational learning, reinforcement, self-control, and self-efficacy (Sutton, 2001), the theory's basis. The initiation or rejection of these concepts and the ability to utilize them in behavioral change is contingent upon the presence or absence of self-efficacy. Specifically, perceived self-efficacy plays a principal role in adopting self-efficacy beliefs and how these beliefs affect other theoretical determinants (Bandura, 2001). Because this element has a decisive impact on the other components' directionality within this theory, an analysis of this concept would be generalizable to these features.

Self-efficacy is the facilitating concept in the SCT. It is the driving force behind the commitment to and sustaining health-promoting behaviors (Bandura, 2004). Self-efficacy is a key aspect of the larger Social Cognitive Theory (SCT) and serves as the driving force behind initiating or maintaining a commitment to behavioral change. As per Bandura (1997), the individual's perception of obstacles as surmountable or insurmountable is determined by beliefs built through self-efficacy.

Heightened self-efficacy beliefs could lead to a heightened belief that obstacles can be overcome and that a person could be successful. Studies have shown that weight control and regular PA participation are directly influenced by self-efficacy beliefs (Byrne et al., 2012; DuCharme & Brawley, 1995; Jackson, 2010; Kerrigan et al., 2018). Intensifying these beliefs may possibly improve the chances of successfully regulating weight and promoting sustained physical exercise participation.

Insight into self-efficacy effectiveness within the 12-hour shift work environment could prove valuable in developing effective interventions to decrease obesity within the 12-hour night shift population. Self-efficacy is essential in inspiring changes in health behaviors both as a predictor of initiation and maintenance of these health behaviors (Bandura, 1997). Bandura (1977) concluded in his research that the behavioral theoretical concept of self-efficacy is influenced by promoters or facilitators, motivating beliefs into actions. In this study he showed that self-efficacy is supported through both self-efficacy beliefs and perceived self-efficacy (Bandura, 1977).

Self-efficacy beliefs are general and pertain to everyone (Bandura, 1997). Individuals believe they can accomplish a task based on past experiences or exposure to situations. These beliefs arise from historical views of the situation. By contrast, perceived self-efficacy is due to an individual's belief in themselves and their ability to overcome a condition based on environmental influences within the current situation (Bandura, 1994). Both perceived self-efficacy and self-efficacy beliefs are the conventionalized determinants for an individual's propensity for behavioral change. The examination of the correlation between self-efficacy, PA, and sleep failed to assess the

contributing factors that impact self-efficacy. This research does not translate into an evaluation of the motivators that control self-efficacy.

Even though this study focused on PA and sleep as predictors of self-efficacy, it did not analyze the motivators that influence self-efficacy. According to Bandura's research (1997), a person's beliefs affect their behavior. Self-efficacy, specifically the belief that one can achieve a desired outcome (Bandura, 1994), is a significant factor in adopting self-efficacy beliefs and how they impact other theoretical determinants. However, external factors can hinder a person's actions and distort their perception of self-efficacy (Bandura, 2001). These perceptions can be distorted secondary to environmental constraints which stifle an individual's actions, regardless of self-efficacy beliefs. Because these external factors have a decisive impact on the other components' directionality within this theory, an analysis of behavioral change using self-efficacy limited the generalizability of this theory's other concepts.

Incorporating self-efficacy is especially central within the nursing community, where there is a negative correlation between health promotion and the nurses' private health behavior (Aranda & McGreevy, 2014; Carlson & Warne, 2007; Muireann, 2017). Direct application of the SCT to the current poor health practices within the 12-hour night shift population may generate awareness of these practices and provide the worker with realistic interventions to alter adverse health practices. The initiation or rejection of these concepts and the ability to utilize them in behavioral change is ultimately contingent upon the presence or absence of self-efficacy.

Literature Review Related to Key Variables

Historical Review of Night Shift Work and Obesity

RNs are among the most influential professional groups in the United States that employ shift workers. According to the 2010 United States Census, there are reportedly 2,824,641 RNs in the United States workforce. This number is 90% female. (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2013). Although numerous studies have concluded an inverse correlation between education level and obesity, RNs remain in the top five most obese populations by occupation (Barlin & Mercan, 2016; Bonauto, Lu, & Fan, 2014; Caban et al., 2005; Gu et al., 2014). Shift workers, defined as those persons working outside the typical 8-hour day shift, including rotating shifts, have been shown to have a higher tendency to become obese. Studies have attributed this to a higher level of leisure-time inactivity (Pedersen et al., 2016; Peplonska et al., 2014). These same studies are divided into the impact of occupational activity vs. sedentary occupation on overall health (Choi et al., 2010; Steeves et al., 2012).

For decades, obesity has been oversimplified into a mathematical equation, citing that energy in must equal energy out. Researchers often focused on overeating as the contributor to obesity, with only limited mention of PA and even less mention of sleep (Addo et al., 2015; Hill et al., 2012; Jalambo et al., 2018). These studies touch on the implications of PA and sleep in relation to obesity, but place greater emphasis on overeating as the primary factor contributing to this health issue. Many studies have since been conducted, focusing on analyzing caloric intake as well as the timing and

composition of nutrients consumed (Baron et al., 2017; Lopez-Minguez et al., 2019; Versteeg et al., 2018). However, these studies do not directly examine the impact of shiftwork on PA and sleep in relation to obesity.

Psychological, biological, and environmental determinants affect the propensity for obesity in any individual, PA levels, and sleep habits notwithstanding. Some of these determinants are modifiable and mitigate the impact of shift-related obesity. Two adjustable actions associated with shift workers are quality and quantity of sleep and PA. Working nontraditional shifts has been shown to affect leisure time PA resulting in more weight gain and promoting less weight loss among shift workers (Au et al., 2013; Mercan, 2014; Bodenheimer et al., 2009). Engaging shift workers in programs that facilitate involvement in health-promoting behaviors could enhance those shift workers' awareness of and participation in these programs.

Obesity Classified

According to the Centers for Disease Control and Prevention (CDC), obesity is defined as a body mass index (BMI) greater than 30 kg/m^2 (CDC, 2017). The World Health Organization (WHO) further allocates six categories of obesity for adults over the age of 20 years old: BMI below 18.5 is defined as underweight; BMI 18.5-24.9 is average weight; BMI 25.0-29.9 is pre-obesity; BMI 30.0-34.9 is obesity class I; BMI 35.0-39.9 is obesity class II; BMI over 40 is obesity class III (WHO, 2019). Studies have shown that shift workers have a higher propensity for metabolic syndrome and the comorbidities associated with this condition (Tucker et al., 2012; Torquati et al., 2018; Mohebbi et al.,

2012). These actualities highlight the need for an intervention to promote health behaviors among shift workers.

BMI as an Indicator for Evaluating Obesity

There are several methods of measuring obesity. Historically BMI is the measure most often used to reference obesity. The earliest association of BMI as an indicator of obesity was developed by evaluating tables designed by the Medico-Actuarial Mortality Investigations of 1912 (The Association of Life Insurance Medical Directors and The Actuarial Society of America, 1912). These tables were developed through insurance companies that recorded policyholders' comorbidities over time and the data used to produced tables of "ideal" body weights used for reference by physicians at that time (Lew, 1954). Doctors used these tables to advise clients on the boundaries to strive for to maintain optimal health and minimize their probability of premature death (Pai & Paloucek, 2000). By evaluating the data in these tables, standards defining the association between weight and diseased states were developed.

BMI took nearly three decades to emerge as a formal benchmark for specifying the relationship between body mass and disease states. Known before 1972 as the Quetelet index, BMI was the mathematical calculation of weight divided by height^2 (Komaroff, 2017). This official designation of BMI as a concept was developed in the 1940s by a Belgian mathematician, Adolphe Quetelet when his preoccupation with the bell-shaped curve directed him to search for the "normal man" (Eknoyan, 2008). Through two well-known studies, BMI was a paradigm indicator of obesity in the 1970s (Keys et al., 1972).

Two studies, the Framingham Heart Study (FHS) (Florey, 1970) and Ancel Keys Study (Keys et al., 1972), brought attention to BMI as a measure of ideal body weight. FHS analyzed 5,127 individuals free of heart disease who were examined at the end of year one and underwent subsequent examinations at different intervals over six years. The analyses included height, weight, triceps, and skinfold thickness measurements. Florey (1970) concluded that the Quetelet index (W/H2) was the best indicator for designating the relationship between weight and other disease states in western males, while W/H was best for females. Ancel Keys (1972) repeated the study with men in Europe, Japan, South Africa, and the United States. As a result of this study, the Quetelet Index was renamed BMI and elevated in research as the best indices for associating body fat composition with disease status (Keys et al., 2014). BMI is the most popular anthropometric index used in epidemiological studies to gauge the predictive association between body fat composition and risk for heart disease.

Notwithstanding its limitations, the need for a homogenous designation for obesity led to the historical definition of obesity utilizing BMI as a standard. The accuracy and application of this obesity measurement are often challenged by studies specifying the inability of BMI to measure overall body fat distribution and the limitations associated with BMI to standardizing genders (Ford et al., 2003; Gutin, 2018; Nuttall, 2015; NCD Risk Factor Collaboration (NCD-RISC), 2017). More recent objections list BMI's inability to adjust for a build as another limiting BMI (Nuttall, 2015). BMI's failure to adjust for visceral adiposity leads to the misclassification of individuals at risk for elevated BMI (Shuster et al., 2012; Tatsumi et al., 2017). Using

BMI as a sole measurement does not factor in the differences in fat and lean mass between individuals. These lean mass differences can lead to people not being adequately educated or evaluated for related health issues. Additionally, athletes with a lot of muscle mass may fall into the obese category based on their weight but are not necessarily at risk for obesity-related conditions.

To accurately measure metabolic syndrome or obesity, no single index has been found to be sufficient. Waist circumference, neck circumference, lipid accumulation product, and body adiposity index require a physical examination and cannot be validated through an online survey. Waist circumference, while most accurate for women, needs to be standardized and adequately instructed to ensure precise measurement (Tolonen et al., 2017). These indices cannot be universally applied to all genders and races in assessing body fat composition. Therefore, BMI is the most appropriate non-invasive measurement for evaluating obesity in this study.

Workforce Impact of Obesity

Obesity's impact is not limited to the nursing workforce but has economic implications. The rising trend of obesity amplifies the burden caused by the United States' obesogenic society. This burden results in decreased productivity, increased sick days, and work-related injuries (Lin et al., 2013; Schulte et al., 2007). Inadequate nursing staff leads to facilities increasing patient-to-nurse ratios, which negatively affects patient outcomes (Silber et al., 2016; Tubbs-Cooley et al., 2013). Long work hours and short turnaround times affect RNs' ability to care for themselves and their patients. Employers

should prioritize their employees' health to prevent premature exits from the work environment due to obesity-related comorbidities.

Interventions that promote healthy behaviors among workers on the job site effectively promote healthy habits. Workplace programs that improve health have been identified as the best place to reach the general population, where most adults spend most of their time (Tabak et al., 2015; Watts et al., 2016). Workplace interventions that help employees establish and maintain healthy habits effectively reduce obesity-related illnesses (Luckhaupt et al., 2014; Pitt-Catsouphes et al., 2015; Strickland et al., 2015). These findings suggest that workers are likelier to engage in healthy behavior if their employer promotes these habits.

Worksites are a proven venue for effectively promoting and maintaining good health. In the National Heart, Lung, and Blood Institute (NHLBI) study conducted from 2005 to 2008 on 1336 individuals that completed the study, PA and dietary interventions coupled with an improved perception of organizational commitment were effective in altering perceptions of corporate responsibility to health and had a positive dose-response to the maintenance of BMI (Lemon et al., 2010). The same encouraging response to BMI through worksite interventions was also noted in the 2005 study involving transit workers (French et al., 2010). The workplace environment fosters health conscientiousness and social support for changing adverse behaviors. The workforce structure's social and environmental benefits are limited only by the number of venues offering these interventions.

Current worksite PA programs must do more to persuade employers to invest in these programs. An assessment of the 2010 work-related goal of 75% of worksites offering comprehensive worksite health programs availed that only 17.1% of the federal worksites were compliant with establishing these programs in 2017 (Linnan et al., 2019). In Maryland, there are a limited number of federally sponsored programs to improve employee involvement in PA. Utilizing the Healthiest Maryland Business (HMB) program, one local hospital secured a 50% increase in employees' daily PA (Cambridge Pediatrics, 2018). Through several employee incentives, this group successfully provided interventions that offered better food choices for employees and engaged them in increased PA health awareness. Health Project is a federally funded project that assists employers in designing and instituting programs targeting good eating habits and understanding the impact of employment on health and wellbeing (Koop, 2018). Although effective in promoting positive health behaviors, they are seldom engaged by night shift workers. The funding is already in place to assist employers in facilitating their employees' health through on-site programs. Very few job sites utilize incentives for health-promoting programs. In facilities where these programs exist, the programs need to be designed considering the anomalies associated with shift work.

Shift workers are most affected by poor sleep and PA behaviors, so their participation in on-site health programs is crucial. However, existing programs that focus on promoting a healthy weight may not engage shift workers (Chiou et al., 2014; Nabe-Nielsen et al., 2016), as they may not consider work hours when planning activities. Interventions are developed around the dayshift hours and are less conscientious of the

conflicts and idiosyncrasies experienced by shift workers. Other barriers include nurses' responsibilities to care for their families, lack of finances, long hours, fatigue, stressful conditions at home and work, and lack of support from supervisors, friends, and family (Hastings & Ross, 2014; Ross et al., 2016). Effective work-based programs must be tailored to the specific challenges faced by shift workers.

In addition to low attendance in existing work-based programs (IIvig et al., 2018; Robroek et al., 2009), current projects must be better researched. There is little research into the effectiveness of these programs and whether they will impact behavior enough to reverse the chronic conditions experienced by shift workers (Albert et al., 2014; Kelly & Wills, 2018; Richter et al., 2010). Existing studies are limited in scope and address only the program's outcome. Prevailing studies disregard the physical, psychological, environmental, and social nuances experienced by RNs as a profession (Blake et al., 2019).

There is little or no reference to a needs-based approach to formulating or designing programs. Even with quality funding and support, structuring a high-quality program that engages shift workers and addresses the obstacles these workers face is lacking. To effectively speak to the issues potentiating the poor health outcomes of shift workers, programs must be designed to focus on these workers' precise needs.

One approach that has been proven helpful in redirecting adverse behaviors is shifting through self-efficacy. Programs should be designed based on the needs of shift workers, and self-efficacy concepts can help redirect adverse behaviors. Employers can incorporate self-efficacy to assist workers in coping with shift work (Bergstrom et al.,

2015; McAuley & Blissmer, 2000) and promote positive health behaviors. Understanding the application of self-efficacy to sleep and PA interventions can enable employers to assist employees in engaging in recommended fitness levels and acquiring adequate sleep (Mao et al., 2017). Self-efficacy has been established as an influential tool for directing and maintaining healthy behaviors. Positive health behaviors are mediated and bridged by incorporating heightened self-efficacy (Bachmann et al., 2016). Employers can incorporate self-efficacy to assist workers in coping with shift work and promote positive health behaviors. This can increase participation in health programs and establish their effectiveness (Bachmann et al., 2016).

Sleep Trends and Effects on Health and Sleep Efficacy

The 12-hour shifts that many nurses in major facilities commonly work have been debated for decades. The 12-hour shifts leave workers little time for other daily activities, and when the worker is scheduled for quick turnaround times, there is little time for sleep or exercise. The contention is that the extended workday leads to low quality and quantity of sleep and leaves nurses at risk for obesity-related health conditions related to sleep depravement and potentiates self-injury (Ferreira et al., 2017; Nena et al., 2018). It is suggested that the lack of sleep combined with poor self-care could lead to nurse-induced injury to the patients under their care (Kupperschmidt, 2018; Stanojevic et al., 2016). In a study by Bae and Fabry (2013), experimenters found that workers working the 12-hour night shifts were subjected to fewer hours of sleep and inferior sleep quality. In addition to job stress, low sleep quality has been disclosed as a contributing factor to potentiating nursing errors (Lin et al., 2014). Over a decade, less than the recommended seven hours

of sleep has been cited as an intensifying factor for adiposity (Patel et al., 2008). This detail was supported in a review of literature conducted from 1970 to 2011, which exposed that short sleep duration places one at risk for conditions that exacerbate the risk for obesity but could not confirm a causal relationship between these two variables (Hargens et al., 2013; Klingenberg et al., 2012). Disruptions in sleep quality and quantity reduce nurses' immediate job performance, leaving patients at risk for injury and exposing these workers to conditions that weaken their health by exposing them to obesity and all the comorbidities associated with this condition.

The long work hours and short turnaround times that many RNs face can affect their ability to care for themselves and the care they give their patients. Sleep desynchronization- defined as sleeping during the day and working during the night- harmfully impacts an individual's life through changes in biological rhythms, disruption of family life, and health issues such as insomnia, anxiety, cardiovascular disease, and breast cancer (Anbazhagan et al., 2016; Chellappa et al., 2019; Marinache, 2016; Vallieres et al., 2014). The circadian system located in the suprachiasmatic nucleus (SCN) is regulated through retina signals that initiate genes that "set" an individual's clock to solar time (Paschos, 2015). Through this system, temperature and food intake are regulated. This system stimulates hormones within the body, such as leptin, to decrease the satiety hormone (Scheer et al., 2009). The metabolism of nutrients and the signaling of nutrient needs are regulated through the synchronization of these systems. The misalignment of these systems could lead to conditions that enhance the potential for elevated BMI. Lack of sleep quality and circadian disruption are associated with

decreased mental functioning and workplace inefficiency (Sletten et al., 2020). Sleep disruption leads to the degeneration of all biological systems through a network of biological, psychological, and endocrine dysregulations. When the lack of sleep is sustained, individuals risk illnesses and premature death.

Although the mechanism is unknown, the lack of sleep predisposes shift workers to obesity and comorbidities connected to elevated BMI. Current researchers speculate that the cause is a result of insulin resistance caused by desynchrony because of working unconventional hours as the source of conditions associated with metabolic syndrome (Jehan et al., 2017; Kervezee et al., 2020; Mohd et al., 2020). Other investigators have cited the change in eating patterns and increased caloric intake by those deprived of sleep due to elevated BMI (St-Onge M. P., 2017; Stothard et al., 2020). Still, other studies have revealed no link between eating patterns and BMI (Cayanan et al., 2019; Samhat et al., 2020). Despite the lack of evidence to prove or disprove either result, the results of all these studies demonstrated an apparent increase in BMI among shift workers with less than the recommended 7 hours of sleep.

Explorations simulating shiftwork conditions of sleep deprivation and circadian disruptions have exposed that these conditions lead to obesity in rodents (Shi et al., 2013) and human models (Buxton et al., 2012) without increased caloric intake. It is proposed that this weight gain results from decreased metabolism and dysregulation of insulin secretion. Rodent experimentations have also shown that the lack of sleep desynchrony causes misalignment of the liver-glucose connection (Kalsbeek et al., 2014). Under normal conditions, feeding times throughout the day regulate glucose levels. During rest,

the liver excretes insulin to maintain normal glucose levels. Disruption of the circadian rhythm disrupts this system and causes inefficient glucose metabolism. The disorder of this system causes the tissues to become insensitive to insulin, leading to insulin resistance, diabetes, and obesity (Shi et al., 2013).

Self-efficacy is a significant component of interventions for treating numerous sleep disorders. In the 2009 quantitative study of 236 patients from three general family practices conducted to assess the utility of self-efficacy for sleep, researchers learned that conditions such as insomnia could be managed behaviorally by encouraging patients to obtain normal sleep (Rutledge et al., 2013). The participants rated their willingness to accept non-pharmacological interventions, beliefs about sleep and sleep self-efficacy, insomnia severity, and how they rated their feelings of depression. The results showed that self-efficacy for sleep correlated with all these variables. These results correlated with previous examinations, which revealed a connection between the acceptance of behavioral treatments and high self-efficacy levels.

Current studies highlighting sleep efficacy and insomnia have demonstrated an inverse relationship between these variables. In one recent study conducted in Shanghai, China, including 104 participants with insomnia disorders, the researchers concluded that sleep efficacy could be enhanced through sleep-management intervention instituted by altering self-efficacy beliefs (Mao et al., 2017). In other studies, such as the University of Tubingen's study on 2,399 students suffering from insomnia and nightmares, high self-efficacy correlated with the lack of or low frequency of nightmares (Schlarb et al., 2015).

These researchers concluded from these studies that sleep self-efficacy could be wrought and applied to interventions intended to augment sleep quality and quantity.

Physical Activity

Regular PA is essential for maintaining optimal health. This fact has been well-established through numerous research studies showing that engaging in exercise throughout one's life can help preserve muscle strength and cardiovascular health. Even if starting PA later in life, there is still time to begin an exercise regimen and experience the benefits (Suliga et al., 2018). A 20-year longitudinal study found that high PA levels can help prevent weight gain during the transition from young adulthood to middle age (Hankinson et al., 2010). Furthermore, regular PA has significantly improved health outcomes in individuals with type 2 diabetes, breast and colon cancers, and coronary heart disease (Lee et al., 2012). PA is an excellent way to achieve desired health goals at any stage in life, whether aiming to maintain muscle strength or reduce BMI.

Research has shown that the lack of PA can significantly contribute to elevated BMI. Studies have found that PA is inversely associated with BMI, meaning that the more active a person is, the lower their BMI tends to be Du et al., 2013; Serrano-Sanchez et al., 2019). Participating in recommended levels of PA is more effective than focusing solely on dietary intake to reduce the risk of cardiovascular disease (Fruge et al., 2015)**.**

When examining the impact of inactivity on obesity, it is essential to distinguish between activity that occurs during work and leisure time physical activity (LTPA). While some may assume that having an active job can compensate for lack of exercise during free time, research has shown that workers with highly active jobs are still more

likely to be obese than those who engage in leisure-time PA, even when comparing workers with similar levels of occupational activity (Rosique-Esteban et al., 2017; Saint-Maurice et al., 2019; Tian et al., 2016). Given that nursing units can have varying levels of occupational activity, researchers should focus on the amount and intensity of LTPA in their study. This study concentrated on the amount and intensity of LTPA. By understanding the role of LTPA in overall health, we can improve our well-being and reduce the risk of obesity and related health issues.

The benefits of LTPA are well documented in the literature. The SPOTLIGHT project conducted in 2014 studied 5,295 adults in a European region, exposed that watching television (TV) was identified as the most consistent correlate of being overweight (Lakerveld et al., 2015). Lakervels et al. (2015) researchers disclosed that each 2-hour increment of sitting and watching TV was associated with a 23% increased risk of obesity (Roda et al., 2016). These researchers also disclosed that higher leisure time activity decreased the likelihood of being obese. These results are consistent with the conclusions incurred from previous studies, exemplifying the benefits of LTPA (Church et al., 2011; Hankinson et al., 2010). As concluded from other studies, leisure-time inactivity was not causative of obesity but contributed to or exacerbated the condition. Combining obesogenic habits, such as eating while watching TV or sleeping fewer than the recommended hours, increases a worker's propensity to become obese.

PA is a validated means of reducing or maintaining BMI in shift workers by modifying metabolic syndrome conditions and potentiating obesity. Even with plentiful evidence highlighting the advantages of LTPA, shift workers do not regularly get the

needed levels of LTPA (Loprinzi, 2015). Shift work has been exposed to negatively affect the PA participation of night and evening shift workers (Loprinzi, 2015).

Instituting PA following CDC guidelines- 150 minutes of low to moderate activity per week has consistently been shown to substantially improve the health of people suffering from physical inactivity conditions such as type 2 diabetes, breast and colon cancers, and coronary heart disease (Lee et al., 2012). Studies have shown that PA increases brain activity efficiency and white matter integrity in children and older adults (Ericson et al., 2015). The benefits of PA gained through prior studies are supported by the results of the survey conducted on 55–80 from 1966 to 2001 (Colcombe & Kramer, 2003) and the more recent longitudinal study conducted from 2002 and carried out in waves of 2 years over eight years on 4,555 participants over the age of 50 utilizing 18,220 observations (Daly et al., 2015). Not only is instituting a PA regimen effective in maintaining health but it was revealed through a 20-year study that maintenance of high PA levels has also been shown to minimize weight gain when transitioning from young adulthood to middle age (Hankinson et al., 2010).

Shift work decreases the ability of workers to participate in leisure-time PA. Unlike non-shift workers, shift workers in that study did not differ in the number of hours engaged in PA (Loef et al., 2016). That study revealed that shift workers did more walking than non-shift workers but remained more obese than these workers. Shift work has been shown to negatively affect the participation level of PA among night and evening shift workers (Loprinzi, 2015). Although shift workers did engage in PA, these sessions were ineffective in controlling weight gain. Despite the inability to lose weight

in some individuals, PA has been shown to reduce the mortality risk associated with coronary heart disease when these individuals engage in PA (Moholdt et al., 2018). Even without weight loss, PA has overall benefits in promoting and sustaining health.

Self-Efficacy Impact on Independent Variables

Age and Self-efficacy

This study examined participants across various age ranges, including nurses between the ages of 20 and 30 and those between 40 and 50. The different life stresses experienced by these groups can impact their level of self-efficacy. Research has indicated that older adults may have lower self-efficacy for exercise due to their belief that the benefits of exercise decrease with age (Diener & Diener, 1995; Gothe et al., 2011; McAuley et al., 2011). However, one study found that older individuals who engaged in PA showed a more positive trend in their self-efficacy beliefs (Netz & Raviv, 2004).

Gender

Studies have shown that the gender of shift workers can have varying biological effects, including changes in melatonin secretion linked to the risk of diabetes (Khosravipour et al., 2021; Moreno, et al., 2019). While there are differences in self-efficacy for exercise and sleep between males and females in general, these differences are attributed to gender-based sources rather than levels of self-efficacy.

Research spanning several decades has demonstrated that the application of self-efficacy to health-related behavioral change differs between men and women (Hankonen et al., 2014; Helgeson, 1994; Patrao et al., 2017). These studies have found that women

perceive their health status as lower than men and that socioeconomic factors play a role in men, while education level is more relevant for women (Bora & Saikia, 2015). Another study examining women's self-efficacy in PA found that self-efficacy, general affect, and peer support influenced female participation, while self-efficacy and socioeconomic status were determining factors for male participation (Yeong-Ja & Yeongmi, 2019).

Race/Ethnicity

Research has shown that African Americans and Caucasians in the United States have varying levels of self-efficacy for health (Assari et al., 2016; Assari, 2017). According to Assari (2017), these differences do not affect the mortality risk of AA males. These studies indicate that while AAs generally have lower self-efficacy levels than other races, this does not impact their overall health or mortality rate. AA men have comparable levels of self-efficacy to Caucasian males but attribute their lower mortality rate to resilience through adaptive coping strategies.

Within the AA community, there are notable differences in self-efficacy between males and females. Studies indicate that the effects of obesity-related physical inactivity in AA females are disproportionately higher than in other ethnicities (Bland & Sharma, 2017; Hart et al., 2016; Sebastiao et al., 2014). Some studies attribute this to lower self-efficacy or belief in achieving desired outcomes (Robinson & Wicks, 2012; Stets & Burke, 2014). In contrast, others point to a distorted body image or comfort with larger body sizes (Baruth et al., 2015). These gender and race differences highlight the

importance of using alternative approaches to engage these populations in interventions to increase adherence to self-efficacy-based PA regimens.

Number of Shifts Worked Consecutively

Studies have found that 12-hour shift workers, regardless of shift worked, have lower levels of sleep self-efficacy than 8-hour shift workers (Ganesan et al., 2019; Zhang et al., 2016). According to these studies, this is attributed to the other demands on the shift worker. Quick turnaround times are associated with higher errors and more unsatisfactory work performance (Amaral et al., 2015; Sallinen & Kecklund, 2010; Smith et al., 1998).

Number of Years on Shift

Few studies have directly addressed duration on shift-related differences in sleep and self-efficacy. However, biological and physiological changes occur with age and time on the shift. Some night shift workers have shown adaptability to that shift, facilitated by altering their circadian rhythm (Reinberg & Ashkenazi, 2008; Sharma, 2003). The ability to adapt to the assigned shift mitigates the symptoms associated with working alternative shifts. Folkard (2008) showed that only about one in four workers had shown a significant ability to completely adapt to the shift change to gain any health benefits among permanent night workers. In general, variations in tolerance to 12-hour shifts and how susceptible a worker is to the consequences of that shift are dependent on individual phenotyping, with some workers showing no deficit to others showing extreme vulnerability (Geiger-Brown et al., 2012; Goel et al., 2015; Tkachenko & Dinges, 2018).

Cohabitation Status

Research shows that living arrangements significantly impact a person's self-confidence, particularly regarding PA and sleep. The impact of cohabitation status is consistent among those who work 12-hour shifts, regardless of their specific shift (Alves et al., 2016; Daskin, 2019; Wilkerson et al., 2019). The level of support a person receives plays a crucial role in their ability to maintain healthy habits. Women who are physically active and have partners who exercise regularly tend to exercise more than single women (Gabriel et al., 2006; Resnick et al., 2002; Roberson et al., 2018). Individuals who lack support are less likely to participate in healthy behaviors. Workers with supportive relationships feel more confident in maintaining healthy habits, including PA and sleep.

Summary

Shift work can harm employees' health and well-being, especially nurses. Nurses are a large part of the healthcare system. Having healthier nurses would improve patient care and decrease illnesses associated with the shift and obesity-related conditions affecting this population. When a nurse's job performance is challenged, harm can come to the nurse and their patients. The literature showed that the concept of "energy in must equal energy out" is not straightforward for night shift workers. The decrease in metabolism and the disruption of the circadian system within shift workers expose them to conditions that potentiate obesity. Self-efficacy is a significant motivator in health-promoting activities, enhancing the ability of night shift workers to maintain health. This model considers the environmental, biological, and cognitive requirements needed to

surmount barriers to participation in health-related tasks such as getting the recommended allowance of sleep and PA. The literature highlighted how self-efficacy is effectively utilized in several sleep disorders and enhanced participation in PA, assisting participants in overcoming barriers hampering successful commitment to getting the recommended quantity of either.

Lower metabolism of food among night shift workers makes PA and sleep much more critical for these workers (McHill & Wright Jr., 2017). Exercise is beneficial in burning excess calories, but regular exercise can increase workload tolerance, decrease tiredness, and decrease work-related injuries. While the impact of shift work on disease and interventions has been extensively researched, strategies to promote engagement in exercise and sleep for 12-hour shift workers have yet to be fully explored. To combat the health issues associated with this shift, educating workers on the potential risks and implementing policies to mitigate them is essential. Interventions must be accessible to prevent weight gain among this population and encourage a personal and organizational commitment to preventing obesity.

In addition to individual interventions, management and institutional policies should also focus on enhancing overall employee sleep hygiene and fitness (Redeker et al., 2019). Corporations must understand the perception of night shift workers on their situation and associated barriers to initiate a sufficient sleep and exercise regimen. It is crucial to implement screening processes to optimize the hiring of night shift workers with a conscientiousness for the impact of shift work on exercise and sleep, which can

help minimize turnover. The impact of shiftwork on disease and the effectiveness of interventions have been examined extensively.

Less reviewed is the significance of strategies to facilitate engagement in PA and sleep in 12-hour shift workers. The downstream approach to combat the health issues experienced on this shift should include educating the worker before being assigned to shift the health risk and institutional and industry-wide policies to mitigate these risks. A comprehensive understanding of what works for shift workers and how to facilitate engagement in PA and sleep-enhancing efforts is vital to developing a healthier workforce. Accessible interventions are needed to prevent weight gain among this population and foster a conscious commitment to preventing obesity on personal and organizational levels. Corporations should understand the nightshift workers' perception of their situation on initiating the night shift and if they perceive the associated barriers as manageable while instituting a sufficient sleep and exercise regimen. Additionally, strategies for short napping and altered lighting have increased alertness and heightened the propensity for PA and sleep with shift workers (Redeker et al., 2019). These behaviors can be endorsed to enhance the longevity of shift workers.

Self-efficacy, sleep, and PA levels of night shift nurses working in direct patient care were analyzed using a quantitative methodology, specifically regression analysis. The exact setting details and an analysis of the tools used to measure the variables are explained and evaluated in the next chapter. The study design description included the survey distribution method, the time of the survey availability, and the sample and effect

size. The third chapter also delineated how the information was collected and protected participant-sensitive information.

Chapter 3: Research Method

Introduction

Based on a thorough review of pertinent literature, I have concluded that self-efficacy is a highly effective tool for modifying unhealthy behaviors. However, it is concerning that there is a lack of research on the application of self-efficacy concepts for PA and sleep among individuals working 12-hour night shifts. In this Chapter, I will detail the methodology and study design utilized to assess the relationship between self-efficacy for PA and sleep among nurses working 12-hour night shifts. Independent and dependent variables, as well as the operationalization of concepts, have been defined and clarified by this researcher. Furthermore, this Chapter contains an analysis of the method used to answer research questions, including the study's purpose, research design and rationale, methodology, participant recruitment and motivation, instrumentation, and ethical considerations.

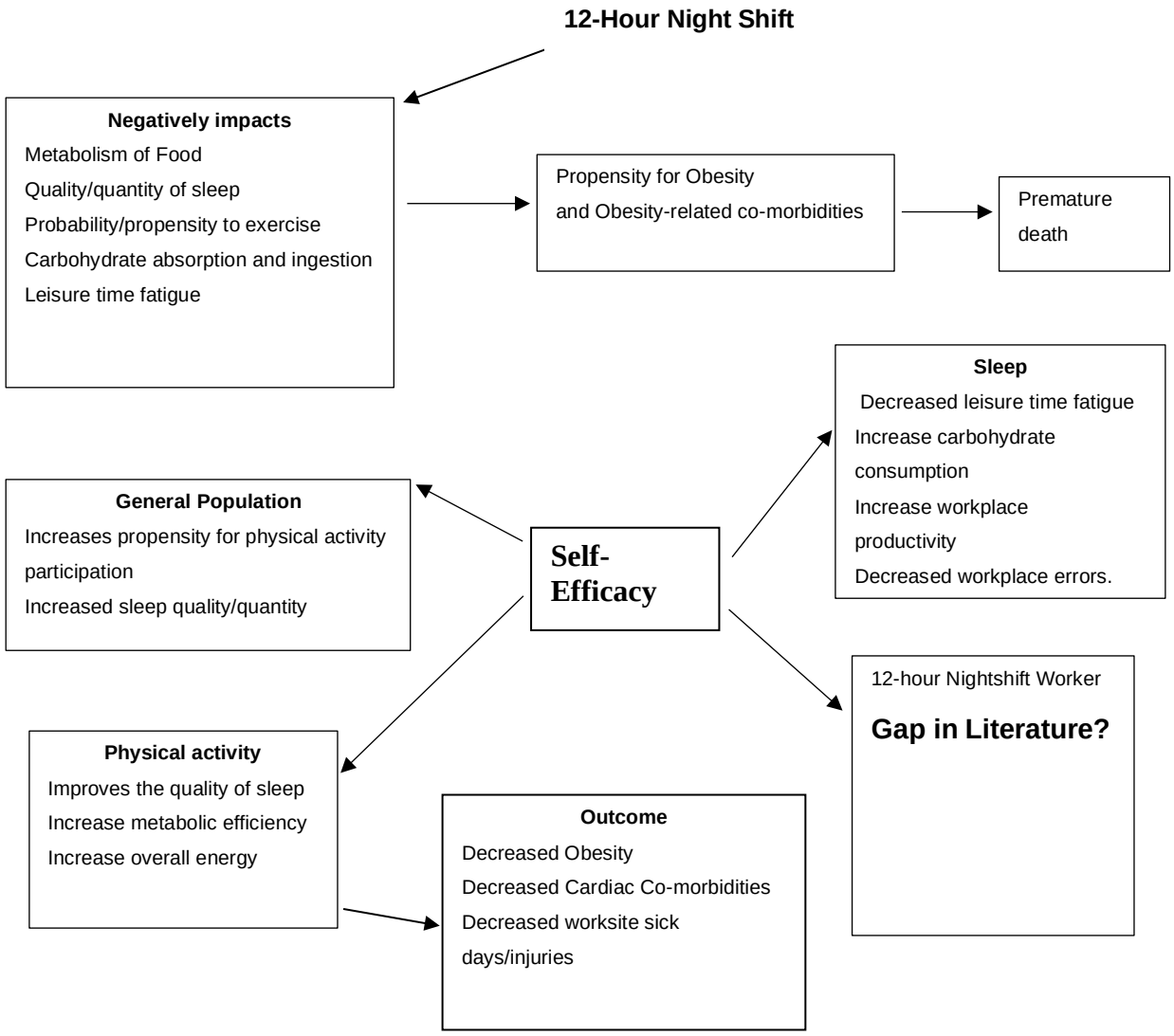
Purpose of the Study

I conducted this study to examine the relationship between self-efficacy for sleep and PA, quality and quantity of sleep, and PA among 12-hour night shift workers. Chapter 2 highlighted the gap in existing literature, which I explored in my research. Specifically, I investigated the association between self-efficacy for sleep and exercise, and variables that increase the risk of obesity and elevated BMI among 12-hour night-shift nurses. Understanding the role of self-efficacy in overcoming barriers to sleep and PA is crucial to developing effective interventions for night shift workers. This information can help employers design programs that promote better health and

productivity among their employees. Additionally, studying self-efficacy can aid healthcare practitioners in providing holistic care to clients and combatting the trend of obesity among night-shift workers.

Figure 1

The gap in the Literature Map



Research Design and Rationale

Dependent Variables

This study's dependent variable (DV) included quality and quantity of sleep and the number of hours of participation in PA. These were measured through direct questions included in the survey. The level of commitment to exercise was determined by using the self-efficacy for behavior scale. This 9-item scale contains questions such as: How sure are you that you will do each of the following: Exercise for 20 minutes three times a week? Exercise when you are tired or depressed? I computed the responses computed using the method detailed in the instrumentation section of this paper.

Independent Variables

This study's independent variables (IVs) were self-efficacy for acquiring a recommended number of hours of sleep, quality of sleep, and leisure-time exercise levels. For many years, numerous studies have identified self-efficacy as a reliable motivator for adopting sustainable healthy habits (Affendi et al., 2018; Becker et al., 1993; Slovinec et al., 2014; Strecher et al., 1986). This theory has several validated scales that were applied to this analysis.

In this study, a thorough analysis was conducted on various independent variables, shift worked, number of years on the shift, current height, and weight. Demographic information such as age, gender, and cohabitation status were also considered independent variables to determine their impact on the study's outcomes variables.

Research Design

I conducted this quantitative, correlational cross-sectional study to examine the relationship between shift-workers self-efficacy (confidence) for adequate sleep self-efficacy and self-efficacy for PA. The approach for this study was a questionnaire distributed through workplace electronic mail and through phone and I-pad to nursing staff in non-administrative positions. Quantitative research is exploratory and deductive and assumes that the best approach to answering the questions is numerically (Claydon, 2015). Cross-sectional studies measure participants' outcomes on exposure to a variable at a single point in time (Setia, 2016).

The cross-sectional design differs from experimental designs in that it enables researchers to narrow down the population by applying specific inclusion and exclusion criteria. This approach limits the number of surveys distributed and ensures that the community investigated is included in the study. The cross-sectional method is a directed and cost-effective approach to procuring desired information.

Barnett et al. (2012) discovered that frequencies, cross-tabulation, rates, and graphical displays effectively convey descriptive analysis. For this study, I utilized graphs and tables to present the results with clarity and precision. Etikan et al. (2016) state that the ideal response rate varies depending on the group surveyed. How the data is presented visually is determined by the characteristics of the data and is addressed at the conclusion of the study.

Methodology

Population

The participants I chose for this study were from a group of RNs who work directly with patients in hospitals. To be included in the study, nurses had to be full-time, with a scheduled work week of 72 hours for a 2-week pay period and have at least one year of experience in direct patient care. The study was conducted across different hospitals.

Sampling and Sampling Process

The selection of RNs for this study was based on their proximity and accessibility, utilizing a snowball sampling method. Nonprobability selection is often used when the population needed for research is not readily accessible or involved in illicit activities (Etikan et al., 2015). Due to the enduring restrictions to access to the nursing population related to the limitations enforced because of COVID-19, in-person access to institutions was tightly controlled. Surging COVID-19-related illnesses among employees have resulted in workers being displaced to work from home and the cancellation or indefinite postponement of several required board meetings. Given the unprecedented challenges presented by the ongoing pandemic, successfully reaching the target population in person proved to be an improbable task. As such, I conducted a non-experimental quantitative study to evaluate the relationship between self-efficacy for PA and sleep self-efficacy among 12-hour RNs. I employed snowballing and social media as effective collection techniques to procure the necessary data.

When using snowball sampling, participants can either be selected using a linear or a non-discriminative exponential approach. To conduct this study, I employed a non-discriminative exponential approach to enlist the required participants. Non-discriminative exponential snowballing is when several professional members are approached to participate and recruit one or more acquaintances. While the population selected for this study includes participants from a diverse range of communities, it is uncertain whether the results can be applied to the entire population. However, this nonprobability distribution method was chosen due to its cost-effectiveness and feasibility compared to other selection methods that are more expensive, time-consuming, or inaccessible to the population of interest

Power Analysis

Power analysis is a commonly used statistical tool to assess the probability of rejecting the null hypothesis when it is false (Jackson & Turner, 2017). For this study, I set a power of 0.8. According to Aquirre-Urreta and Ronkko (2015) and Fritz and MacKennon (2007), a power of 0.8 means there is an 80% chance of detecting the underlying relationship, based on the researchers' assumptions.

Various analyses used in this study, including multiple linear regression, bivariate correlations, point biserial correlations, and Chi-square analyses, were subjected to power analysis. The Chi-square test of independence had the most rigorous sample size requirement. Faul et al. (2009) reported that a minimum sample size of 233 is necessary to achieve a statistical power of at least 0.8, with an alpha of 0.05 and a medium effect size ($w = 0.3$), for a Chi-square analysis with 20 degrees of freedom.

Procedure for Recruitment, Participation, and Data Collection

Recruitment and Participation

Participants for this study included all the RNs working within the metropolitan area and those having access to social or electronic media. Recruitment occurred in three stages. Under IRB approval, a formal invitation to participate in the study was distributed to a core sample of RNs through private e-mail and Facebook accounts. The invitation letter (appendix B) outlined the study's purpose and instructions on answering the questions. The respondents who accepted the invitation letter were invited to read the informed consent form. The participants were instructed to answer all questions honestly and to the best of their ability. The candidates were informed that accessing the survey served as consent to filling out the study and for their answers to be included in the analysis. The participants were given the option to leave the survey at any point if they felt uneasy about answering any of the questions. They were also allowed to skip any question that they didn't want to answer.

To gather participants for the study, social media advertising and various nursing organizational Facebook pages were utilized. This method has been proven to enhance the diversity and representativeness of the population studied and increase the number of respondents, as per current research by Chambers et al. (2020). The exact introduction process to the study purpose and inclusion criteria were highlighted in the invitation flyer (appendix A) and invitation letter.

Data Collection

The survey was administered through Survey Monkey to all RNs who work at least 72 hours or more per pay period and are employed in direct patient care. The survey link was sent via email to potential participants. Only nurses who provide direct patient care and have had consistent employment for at least one year were invited to participate in the survey. Participants were asked to indicate the number of years of employment at the beginning of the survey. The survey included various scales, such as nominal, ordinal, and interval scales. The results were collected, aggregated, tabulated, and analyzed using SPSS software.

The participants of the study were requested to respond to inquiries regarding their sleep quality and quantity, frequency of exercise, and questions about their height and weight. The information about their height and weight was utilized to calculate their BMI. The participants were informed that by accessing the survey, they were giving their consent to participate in the research, and their answers would be included in the analysis.

Instrumentation

Self-efficacy for sleep quantity was measured using a variation of the self-efficacy for sleep scale (SE-S) (Lacks, 1987). This scale contains nine items with questions addressing a respondent's beliefs in their ability to make time for sleep. The participants are asked to answer questions such as: Indicate how confident you are: Lie in bed, feeling relaxed? Lie in bed, feeling mentally flexible? Fall asleep in under 30 minutes. The scores in this tool range from 9 to 45, with higher scores correlating with higher self-efficacy for sleep. The SE-S has been used since its development in 1987 and

has a consistent Cronbach's alpha of 0.71-0.86 (Bouchard et al., 2010; Fichten et al., 2001; Rutledge et al., 2013). The four additional questions have a possible score of 4-20 on a Likert scale, with a higher score indicating high self-efficacy for acquiring the recommended quantity of sleep.

The PSQI consists of 19 items interrogating regular sleep habits. This scale subjectively measures seven dimensions of sleep which explore sleep quality. PSQI is the most widely used measure of sleep quality universally and has been translated into many languages and focuses on psychological rather than objective sleep measures (Buysse et al., 2008; Ong et al., 2017). The PSQI measures seven components of sleep: duration, sleep disturbance, sleep latency, sleep dysfunction, sleep efficacy, overall sleep quality, and the need for medications to sleep. Individually, the questions are graded from 0 to 3. A score of 3 represents a worse sleep quality.

Self-efficacy for exercise was measured using the Exercise Self-efficacy Scale (ESE). The ESE is a 9-item scale with responses ranging from very sure to not at all sure. The scores were then added to obtain a total score between 0 and 90. A higher score indicates greater self-efficacy for exercise. This tool has been consistently shown to have an internal consistency of α=0.90-0.94 (Resnick & Jenkins, 2000; Wilcox et al., 2005).

Adherence to PA will also be measured through direct questions within the survey using the EARS. Examples of the questions on this 7-question tool include statements such as: I do my exercises as often as recommended; I adjust the way I do my exercises to suit myself; I don’t get around to doing my exercises; Other commitments prevent me from doing my exercises; I feel confident about doing my exercises; I don’t have time to

do my exercises. The questions are graded on a Likert scale from 0= totally disagree to 4= strongly agree. The answers are scored from 0-28, with higher scores reflecting higher exercise adherence. Positive response questions on this scale are reverse scored. Items 1,4 and 6 are scored using an ordinal answer scale (0 = strongly agree to 4 = totally disagree), with higher scores indicating greater adherence.

Operationalization of Constructs

Dependent Variables

The DV of this study includes the quality and quantity of sleep and the number of hours spent participating in PA. The data for these variables were collected directly from participants' responses. In addition, adherence to PA was assessed through direct questions within the survey, using the Self-Efficacy for Exercise Behavior Scale. Examples of the questions on this tool include: How confident are you that you will do each of the following: Exercise for 20 minutes three times a week? Exercise when you are tired or depressed? The answers were graded on a 4-point Likert scale, with 1 representing a very sure and four not sure at all, meaning the level of agreement of each subject's perceived self-efficacy in different areas of life.

Sleep quality was measured through PSQI. The PSQI consists of 19 items interrogating everyday sleep habits. This scale subjectively measures seven dimensions of sleep which explore sleep quality. The questions on this survey were graded from the compilation of scores generated from a Likert scale based on participant recall of sleep patterns for the past month. Despite its limitations in measuring primary insomnia, PSQI remains universally the most widely used measure of sleep quality (Buysse et al., 2008;

Ong et al., 2017). This tool has a recorded reliability coefficient or Cronbach's Alpha of 0.69 to 0.83 for all seven components of the tool (Smyth, 1999; Manzar et al., 2018; Spira et al., 2012). The questions on this survey were graded from 1 to 21.

Independent Variable: Self-efficacy for exercise

The independent variables in this study include the level of self-efficacy of 12-hour shift workers and their ability to engage in the recommended allotment of exercise and sleep. For this study, self-efficacy for exercise was measured using the ESE. The ESE is a 9-item scale with responses ranging from very sure to not at all sure. Questions on this, too, referred to inquiries: How confident are you that you will do each of the following: Exercise for 20 minutes three times a week? Exercise when you are tired or depressed? The responses were then added together for a total score ranging from 0-to 90. The higher the score, the higher the self-efficacy for exercise.

Independent Demographic and Control Variables

BMI

For this study, obesity was defined as having a self-reported BMI of 30 or greater (WHO, 2019; Welcome, 2017; Purnell, 2018). BMI was calculated using the formula: weight (lb.)/ [height (in)]^2 x 703 (CDC, 2017). Respondents were asked to document their height without shoes in inches and weight in pounds. The BMI was computed and inputted into the SPSS software for further analysis.

Age

All RNs working within the facility were invited to participate in the survey. This analysis included participants between the ages of less than 30 and greater than 65. The

age groups were follows: < 30 years of age; 30 to 34 years of age; 35 to 39 years of age; 40 to 44 years of age; 45 to 49 years of age; 50-54 years of age; 55 to 59 years of age; 60 to 64 years of age; and 65 years of age or older. These ranges represent the fields used for the Nursing Workforce Survey (Smiley et al., 2018 Supplement).

Gender

For this study, gender was operationalized using the nominal or dichotomous scale with male and female categories. Although other classifications exist under which members of the general population identify, participants were asked to select the category they most identify with among the two listed in the survey.

Ethnicity

I categorized ethnicity into six different classes using a six-point nominal scale. Based on the qualitative differences in the classifications, I assigned a numeric ranking to this variable. These groupings represent the statistical majority of races in the nation. The categories include:

a. African American
b. European American
c. Asian
d. Hispanic
e. American Indian
f. Neither of these

Number of Years on Shift

The number of years worked on a specific shift was a straightforward ratio scale. Although zero years of service is possible, none of the participants included have worked zero years. Zero is still, however, possible. The intervals were shorter for the first 20 years for a more accurate recall of weight gained and PA habits. This variable was scrutinized using regression analysis, discerning the relationship between BMI, PA, and sleep quality and quantity. Years of service were measured using the scale: 1 to 5 years, 6 to 10 years; 11 to 15 years; 16 to 20 years; 21 to 25 years; and 26 or more years.

Cohabitation Status

Describe your living situation. The cohabitation status scale is also a ratio scale, with a single status equivalent to zero on the survey.

a. Single
b. Cohabitation with partner
c. Widowed
d. Cohabitation with dependent children
e. Cohabitation with a partner and dependent children

Data Analysis Plan

The aggregate data was analyzed using SPSS (IBM SPSS version 28). This program is designed for the analysis and presentation of data. This program's statistical data evaluation is contingent on the syntax applied to the variables. If the variables are reversed or misappropriated, the output could be misinterpreted. This program is specifically designed to manage and analyze data using either regression analysis or

analysis of variables. Data sets used with Survey Monkey are compatible with SPSS, and data aggregates can be directly downloaded into the program. Once the syntax is set for the program, the data from Survey Monkey was correlatively populated into the SPSS program in the order of respondent replies.

To prepare the data for analysis, composite scores were calculated for sleep self-efficacy, self-efficacy for PA, and quality of sleep according to the instrumentation instructions. Additionally, univariate outliers were removed from the data. For the continuous variables of interest, outliers were assessed by standardizing scores and looking for values outside the absolute value of 3.29 (Tabachnick & Fidell, 2013). Descriptive statistics were presented for the demographic variables and variables of interest. Means and standard deviations were calculated for continuous variables, such as sleep self-efficacy and self-efficacy for PA. Frequencies and percentages were calculated for nominal/ordinal variables, such as gender and cohabitation status.

Cronbach's Alpha

Cronbach's alpha tests variables to determine how closely related a set of test questions are as a group (Taber, 2018). The reliability of the variables sleep self-efficacy, self-efficacy for PA, and quality of sleep were verified with a Cronbach's alpha reliability analysis. According to (Konaszewski et al., 2021), Cronbach's alpha values of 0.70 or greater indicate acceptable reliability.

Statistical Assumptions

Before conducting each correlation, the assumption of linearity was assessed. Linearity for each variable was assessed graphically using a scatterplot. Additionally, the

chi-square test requires the expected frequencies to be sufficiently large. At least 80% of expected frequencies should be greater than or equal to five, with none less than one (McHugh, 2013).

Before conducting each regression analysis, the assumptions of normality of residuals, homoscedasticity of residuals, absence of multicollinearity, and lack of outliers were assessed. The assumption of normality of residuals requires that the residuals of the regression fall along with a normal distribution (a bell-shaped curve). To determine that normality has not been violated, a Q-Q scatterplot of the residuals was examined (Field, 2017; Bates et al., 2014; DeCarlo, 1997). Homoscedasticity assumes no underlying relationship between the residuals and the fitted values. This assumption was examined with a scatterplot of the residuals and the fitted values (Field, 2017; Bates et al., 2014; Osborne & Walters, 2002). The following assumption is the lack of multivariate outliers. This was determined using Mahalanobis distances, defined as any observation with a studentized residual that exceeds the 0.999 quantile of a *t*-distribution, with the degrees of freedom being *n*-1, where *n* is the sample size (Field, 2017; Pituch & Stevens, 2015). Finally, the absence of multicollinearity requires that the predictor variables are not too highly correlated with one another. This was assessed using variance inflation factors (VIF), in which values over 10 imply the presence of multicollinearity (Menard, 2009).

Research Questions and Hypotheses

RQ1: What is the association between sleep self-efficacy and self-efficacy for PA, PA adherence, and the demographic variables age, gender, race/ethnicity, shift worked, and cohabitation status among RNs working 12-hour shifts?

$H_0$1: There is no association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working 12-hour shifts.

H_a1: There is an association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, shift worked, and cohabitation status among RNs working 12-hour shifts.

RQ2: To what extent does BMI mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts?

$H_0$2: BMI does not mediate the association between sleep self-efficacy and quantity of sleep, and quality of sleep among RNs working 12-hour shifts.

H_a2: BMI does mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts.

RQ3: To what extent do self-efficacy for PA and BMI predict PA adherence among RNs working 12-hour shifts?

$H_0$3: There is no predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

H_a3: There is a predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

RQ4: To what extent do sleep self-efficacy and shift worked predict the quantity of sleep among RNs?

$H_0$4: There is no predictive relationship between sleep self-efficacy and the shift worked and quantity of sleep among RNs.

H_a4: There is a predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.

RQ5: To what extent do sleep self-efficacy and shift worked predict quality of sleep among RNs?

H_05: There is no predictive relationship between sleep self-efficacy and shift worked and quality of sleep among RNs.

H_a5: There is a predictive relationship between sleep self-efficacy and the shift worked and quality of sleep among RNs.

RQ6: To what extent do self-efficacy for PA and shift worked predict participation in PA among RNs?

H_06: There is no predictive relationship between self-efficacy for PA and shift worked and participation in PA among RNs.

H_a6: There is a predictive relationship between self-efficacy for PA and shift worked and participation in PA among RNs.

Statistical Analysis of Variables

The relationship between self-efficacy for PA and sleep in nurses working the 12-hour shift was analyzed using multiple linear regression analysis. To this end, three coefficients were used: Pearson's correlation coefficient (r), Spearman's rho (r_s), and the Phi coefficient. Correlation denotes a relationship between statistical variables (Akoglu, 2018). Although these coefficients do not prove causation, they can quantify the strength of the relationship between variables. Both Pearson's r and Spearman's rho r_s are bivariate in that they measure the relationship between two variables.

Pearson’s correlation coefficient measures the linear relationship between variables where r denotes the coefficient, and p is the population from which the sample was drawn (Sedgwick, 2012). This coefficient is appropriate when the variables are numeric and at least one of them is linear. The raw data was evaluated using a scatterplot to assess the linearity between the variables. Scatter plots give the researcher a visual depiction of the data and show if it is linear. The resulting value is a correlation coefficient, which lies between -1 and +1, with values closer to -1 contingent upon the linearity's direction if it is positive or negative. This value is affected by the sample size, and larger samples may have a significant linear relationship, although the coefficient is closer to zero. The variables appropriate for the use of r must be continuous. Because this study uses continuous and ordinal measurements, a mixture of r and rs enhances results.

Spearman’s r_s is used with the r when the rank is of more value than the individual costs, and the data is collected using an ordinal, interval, or ratio scale. Spearman's r is a non-parametric value that does not require conditional information (Gauthier, 2001). Spearman's r correlates monotonic and measures the parallel change in two correlations without suggesting its strength. It merely shows if one variable increase when the other increases or a relationship between the variables (de Winter et al., 2016). Like Pearson’s coefficient, Spearman’s r_s can range from -1 to +1, with either value representing a perfect relationship and 0 meaning no relationship (Mukaka, 2012).

The variables in this study were entered into multiple regression analysis models. After assessing for linearity, the correlations were assigned a coefficient value and an associated p-value. This analysis method is appropriate when the study aims to predict

the functional relationships between variables and which variables are significant (McDonald, 2014). The Alpha or p-value denotes the significance level of the study. This value is set at 0.05 and represents the probability of falsely accepting or falsely rejecting the null hypothesis (Rose & McGuire, 2019). Cohen's standard for regression analysis was calculated as a standard for validating the effect size's strength on the variables. For regression analysis, a Cohen coefficient of 0.14 is considered small; 0.39 = medium; and 0.59 = large effect or weight of correlation between variables (Lachowicz et al., 2018).

The model was assessed using the F test, which was examined to evaluate the collective effect of all the independent variables on the DV (Liu et al., 2016). If significant, the relationship's strength for the individual variables can be assessed through either the t-test or backward elimination. Either method would generate a unique significance in the relationships between the variables. The t-test can then be used to produce a p-value to summarize the importance of the strength of the relationship between variables with p-values less than 0.05 suggesting that the null hypothesis should be rejected, and the alternative hypothesis accepted (Wang et al., 2019).

Statistical Analysis of Research Questions

RQ1

What is the association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, shift worked, and cohabitation status among RNs working 12-hour shifts?

To examine RQ1, a series of Chi-square Tests of Independence were conducted to examine whether age, ethnicity, and cohabitation status were independent from Sleep Self-Efficacy (SES), exercise self-efficacy, PA Adherence, and BMI respectively. To be able to compare the nominal demographic variables to the scale variables of interest, the variables of sleep self-efficacy, exercise self-efficacy, and PA Adherence were dichotomized into high and low scores. Additionally, the variable of BMI was separated into three categories: healthy weight, overweight, and obese.

To assess these relationships a series of Pearson correlations were run. Results were analyzed using the Pearson correlation coefficient (ρ). This correlation coefficient indicates the strength of the linear association between two variables. This correlation coefficient ranges from −1 to +1, and a correlation of 0 indicates that there is no relationship between the variables. Additionally, the sign of the coefficient describes the direction of the relationship. This means that positive values indicate that as one variable increases, the other variable also tends to increase. In contrast, negative values indicate an inverse relationship, where one variable tends to decrease as the other increases. Cohen (1988) provides heuristics for determining the effect size of ρ, where values within the ±0.10 to ±0.29 range indicate a weak association, values within the ±0.30 to ±0.49 range indicate a moderate association and values of ±0.50 or greater represent a strong association.

A series of point biserial correlation analyses were conducted for gender, shift worked and the continuous variables of interest (sleep self-efficacy, exercise self-efficacy, PA adherence, and BMI). A point biserial correlation is a special case of the

Pearson correlation used when the goal of the researcher is to determine if there is a significant relationship between a scale/continuous variable and a dichotomous variable. Cohen's standard was used to evaluate the strength of the relationship, where 0.1, 0.24, and 0.37 represent small, medium, and large effect sizes (Cohen, 1988). These effect size thresholds assume that both values of the binary variable are equally likely to occur (Rice & Harris, 2005; McGrath & Meyer, 2006).

Point biserial correlations are a bivariate measure of the strength of the relationship between a continuous (interval/ratio) and a dichotomous variable. Correlation coefficients of r range from −1 to +1, and a correlation of 0 indicates that there is no relationship between the variables. Additionally, the sign of the coefficient describes the direction of the relationship. This means that positive values indicate that as one variable increases, the other variable also tends to increase, while negative values indicate an inverse relationship, where one variable tends to decrease as the other increases. Cohen (1988) provides heuristics for determining the effect size of ρ, where values within the ±0.10 to ±0.29 range indicate a weak association, values within the ±0.30 to ±0.49 range indicate a moderate association and values of ±.50 or greater represent a strong association.

Finally, a series of Chi-square Tests of Independence were conducted to examine whether Age, ethnicity, and cohabitation status were independent from Sleep Self-Efficacy (SES), exercise self-efficacy, PA Adherence, and BMI respectively. To be able to compare the nominal demographic variables to the scale variables of interest, the variables of sleep self-efficacy, exercise self-efficacy, and PA adherence were

dichotomized into high and low scores. Additionally, the variable of BMI was separated into three categories: healthy weight, overweight, and obese.

The Chi-square test of independence is an appropriate analysis when the goal of the research question is to determine whether two categorical variables are independent. Significance was evaluated by calculating a Chi-square statistic (χ^2) and obtaining a *p*-value from a χ^2 distribution with $(r - 1) \times (c - 1)$ degrees of freedom, where *r* and *c* are the numbers of rows and columns in the contingency table. An alpha of 0.05 was used when assessing statistical significance.

RQ2

To what extent does BMI mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts?

To examine RQ2, a series of two mediation analyses were conducted to determine if there was a significant mediating effect of BMI on the relationship between sleep self-efficacy (as measured through the SES) and quantity/ quality of sleep (as measured through the PSQI) respectively. Mediation was examined based on the indirect and direct effects using a Sobel test. The Sobel test is the currently recommended inferential test of mediation (Meule, 2019). This analysis works well for large samples. A series of regression analyses are performed, and coefficients generated for each pathway of significance. The resulting values were then calculated using a website developed by Preacher et al. (2010). The results are based on an alpha of 0.05. The resulting Z score is analyzed using a "Z Scores" table to determine if the value falls outside the $\pm$1.96 two tailed critical value (Abu-Bader & Jones, 2021).

RQ3

To what extent do self-efficacy for PA and BMI predict PA adherence among RNs working 12-hour shifts?

To examine RQ3, a multiple linear regression was conducted to assess if Self-efficacy for PA and BMI predict the number of PA hours per week. Multiple linear regression is an appropriate analysis when the goal is to determine the relationship among a set of nominal, ordinal, or interval/ratio predictor variables on a continuous (interval/ratio) variable. The following regression equation was used: the number of hours worked per week = B_1*self-efficacy for PA + B_2*BMI in which the Bs are the unstandardized beta coefficients. The F-test was assessed to determine if the self-efficacy for PA and BMI collectively predicts self-reported PA levels. Additionally, the multiple correlation coefficient of determination of *R*-squared was evaluated and reported to determine how much variance in the self-reported levels of PA can be accounted for by the two predictor variables. Finally, *t*-tests were conducted to determine the significance of each predictor. The beta coefficients were then examined to describe the magnitude of prediction for each independent variable. For each significant predictor, every one unit increase in self-efficacy for PA or BMI, the level of PA increased or decreased by the magnitude of the unstandardized beta coefficient.

RQ4

To what extent do sleep self-efficacy and the shift worked predict the quantity of sleep among RNs?

To examine RQ4, a multiple linear regression was conducted to assess if sleep self-efficacy and the shift worked predict the quantity of sleep. Multiple linear regression is the appropriate analysis when the goal is to evaluate the relationship among a set of nominal, ordinal, or interval/ratio predictor variables on a continuous (interval/ratio) variable. The following regression equation was used: Quantity of sleep = B_1*sleep self-efficacy + B_2*shift worked in which the Bs are the unstandardized beta coefficients. The F-test was evaluated to determine if sleep self-efficacy and the shift worked collectively predict sleep quantity. Additionally, the multiple correlation coefficient of determination of *R*-squared was evaluated and reported to determine how much variance in the quantity of sleep can be accounted for by the two predictor variables. Finally, *t*-tests were conducted to determine the significance of each predictor. The beta coefficients were examined to describe the magnitude of prediction for each independent variable. For each significant predictor, every one unit increase in sleep self-efficacy or shift worked, the quantity of sleep increased or decreased by the magnitude of the unstandardized beta coefficient.

RQ5

To what extent does sleep self-efficacy and shift worked predict quality of sleep among RNs?

To examine RQ5, a multiple linear regression was conducted to assess if sleep self-efficacy and shift worked can predict sleep quality. Multiple linear regression is an appropriate analysis when the goal is to assess the relationship among a set of nominal, ordinal, or interval/ratio predictor variables on a continuous (interval/ratio) variable. The

following regression equation was used: Quality of sleep = B_1*sleep self-efficacy + B_2*shift worked in which the Bs are the unstandardized beta coefficients. The F-test was evaluated to determine if sleep self-efficacy and shift worked collectively predicts the quantity of sleep. Additionally, the multiple correlation coefficient of determination of *R*-squared were evaluated and reported to determine how much the two predictor variables can account for variance in the quality of sleep. Finally, *t*-tests were conducted to determine the significance of each predictor. The beta coefficients were examined to describe the magnitude of prediction for each independent variable. For each significant predictor, every one unit increase in sleep self-efficacy or shift worked, the quality of sleep increased or decreased by the magnitude of the unstandardized beta coefficient.

RQ6

To what extent do self-efficacy for PA and shift worked predict participation in PA among RNs?

To examine RQ6, an Ordinal Logistic Regression was conducted to determine if the odds of observing each response category of activity level could be explained by the variation in exercise self-efficacy (as measured by ESE) and shift worked. Much like linear regression, prior to the analysis, the assumptions of multicollinearity, and proportional odds were assessed. Ordinal Logic Regression is an appropriate analysis when the goal is to assess the relationship among a set of variables, where the outcome or response variable is ordinal with more than two levels. First the P-value is calculated to determine if the association between the variables is statistically significant. If the α value is equal to or less than 0.05, a statistically significant association can be assumed. Next

the goodness- of- fit is determined. To this end, the McFadden's R-square was calculated. McFadden's values greater than 0.2 are indicative of models with excellent fit (Louviere et al., 2000).

Statistical Analyses Tables

The following tables schematically display how the variables were analyzed statistically. The plans for analyzing each variable and how that variable was analyzed to answer the research question are displayed. Included are the non-parametric analysis used for each variable.

Table 1
Research Question I: Statistical Analysis

Research Questions	Variable(s)	Analyses
RQ1: What is the association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, shift worked, and cohabitation status among RNs working 12-hour shifts? $H_0$1: There is no association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working 12-hour shifts. H_a1: There is an association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working 12-hour shifts.	**(IV)** Sleep Self-efficacy **(IV)** Self-efficacy for PA and BMI **(IV)demographic variables** Age Gender Race/ethnicity Shift worked Cohabitation status	Chi-square analyses/ Pearson correlation

Table 2
Research Question II: Statistical Analyses

Research Questions	Variable(s)	Analyses
RQ2: To what extent does BMI mediate the association between sleep self-efficacy and quantity of sleep, and quality of sleep among RNs working 12-hour shifts? $H_0$2: BMI does not mediate the association between sleep self-efficacy and quantity of sleep, and quality of sleep among RNs working 12-hour shifts. H_a2: BMI does mediate the association between sleep Self-efficacy and quality of sleep, and quantity of sleep quantity and quality of sleep among RNs among RNs working 12-hour shifts.	**(IV)** Sleep self-efficacy **Intervening variable** BMI **(DV)** Quality of sleep **(DV)** Quantity of sleep	Regression analysis with Pearson correlation

Table 3

Research Question III: Statistical Analyses

Research Questions	Variable(s)	Analyses
RQ3: To what extent do self-efficacy for PA and BMI predict PA adherence among RNs working 12-hour shifts? $H_0$3: There is no predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts. H_a3: There is a predictive relationship between self-efficacy PA and BMI and PA adherence among RNs working 12-hour shifts.	**(IV)** Self-efficacy for PA **(IV)** BMI **(DV)** PA adherence	Multiple linear regression

Table 4

Research Question IV: Statistical Analyses

Research Questions	Variable(s)	Analyses
RQ4: To what extent do sleep self-efficacy and the shift worked predict the quantity of sleep among RNs? $H_0$4: There is no predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs. H_a4: There is a predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.	**(IV)** Sleep Self-efficacy (IV) Shift worked **(DV)** Quantity of sleep	Multiple linear regression

Table 5

Research Question V: Statistical Analyses

Research Questions	Variable(s)	Analyses
RQ5: To what extent do sleep self-efficacy and shift worked predict quality of sleep among RNs? $H_0$5: There is no predictive relationship between sleep self-efficacy and shift worked and quality of sleep among RNs. H_a5: There is a predictive relationship between sleep self-efficacy and shift worked and quality of sleep among RNs.	**(IV)** Sleep Self-efficacy **(IV)** Shift worked **(DV)** Quality of sleep	Multiple linear regression

Table 6

Research Question VI: Statistical Analyses

Research Questions	Variable(s)	Analyses
RQ6: To what extent do self-efficacy for PA and shift worked predict participation in PA among RNs?	**(IV)** Self-efficacy for PA **(IV)** Shift worked	Ordinal Logic Regression
$H_0$6: There is no predictive relationship between self-efficacy for PA and the shift worked and participation in PA among RNs.	**(DV)** Participation in PA	
H_a6: There is a predictive relationship between self-efficacy for PA and the shift worked and participation in PA among RNs.		

Threats to Validity

Some instances can occur with any study, altering the research's climate and resulting in a bias. Bias can occur from the design of the analysis to the analysis of the data collected. Any of these changes could alter the validity of the investigation results. How well extraneous variables are controlled dictated the study's rigor or internal validity (Slack & Draugalis, 2001; Andrade, 2018). For this study, the potential for missing data could threaten the validity of the results. Although the survey was online, the participant had a right to withdraw from the study. They may answer only part of the research and not the entire questionnaire for several reasons. What is done with the missing data and collected data could bias the study in either direction.

Internal validity can also be threatened by bias commonly associated with self-reporting questionnaires. The bias most relevant to this study was recall bias. Depending on the respondent, survey respondents were asked to recall events from the past weeks to the past decades. The participants in this study were asked their current height and weight from which BMI was calculated. Several recent studies have validated the accuracy of these values (Hodge et al., 2019; Davies et al., 2020; Olfert et al., 2018). These studies

have concluded that self-reported values correlate with measured values and are valid for calculating BMI. Hours of sleep recall correlate only moderately with actigraphy-measured sleep, with the length of sleep often over-reported (Lauderdale et al., 2008; Reid et al., 2018). How recall bias is managed in this inquiry was examined in the limitations section of this document.

Instruments used for this study have been assessed for internal validity through decades of research. The participants were asked to estimate values instead of giving exact numbers. The events considered are recurring and are more likely to enhance recall. The participants were asked to recall how many hours they slept in the last 24 hours or even the previous week. Using technology to measure sleep has been shown to have low validity (Degroote et al., 2020), and remembering this data could be challenging. Minimizing the recall period, using validated instruments, and recalling habitual or routine events are documented methods for reducing bias associated with self-administered surveys (Althubaiti, 2016). Although these interventions have been shown to minimize recall bias, none has been shown to eliminate this bias.

Bias is markedly complicated when the respondents and the surveyor are familiar with each other. Sponsor bias occurs when the respondents have a relationship or are familiar with the researcher. In this case, the contributors provided answers that support or negate the findings depending on the relationship's tenure. The literature suggests that sponsor bias is countered when the researcher's identity is hidden from the participants (Holman et al., 2015). Even without a formal introduction, this approach presented a problem in the chosen venue because many participants were, at minimum, be familiar

with me and my educational status. Alternatively, the research question was neutrally presented to prevent divulging the direction of the study. Minimizing knowledge of the intended result or purpose of the survey alleviated the tendency to answer one way or another.

Threats to external validity occur when the population of interest is studied from a selected sample population (Reiss, 2019). Risks to external validity could lead to limitations in generalizability. For this study, the selected population originated from one institution in a single city. Although the most popular confounding variables were addressed, other confounders may exist in other regions, hampering the study's replicability. There may also be minor confounders that affect nurses on one unit but do not affect nurses on another, causing the results to be directionally biased. Including multiple workstations in this survey is a way to control this threat to external validity.

Ethical Procedures

To solicit participants, I sent the flyer (Appendix A) to colleagues and requested that respondents complete the survey and forward the invitation to their associates. The leaflet was posted on my Facebook site and distributed to potential candidates through my email account. The flyer was directly linked to the survey through the universal resource locator (URL) link to text, Facebook, or the dedicated LinkedIn account. The flyer was a synopsis of the study, the purpose, and who is conducting the survey. The deadline for completing the research was also printed on the flyer.

The cover letter (Appendix B) was sent with the flysheet through email and on the Facebook site. This correspondence covered the reason for the study, who was doing the

study, and the social benefits gained through the study. The participation invitation letter appealed to the candidates to participate in the survey. This invitation preceded the study at the beginning of the survey as well and outlined the reason for the analysis and identified who was conducting the review. The participation invitation provided the participant information describing why the research is being undertaken and how it may improve employees' practice or health. This invitation also disclosed how the survey would be conducted among the RNs in their facility. The invitation letter further disclosed information describing the intention to encrypt data while being collected and secured in a limited access database. In addition to the above-listed information, the validated surveys used in this study were also divulged and explained.

The participants encountered the study's informed consent after entering one of the highlighted sites on the flyer (Appendix C). This section outlined their rights and security measures associated with the investigation. The consent also submitted that the contributor's rights and ethics were addressed as outlined by The Belmont Report (The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979). This researcher pledges to adhere to those principles throughout the study. Informed consent was a formal invitation to participate in the survey before accessing the questionnaire. The participants were informed that they may refuse to answer any question they prefer not to answer. Respondents may also withdraw from the study or decline to have their responses included in the aggregate analysis at any time. This information was accompanied by contact information for the researcher and

the IRB approval date. By clicking the link to the survey, the respondents acknowledged understanding of the consent and agreement to its terms.

This study was conducted through the internet, but the initial invitations were distributed in an environment where the participants were familiar with the surveyor. This environment predisposed the study to risk associated with conflict of interest or power differentials. My position was not one of power or influence. As disclosed in the consent, there was no way to trace the responses back to the e-mail addresses, and there was no way to know who filled out the survey and who did not.

Summary

In this study I examined the relationship between self-efficacy and 12-hour shift-workers' and their participation in recommended levels of sleep and PA. This chapter includes a description of how the study participants were recruited, the tools used to analyze the data, and how the survey was distributed to the interested population. This chapter covered how the raw data was studied and tested. In this chapter I also described how the study results were evaluated, which computer program would be used to generate statistically analyzable data and expounded on threats to that data's internal and external validity.

The following chapter contains information on how the data was collected and the demographic breakdown of the data. For the analysis I used tables, charts, and graphs to clarify essential data and aid in statistical interpretation of the results. The conclusions drawn from the data are explained, and the resulting scores for internal validity between and for samples calculated and recorded.

Chapter 4: Results

Introduction

In this quantitative study, Bandura's self-efficacy theory is tested to determine if self-efficacy could enhance or maintain positive health habits among RNs who work 12-hour night shifts. Through this study I analyzed the relationship between the DVs (self-efficacy for sleep, quality and quantity of sleep, self-efficacy for exercise adherence, and level of participation in PA) and IVs including the number of shifts worked, years on the shift, and current height and weight. Demographic information, including age, gender, and cohabitation status, was also collected, and analyzed. The study encompassed six research questions and six associated hypotheses to analyze the relationship between the dependent and independent variables.

In Chapter 1, it was explained how obesity can negatively impact shift workers, increasing their risk for health problems that could lead to mortality or morbidity. Chapter 2's literature review revealed a need for more research on self-efficacy for PA and sleep among those who work 12-hour night shifts. The SCT was chosen as the framework for this study and discussed and justified in Chapter 2, in addition to definitions of terminology used throughout the study. In Chapter 3, I introduced and defined the dependent and independent variables and how these variables were operationalized for this investigation.

To evaluate sleep quality, PSQI was used alongside four survey tools to gather information about self-efficacy for sleep and exercise. These surveys helped establish a baseline for assessing the respondents' current levels of self-efficacy and their sleep and

PA practices. In chapter three, I addressed in detail the scales used in this study to evaluate different aspects of sleep and exercise. The SE-S scale was used to determine the individual's ability to allocate enough time for sleep. The PSQI scale was utilized to assess both the quantity and quality of sleep. Additionally, the ESE scale was utilized to gauge the respondent's exercise self-efficacy, and the EARS scale was used to measure the individual's adherence or reasons for non-adherence to an exercise routine.

In Chapter 4, the research questions are analyzed, and the purpose of the study is highlighted. Additionally, the sampling process is overviewed, which includes handling missed data, converting data, and a descriptive analysis of the studied population and variables. Each of the six research questions are addressed individually and correlations among the study variables are explored. Finally, the six research questions are summarized and discussed in relation to the purpose of the study.

Purpose of the Study

The objective of this correlational study was to investigate the relationship between the sleep and PA patterns of RNs working 12-hour shifts and various factors such as SE-S, ESE, PSQI, Quantity of sleep, and EARS. To accomplish this, I established four specific objectives that aligned with the research questions of this study.

1. Purpose 1: To assess the association between demographic variables and self-efficacy for sleep (adhering to 7-9 hours of sleep per night) and PA self-efficacy for adherence (150 minutes of moderate-intensity PA per week) among RNs working 12-hour shifts.

2. Purpose 2: To evaluate the relationship between BMI and self-efficacy for sleep with self-reported quantity and quality of sleep among RNs working a 12-hour shift.
3. Purpose 3: To establish whether there is a difference in the measured self-efficacy for sleep and reported quantity of sleep per day among RNs who work different shifts (i.e., day and night shifts).
4. Purpose 4: To identify the relationship between exercise self-efficacy and the amount of reported level of exercise among shift workers by shift worked (i.e., day shift and night shift).

Data Collection

Time Frame, Recruitment, and Response Rates

I conducted an online survey through Survey Monkey to gather information from RNs. The survey focused on their quality of sleep and exercise and their self-efficacy for both. I also collected some demographic information, including age and ethnicity. The survey was open from March 28, 2023, to April 2, 2023. Once the survey was closed, the dataset was uploaded to SPSS version 28 for analysis. The research collection process was carried out without any discrepancies, as explained in Chapter 3.

I started collecting data for this analysis as soon as the survey opened without conducting a pilot study. To help spread the survey link, I reached out to some colleagues via personal email, as outlined in Chapter 3. Unfortunately, I did not get a great response in the first two weeks. In week 3, I tried a new approach by creating a cell phone link and

sending the survey via text to colleagues. I also promoted the survey on professional nursing Facebook groups.

I cleaned the data by removing any outliers and missing information in preparation for analysis. There was one outlier that I removed from the dataset. Additionally, I followed the instrument instructions to calculate composite scores for sleep self-efficacy, sleep quality, exercise self-efficacy, and PA adherence. Before conducting hypothesis testing, I calculated demographic and interest variables summary statistics.

Baseline Descriptive and Demographic Characteristics

The online survey yielded 273 participants who completed the online questionnaire. After eliminating incomplete responses, 266 suitable responses were obtained for the final analysis. Out of these, only 101 individuals worked a 12-hour shift. A filtered analysis was conducted on these participants to answer RQ1 through RQ3, which specifically pertained to this demographic. To answer RQ4 through RQ6, the entire population I analyzed the entire population of respondents. The filtered data revealed that 29.7% of the 101 participants worked 12-hours days and 70.3% worked 12-hour nights. Analytically 56.4% (n = 58) of this population were 20 to 50 years of age with 65.3% (n = 66) having 1 to 15 years of experience. Demographically 26% (n = 26) of the participants were single or widowed with the majority 30.7% (n = 31) cohabitating with partner, and 22.8% (n = 23) cohabitating with partner and dependent children.

In the United States there are 3,363,000 RNs employed in the profession. Statistically, 14.5% are African American, 73.6% are Caucasian, 8.9% are Asian, 8.1%

are Hispanic with 87.9% women and 12.1% male (U.S. Bureau of Labor Statistics, 2023). The survey returned 101 individuals of the 266 total responses who were 12-hour shift workers. Within this filtered sample, there were 47.5% African American, 16.8 % Caucasian, 56.3% women, 43.6% men, with 51.5% employed full time, and 48.5% employed less than 10 years. Complete demographics with frequencies are listed in the following summary of statistics section.

Univariate Analyses

I calculated frequencies and percentages for categorical variables and means and standard deviations for continuous variables. I also conducted Cronbach alpha reliability analyses for the four composite scores. To answer the six research questions, I performed a series of correlations, chi-squared tests, mediation analyses, and regressions, which are presented below.

Throughout this chapter, I will be examining the following research questions:

RQ1: What is the association between sleep self-efficacy (as measured by the SE-S scale) and self-efficacy for PA (as measured by the exercise self-efficacy scale), PA adherence (as measured by the EARS scale), BMI (as calculated from self-reported height and weight from Demographic Questionnaire), and the demographic variables age(as self-reported on Demographic Questionnaire) , gender (as self-reported on Demographic Questionnaire), race/ethnicity (as self-reported on Demographic Questionnaire), shift worked (as self-reported on Demographic Questionnaire), and cohabitation status (as self-reported on Demographic Questionnaire) among RNs working 12-hour shifts?

$H_0$1: There is no association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working 12-hour shifts.

H_a1: There is an association between sleep self-efficacy and self-efficacy for PA, PA adherence, BMI and the demographic variables age, gender, race/ethnicity, the shift worked, and cohabitation status among RNs working 12-hour shifts.

RQ2: Does BMI mediate the relationship between sleep self-efficacy and the quantity and quality of sleep among RNs working 12-hour shifts?

$H_0$2: BMI does not mediate the association between sleep self-efficacy, quantity of sleep, and quality of sleep among RNs working 12-hour shifts.

H_a2: BMI does mediate the association between sleep self-efficacy and quantity of sleep and quality of sleep among RNs working 12-hour shifts.

RQ3: Is there a predictive relationship between exercise self-efficacy and BMI as measured by the self-reported level of PA adherence among RNs working 12-hour shifts?

$H_0$3: There is no predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

H_a3: There is a predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts.

RQ4: To what extent does self-efficacy for sleep and the shift worked predict the quantity of sleep among RNs?

$H_0$4: There is no predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.

H_a4: There is a predictive relationship between sleep self-efficacy and shift worked and quantity of sleep among RNs.

RQ5: To what extent does sleep self-efficacy and shift worked predict the quality of sleep among RNs?

H_05: There is no predictive relationship between sleep self-efficacy and the shift worked and quality of sleep among RNs.

H_a5: There is a predictive relationship between sleep self-efficacy and the shift worked and quality of sleep among RNs.

RQ6: To what extent do exercise self-efficacy and shift worked predict participation in PA among RNs?

H_06: There is no predictive relationship between exercise self-efficacy and shift worked and participation in PA among RNs.

H_a6: There is a predictive relationship between exercise self-efficacy and shift worked and participation in PA among RNs.

Summary Statistics

Before conducting the hypothesis testing, I calculated descriptive statistics for both the demographic questions and variables of interest. I calculated frequencies and percentages for categorical variables and means and standard deviations for continuous variables. There were no missing values in any category.

First, I calculated frequencies and percentages for age, cohabitation status, ethnicity, gender, employment status, shift worked, activity level, and weight gained. The most frequently observed category of age was 40 to 49 years old (n = 27, 26.21%). The

most frequently observed category of cohabitation status was cohabitation with partner (*n* = 32, 31.07%). The most frequently observed category of ethnicity was African American (*n* = 49, 47.57%). The most frequently observed category of gender was Female (*n* = 58, 56.31%). The most frequently observed category of employment status was Full-Time (72 hours or more per 2 weeks' pay period) (*n* = 54, 52.43%). The most frequently observed category of shift worked was 12-hour night shifts (*n* = 71, 68.93%). The most frequently observed category of activity level was low (exercise never or less than once a week for 30 minutes or more; *n* = 43, 41.75%). The most frequently observed category of weight gained was 0 to 5 pounds (*n* = 22, 21.36%). Frequencies and percentages are presented in Table 7.

Table 7

Frequency Table for Demographic Variables of Interest

Variable	*n*	%
Age		
20-29 years old	8	7.77
30-39 years old	23	22.33
40-49 years old	27	26.21
50-59 years old	22	21.36
OVER 60 years old	23	22.33
Cohabitation Status		
single	18	17.48
cohabitation with partner	32	31.07
widowed	8	7.77
cohabitation with dep child/children	21	20.39
cohabitation with partner and dep child/children	24	23.30
Ethnicity		
African American	49	47.57
European American/ Caucasian	17	16.50
Asian	20	19.42
Hispanic	8	7.77
American Indian	8	7.77
Other	1	0.97
Missing	0	0.00
Gender		
female	58	56.31
male	45	43.69
Employment Status		
full-Time (72 hours or more per 2-week pay period)	54	52.43
part-Time (36 hours or more but less than 72 hours per 2-week pay period)	26	25.24
less than part-time (less than 36 hours per 2-week pay period)	23	22.33
Shift Worked		
12-hour day shifts	32	31.07
12-hour night shifts	71	68.93
Activity Level		
low (exercise never or less than once a week for 30 minutes or more)	43	41.75
moderate (exercise one or more times a week for 30 minutes or more)	37	35.92
high (exercise two or three times a week for 30 minutes or more)	23	22.33
Weight Gained		
0 pounds	13	12.62
0 TO 5 pounds	22	21.36
6 TO 10 pounds	12	11.65
11 TO 20 pounds	8	7.77
21 TO 30 pounds	18	17.48
31 TO 40 pounds	21	20.39
41 TO 50 pounds	9	8.74

Note. Due to rounding errors, percentages may not equal 100%.

Furthermore, the means and standard deviations of the relevant continuous variables were computed and presented. The observations for sleep self-efficacy had an average of 27.20 (*SD* = 7.12). The observations for quantity of sleep had an average of 6.91 (*SD* = 1.55). The observations for quality of sleep had an average of 9.65 (*SD* = 3.88). The observations for exercise self-efficacy had an average of 24.34 (*SD* = 5.87). The observations for PA adherence had an average of 13.08 (*SD* = 4.23). The summary statistics can be found in Table 8.

Table 8

Summary Statistics Table for Continuous Variables of Interest

Variable	*M*	*SD*	*n*
Sleep Self Efficacy (SES total)	27.20	7.12	103
Quantity of Sleep (Hours of sleep)	6.91	1.55	103
Quality of Sleep (PSQI)	9.65	3.88	103
Exercise Self Efficacy (ESE total)	24.34	5.87	103
PA Adherence (EARS total)	13.08	4.23	103

Reliability Analysis

To determine the reliability of the composite scores, a series of Cronbach alpha coefficients were calculated for the variables of sleep self-efficacy, quality of sleep, exercise self-efficacy, and PA adherence. The Cronbach's alpha coefficient was evaluated using the guidelines suggested by George and Mallery (2018) where: > 0.9=*excellent*, > 0.8=*good*, > 0.7=*acceptable*, > 0.6=*questionable*, > 0.5=*poor*, and ≤ 0.5=*unacceptable*.

The items for SE-S, EARS, and ESE had a Cronbach's alpha coefficient of 0.70 and above, indicating acceptable to good reliability. The items for PSQI, however, had a

Cronbach's alpha coefficient of 0.68, indicating questionable reliability. Table 9 presents the results of the reliability analysis.

Table 9

Reliability Table for SES, PSQI, EARS, and ESE

Scale	No. of Items	α	Lower Bound	Upper Bound
SES	9	0.89	0.86	0.91
PSQI	9	0.68	0.61	0.75
EARS	7	0.70	0.66	0.73
ESE	9	0.89	0.86	0.91

RQ1 Statistical Analysis and Results

To answer the first research question, a series of correlational and relational analyses were conducted to determine if there were significant relationships between sleep self-efficacy, exercise self-efficacy, PA adherence, BMI, and the demographic variables of age, ethnicity, gender, shift worked, and cohabitation status. Specifically, a series of Pearson correlations were conducted to determine if the continuous variables of sleep self-efficacy, exercise self-efficacy, PA adherence, and BMI were related to one another. A series of point biserial correlations were conducted to determine if the continuous variables were significantly related to the dichotomous variables of gender and shift worked. Finally, a series of chi squared analyses were conducted to determine if the demographic variables (age, ethnicity, and cohabitation status) were related to the dichotomized variables of interest (sleep self-efficacy, exercise self-efficacy, PA adherence, and BMI).

Pearson Correlation Analyses

First, a series of Pearson correlations were conducted to determine if there were significant relationships among SE-S, ESE, EARS, and BMI. Cohen's standard was used to evaluate the strength of the relationships, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size (Cohen, 1988). Prior to each analysis, the assumption of linearity was assessed and presented.

Linearity:

A Pearson correlation requires that the relationship between each pair of variables is linear (Conover & Iman, 1981). This assumption is violated if there is curvature among the points on the scatterplot between any pair of variables. Figure 2-Figure 4 present the scatterplots of the correlations. A regression line has been added to assist the interpretation.

Figure 2

Scatterplots with the regression Line Added for SE-S and ESE (left), SE-S and EARS (right)

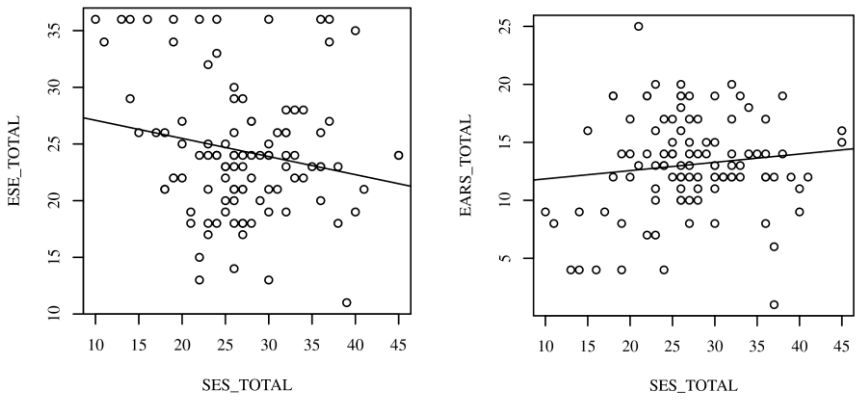


Figure 3

Scatterplots with the regression line added for SE-S and BMI (left), ESE and EARS (right)

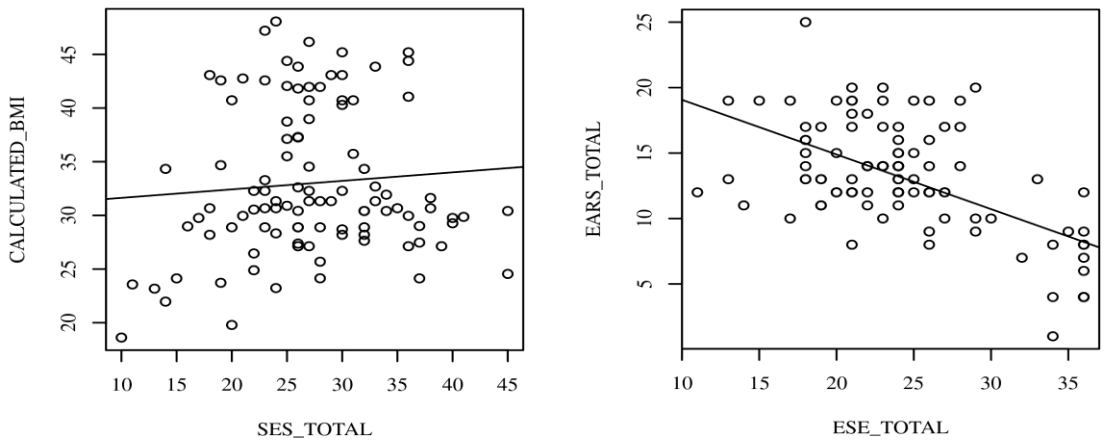
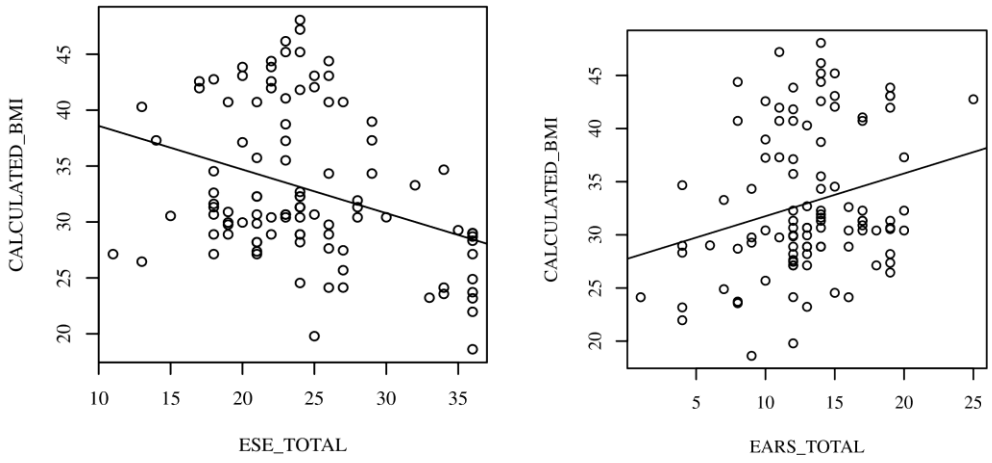


Figure 4

Scatterplots with the regression line added for ESE and BMI (left), EARS and BMI (right)



Results. The results of the correlations were examined based on an alpha value of 0.05. A significant negative correlation was observed between SE-S and ESE, with a

correlation of -0.19, indicating a small effect size ($p = 0.05$). This suggests that as sleep self-efficacy increases, exercise self-efficacy tends to decrease. A significant negative correlation was also observed between ESE and EARS, with a correlation of -0.58, indicating a large effect size ($p < 0.001$). This suggests that as exercise self-efficacy increases, PA adherence tends to decrease. Another significant negative correlation was observed between exercise self-efficacy and BMI, with a correlation of -0.33, indicating a moderate effect size ($p < 0.001$). This suggests that as exercise self-efficacy increases, BMI tends to decrease. Finally, a significant positive correlation was observed between PA adherence and BMI, with a correlation of 0.25, indicating a small effect size ($p = 0.011$). This suggests that as PA adherence increases, BMI tends to increase. No other significant correlations were found.

With a correlation analysis resulting in a significant relationship between ESE-EARS, ESE-BMI, SE-S-ESE, and EARS-BMI, the null hypothesis is rejected. The answer to RQ1 is: There is a significant association between self-efficacy for sleep and exercise self-efficacy, exercise self-efficacy and exercise adherence, exercise seif-efficacy and BMI, and exercise adherence and BMI among RNs working a 12-hour shift. With a correlation analysis resulting in no significant relationship between the variables SES-EARS and SES-BMI, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between sleep self-efficacy and exercise adherence and sleep self-efficacy and BMI among RNs working 12-hour shifts. Table 10 presents the results of the correlations.

Table 10

Pearson Correlation Results Among SE-S, ESE, EARS, and BMI

Combination	*r*	95.00% CI	*n*	*p*
SE-S-ESE	-0.19	[-0.37, -0.00]	103	0.050
SE-S-EARS	0.12	[-0.08, 0.31]	103	0.226
SE-S-BMI	0.08	[-0.11, 0.27]	103	0.408
ESE-EARS	-0.58	[-0.70, -0.43]	103	<0 .001
ESE-BMI	-0.33	[-0.50, -0.15]	103	<0 .001
EARS-BMI	0.25	[0.06, 0.42]	103	0.011

Next, a series of point biserial correlation analyses were conducted for gender, shift worked and the continuous variables of interest (sleep self-efficacy, exercise self-efficacy, PA adherence, and BMI). A point biserial correlation is a special case of the Pearson correlation used when the goal of the researcher is to determine if there is a significant relationship between a scale/continuous variable and a dichotomous variable. Cohen's standard was used to evaluate the strength of the relationship, where 0.1, 0.24, and 0.37 represent small, medium, and large effect sizes (Cohen, 1988). These effect size thresholds assume that both values of the binary variable are equally likely to occur (Rice & Harris, 2005; McGrath & Meyer, 2006).

Gender

The result of the correlations was examined based on an alpha value of 0.05. There was a significant positive correlation between gender and EARS with a correlation coefficient of 0.23 ($p = 0.022$), indicating a small effect size. This suggests that moving from the female category to the male category of gender is associated with an increase in PA adherence. Therefore, the male category of gender tends to be associated with higher values of PA adherence.

With the correlation analysis resulting in no significant relationship between the variables gender-SES, gender-ESE, and gender and BMI, for these variables the answer to RQ1 is: There is no significant association between gender-sleep self-efficacy, gender-exercise self-efficacy, and gender-BMI among RNs working a 12-hour shift. With a correlation analysis resulting in a relationship between the variable gender and exercise adherence, the null hypothesis is rejected. The answer for this variable to RQ1 is: There is a significant association between gender and exercise adherence among RNs working 12-hour shifts. Table 11 presents the results of the correlation.

Table 11

Point Biserial Correlations for Gender and SE-S, ESE, and BMI

Combination	*r*	*n*	*p*
Gender-SE-S	0.09	103	0.362
Gender-ESE	-0.10	103	0.324
Gender- EARS	0.23	103	0.022
Gender-BMI	0.02	103	0.873

Shift Worked

The result of the correlations is examined based on an alpha value of 0.05. There are no significant correlations between any pairs of variables. With a correlation analysis resulting in no significant relationship between the variables shift worked and SE-S, shift worked and ESE, and shift worked and BMI, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between shift worked-sleep self-efficacy, shift worked-exercise self-efficacy, shift worked- exercise

adherence, and shift worked-BMI among RNs working 12-hour shifts. Table 12 presents the results of the correlation.

Table 12

Point Biserial Correlations for Shift Worked and SE-S

Combination	*r*	*n*	*p*
Shift Worked-SE-S	0.00	103	0.988
Shift Worked-ESE	-0.01	103	0.882
Shift Worked- EARS	0.03	103	0.746
Shift Worked-BMI	-0.08	103	0.412

Chi-square Tests of Independence

Finally, a series of Chi-square Tests of Independence were conducted to examine whether Age, ethnicity, and cohabitation status were independent from SE-S, ESE, EARS, and BMI respectively. To be able to compare the nominal demographic variables to the scale variables of interest, the variables of SE-S, ESE, and EARS were dichotomized into high and low scores. Additionally, the variable of BMI was separated into three categories: healthy weight, overweight, and obese.

Age

Prior to each analysis, the assumption of adequate cell size was assessed. This assumption requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least five (McHugh, 2013). This assumption was violated for the comparisons between age and SE-S dichotomized (SE-S_ dic.), and age and BMI. When the assumptions of the chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Therefore, supplemental

Fisher's exact tests were conducted and presented to confirm the results of the Chi-squared analyses.

***Age and* SE-S_ dic**

First, a Chi-squared analysis was conducted between the variables of age and SE-S_ dic. The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(4) = 8.24$, $p = 0.083$, suggesting that age and SE-S_ dic. could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. Table 13 presents the results of the Chi-square test.

Table 13

Observed and Expected Frequencies

	Sleep Self-Efficacy (SE-S_dic)				
AGE	Low	High	χ^2	*df*	*p*
20-29 years old	0[1.32]	8[6.68]	8.24	4	0.083
30-39 years old	3[3.80]	20[19.20]			
40-49 years old	8[4.46]	19[22.54]			
50-59 years old	5[3.63]	17[18.37]			
OVER 60 years old	1[3.80]	22[19.20]			

Note. Values formatted as Observed [Expected].

An additional Fisher's exact test was conducted to confirm whether age and SE-S_ dic. were independent. The results of the Fisher exact test were not significant based on an alpha value of 0.05, $p = 0.092$, suggesting that age and SE-S_ dic. could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. With the Fisher exact resulting in no significant association between the variables age and SE-S_ dic., for these variables the

null hypothesis is accepted. The answer to RQ1 is: There is no significant association between age- SE-S_dic. among RNs working 12-hour shifts.

Age and ESE_dic

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(4) = 5.07$, $p = 0.280$, suggesting that age and ESE dichotomized (ESE_dic) could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. With the Chi-square analysis resulting in independence between the variables age and ESE_dic, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between age and exercise self-efficacy among RNs working 12-hour shifts. Table 14 presents the results of the Chi-square test.

Table 14

Observed and Expected Frequencies

	Exercise Self-Efficacy (ESE_dic)				
Age	Low	High	χ^2	*df*	*p*
20-29 years old	1[1.86]	7[6.14]	5.07	4	0.280
30-39 years old	6[5.36]	17[17.64]			
40-49 years old	3[6.29]	24[20.71]			
50-59 years old	8[5.13]	14[16.87]			
OVER 60 years old	6[5.36]	17[17.64]			

Note. Values formatted as Observed [Expected].

Age and EARS_dic

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(4) = 0.70$, $p = 0.952$, suggesting that age and EARS_dichotomized (EARS_dic.) could be independent of one another. This implies that the observed frequencies were not

significantly different than the expected frequencies. The answer to RQ1 is: There is no significant association between age and EARS_dic among RNs working 12-hour shifts. Table 15 presents the results of the Chi-square test.

Table 15

Observed and Expected Frequencies

	PA Adherence (EARS-dic)				
AGE	Low	High	χ^2	*df*	*p*
20-29 years old	2[2.17]	6[5.83]	0.70	4	0.952
30-39 years old	6[6.25]	17[16.75]			
40-49 years old	8[7.34]	19[19.66]			
50-59 years old	7[5.98]	15[16.02]			
OVER 60 years old	5[6.25]	18[16.75]			

Note. Values formatted as Observed [Expected].

Age and BMI

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(8) = 7.03$, $p = 0.534$, suggesting that age and BMI could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. Table 16 presents the results of the Chi-square test.

Table 16

Observed and Expected Frequencies

	BMI					
AGE	healthy weight	overweight	obese	χ^2	*df*	*p*
20-29 years old	0[0.93]	4[2.17]	4[4.89]	7.03	8	0.534
30-39 years old	3[2.68]	7[6.25]	13[14.07]			
40-49 years old	4[3.15]	7[7.34]	16[16.51]			
50-59 years old	4[2.56]	6[5.98]	12[13.46]			
OVER 60 years old	1[2.68]	4[6.25]	18[14.07]			

Note. Values formatted as Observed [Expected].

An additional Fishers exact test was conducted to confirm the results of the Chi squared test. The results of the Fisher exact test were not significant based on an alpha value of 0.05, $p = 0.590$, suggesting that age and BMI could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. With the Fisher exact resulting in no significant association between the variables age and BMI, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between age-BMI among RNs working 12-hour shifts.

Ethnicity

Prior to each analysis, the assumption of adequate cell size was assessed. This assumption requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least five (McHugh, 2013). This assumption was violated for the comparisons between ethnicity and sleep self-efficacy, exercise self-efficacy, PA adherence, and BMI. When the assumptions of the Chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Therefore, supplemental Fisher's exact tests were conducted and presented to confirm the results of the Chi-squared analyses.

Ethnicity and SE-S _dic

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(5) = 2.19$, $p = 0.822$, suggesting that Ethnicity and SE-S_dic could be independent of one another. This implies that the observed frequencies were not

significantly different than the expected frequencies. Table 17 presents the results of the Chi-square test.

Table 17

Observed and Expected Frequencies

	Sleep Self-Efficacy (ESE_dic)				
Ethnicity	Low	High	χ^2	*df*	*p*
African American	9[8.09]	40[40.91]	2.19	5	0.822
European American/ Caucasian	3[2.81]	14[14.19]			
Asian	4[3.30]	16[16.70]			
Hispanic	1[1.32]	7[6.68]			
American Indian	0[1.32]	8[6.68]			
Other	0[0.17]	1[0.83]			

Note. Values formatted as Observed [Expected].

An additional Fisher's exact test was conducted to confirm whether ethnicity and SE-S_dic were independent. The results of the Fisher exact test were not significant based on an alpha value of 0.05, $p = 0.871$, suggesting that ethnicity and SE-S_dic could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. With the Fisher exact resulting in independence between ethnicity and SE-S_dic, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between ethnicity and sleep self-efficacy among RNs working 12-hour shifts.

Ethnicity and ESE

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(5) = 1.25$, $p = 0.940$, suggesting that ethnicity and ESE could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. Table 18 presents the results of the Chi-square test.

Table 18

Observed and Expected Frequencies

	Exercise Self-Efficacy (ESE_dic)				
Ethnicity	Low	High	χ^2	*df*	*p*
African American	13[11.42]	36[37.58]	1.25	5	0.940
European American/ Caucasian	4[3.96]	13[13.04]			
Asian	4[4.66]	16[15.34]			
Hispanic	1[1.86]	7[6.14]			
American Indian	2[1.86]	6[6.14]			
Other	0[0.23]	1[0.77]			

Note. Values formatted as Observed [Expected].

An additional Fisher's exact test was conducted to confirm whether ethnicity and ESE_dic are independent. The results of the Fisher exact test were not significant based on an alpha value of 0.05, $p = 0.974$, suggesting that ethnicity and ESE_dic could be independent of one another. This implies that the observed frequencies are not significantly different than the expected frequencies. With the Fisher exact resulting in independence between ethnicity and ESE_dic, for these variables the null hypothesis is accepted. The answer to RQ1 is: There is no significant association between ethnicity and exercise self-efficacy among RNs working a 12-hour shift.

Ethnicity and EARS_dic

The results of the Chi-square test were not significant based on an alpha value of 0.05, $\chi^2(5) = 7.03$, $p = 0.219$, suggesting that ethnicity and EARS_dic could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. Table 19 presents the results of the Chi-square test.

Table 19

Observed and Expected Frequencies

	PA Adherence (EARS_dic)				
Ethnicity	Low	High	X^2	*df*	*p*
African American	17[13.32]	32[35.68]	7.03	5	0.219
European American/ Caucasian	3[4.62]	14[12.38]			
Asian	7[5.44]	13[14.56]			
Hispanic	1[2.17]	7[5.83]			
American Indian	0[2.17]	8[5.83]			
Other	0[0.27]	1[0.73]			

Note. Values formatted as Observed [Expected].

An additional Fisher's exact test was conducted to confirm whether ethnicity and EARS_dic are independent. The results of the Fisher exact test were not significant based on an alpha value of 0.05, $p = 0.226$, suggesting that ethnicity and EARS_dic could be independent of one another. This implies that the observed frequencies are not significantly different than the expected frequencies. With the Fisher exact showing independence between ethnicity and EARS_dic, the null hypothesis is accepted for these variables. The answer to RQ1 is: There is no significant association between ethnicity and PA adherence among RNs working 12-hour shifts.

Ethnicity and BMI

The results of the Chi-square test were significant based on an alpha value of 0.05, $\chi^2(10) = 22.37$, $p = 0.013$, suggesting that ethnicity and BMI are related to one another. The following level combinations had observed values that are greater than their expected values: ethnicity (Asian): BMI (healthy weight), ethnicity (Other): BMI (healthy weight), ethnicity (European American/ Caucasian): BMI (overweight), ethnicity (Asian): BMI (overweight), ethnicity (American Indian): BMI (overweight), ethnicity (African American): BMI (obese), ethnicity (European American/ Caucasian): BMI

(obese), and ethnicity (Hispanic): BMI (obese). The following level combinations had observed values that are less than their expected values: ethnicity (African American):BMI (healthy weight), ethnicity (European American/ Caucasian):BMI (healthy weight), ethnicity (Hispanic):BMI (healthy weight), ethnicity (American Indian):BMI (healthy weight), ethnicity (African American):BMI (overweight), ethnicity (Hispanic):BMI (overweight), ethnicity (Other):BMI (overweight), ethnicity (Asian):BMI (obese), ethnicity (American Indian):BMI (obese), and ethnicity (Other):BMI (obese). Table 20 presents the results of the Chi-square test.

Table 20

Observed and Expected Frequencies

	BMI					
Ethnicity	healthy weight	overweight	obese	χ^2	*df*	*p*
African American	5[5.71]	10[13.32]	34[29.97]	22.37	10	0.013
European American/ Caucasian	1[1.98]	5[4.62]	11[10.40]			
Asian	5[2.33]	7[5.44]	8[12.23]			
Hispanic	0[0.93]	1[2.17]	7[4.89]			
American Indian	0[0.93]	5[2.17]	3[4.89]			
Other	1[0.12]	0[0.27]	0[0.61]			

Note. Values formatted as Observed [Expected].

An additional Fishers exact test was conducted to confirm whether the variables of ethnicity and BMI are independent from one another. The results of the Fisher exact test were significant based on an alpha value of 0.05, $p = 0.043$, suggesting that Ethnicity and BMI are related to one another. Because the Fisher exact resulted in an association between ethnicity and BMI, the null hypothesis is rejected for these variables. The answer to RQ1 is: There is a significant association between ethnicity and BMI among RNs working 12-hour shifts.

Cohabitation Status

Prior to each analysis, the assumption of adequate cell size was assessed. This assumption requires all cells to have expected values greater than zero and 80% of cells to have expected values of at least five (McHugh, 2013). This assumption is violated for the comparisons between cohabitation status and SE-S_dic and cohabitation status and ESE_dic. When the assumptions of the Chi-square test are violated, Fisher's exact test can be used to produce more reliable results with small sample sizes. Therefore, two supplemental chi squared tests were conducted and presented.

Cohabitation and SE-S_dic

The results of the Chi-square test are not significant based on an alpha value of 0.05, $\chi^2(4) = 4.10$, $p = 0.392$, suggesting that Cohabitation status and SE-S_dic could be independent of one another. This implies that the observed frequencies are not significantly different than the expected frequencies. Table 21 presents the results of the Chi-square test.

Table 21

Observed and Expected Frequencies

	Sleep Self-Efficacy (SE-S_dic)				
Cohabitation status	Low	High	χ^2	*df*	*p*
Single	5[2.97]	13[15.03]	4.10	4	0.392
Cohabitation with partner	6[5.28]	26[26.72]			
Widowed	0[1.32]	8[6.68]			
Cohabitation with dep child/children	2[3.47]	19[17.53]			
Cohabitation with partner and dep child/children	4[3.96]	20[20.04]			

Note. Values formatted as Observed [Expected].

An additional Fisher exact test is conducted to confirm whether the variables of cohabitation and exercise self-efficacy are independent from one another. The results of

the Fisher exact test are not significant based on an alpha value of 0.05, $p = 0.463$, suggesting that Cohabitation status and SE-S_dic could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies. The Fisher exact test resulted in independence between cohabitation status and SE-S_dic, thus the null hypothesis was accepted for these variables. The answer to RQ1: There is no significant association between cohabitation status and SE-S_dic among RNs working a 12-hour shift.

Cohabitation and ESE_dic

The results of the Chi-square test are not significant based on an alpha value of 0.05, $\chi^2(4) = 5.23$, $p = 0.264$, suggesting that Cohabitation status and ESE_dic are independent of one another. This implies that the observed frequencies are not significantly different than the expected frequencies. Table 22 presents the results of the Chi-square test.

Table 22

Observed and Expected Frequencies

	Exercise Self-Efficacy (ESE_dic)				
Cohabitation status	Low	High	χ^2	*df*	*p*
Single	4[4.19]	14[13.81]	5.23	4	0.264
Cohabitation with partner	11[7.46]	21[24.54]			
Widowed	2[1.86]	6[6.14]			
Cohabitation with dep child/children	5[4.89]	16[16.11]			
Cohabitation with partner and dep child/children	2[5.59]	22[18.41]			

Note. Values formatted as Observed [Expected].

An additional Fisher exact test is conducted to confirm whether the variables of cohabitation and ESE_dic are independent from one another. The results of the Fisher exact test are not significant based on an alpha value of 0.05, $p = 0.230$, suggesting that Cohabitation status and ESE_dic could be independent of one another. This implies that

the observed frequencies are not significantly different than the expected frequencies. As a Fisher exact test resulted in independence between cohabitation status and exercise self-efficacy, the null hypothesis is accepted for these variables. The answer to RQ1 is: There is no significant association between cohabitation status and ESE among RNs working a 12-hour shift.

Cohabitation and PA Adherence

The results of the Chi-square test are not significant based on an alpha value of 0.05, $\chi^2(4) = 7.90$, $p = 0.095$, suggesting that Cohabitation status and EARS_ dic could be independent of one another. This implies that the observed frequencies are not significantly different than the expected frequencies. The answer to RQ1 is: There is no significant association between cohabitation status and EARS_ dic among RNs working a 12-hour shift. Table 23 presents the results of the Chi-square test.

Table 23

Observed and Expected Frequencies

	EARS_ dic				
Cohabitation status	Low	High	χ^2	*df*	*p*
Single	7[4.89]	11[13.11]	7.90	4	0.095
Cohabitation with partner	9[8.70]	23[23.30]			
Widowed	2[2.17]	6[5.83]			
Cohabitation with dep child/children	1[5.71]	20[15.29]			
Cohabitation with partner and dep child/children	9[6.52]	15[17.48]			

Note. Values formatted as Observed [Expected].

Cohabitation and BMI

The results of the Chi-square test are not significant based on an alpha value of 0.05, $\chi^2(8) = 5.04$, $p = 0.753$, suggesting that Cohabitation status and BMI are independent of one another. This implies that the observed frequencies are not

significantly different than the expected frequencies. The answer to RQ1: There is no significant association between cohabitation status and BMI among RNs working 12-hour shifts. Table 24 presents the results of the Chi-square test.

Table 24

Observed and Expected Frequencies

	BMI					
Cohabitation status	healthy weight	overweight	obese	χ^2	*df*	*p*
Single	2[2.10]	5[4.89]	11[11.01]	5.04	8	0.753
Cohabitation with partner	4[3.73]	9[8.70]	19[19.57]			
Widowed	1[0.93]	2[2.17]	5[4.89]			
Cohabitation with dep child/children	0[2.45]	7[5.71]	14[12.84]			
Cohabitation with partner and dep child/children	5[2.80]	5[6.52]	14[14.68]			

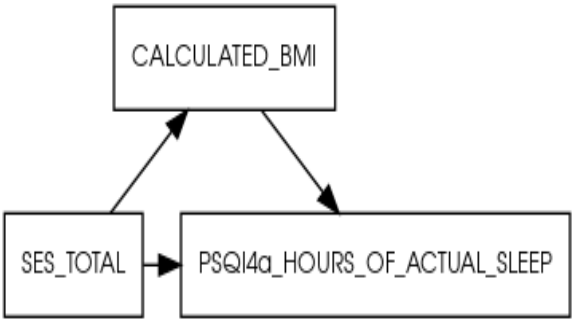
Note. Values formatted as Observed [Expected].

RQ2 Statistical Analysis and Results

To answer the second research question, a series of two mediation analyses were conducted to determine if there was a significant mediating effect of BMI on the relationship between SE-S and quantity/ quality of sleep (Hours of sleep/ PSQI) respectively. The Node diagram or mediation model diagram are seen below in Figure 5.

Figure 5

Node diagram for the mediation analysis



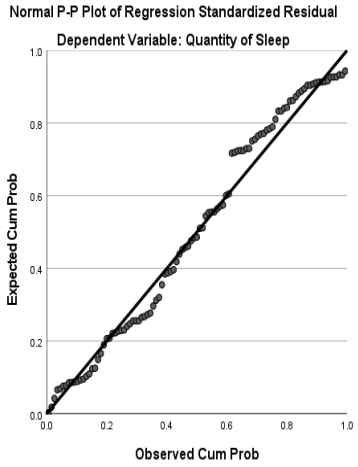
Quantity of Sleep

First, a causal mediation analysis was conducted to assess if BMI mediated the relationship between SE-S and quantity of sleep. Prior to the analysis, the assumptions of normality, homoscedasticity, multicollinearity, and lack of outliers were assessed and presented.

Normality. The assumption of normality was assessed by plotting a P-P scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations indicate that the parameter estimates are unreliable. This scatterplot suggests that the assumption of normality is met. Figure 6 presents a P-P scatterplot of model residuals.

Figure 6

P-P scatterplot for normality of the residuals for the regression model.

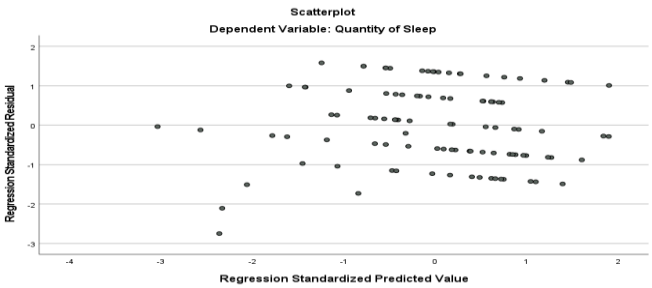


Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with

a mean of zero and no apparent curvature. This scatterplot suggests that the assumption was met. Figure 7 presents a scatterplot of predicted values and model residuals.

Figure 7

Residuals scatterplot testing homoscedasticity



Multicollinearity. Variance Inflation Factors (VIFs) are calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs of less than 10. All predictors in the regression model had VIFs of less than 10. The VIFs for SES and BMI were both 1.01 in the model.

Outliers. To identify influential points, Cooks distances were calculated and assessed. An outlier is defined as any value over the 50th percentile (Cook, 1977). There are no outliers present in the dataset.

Results. Mediation was examined based on the indirect and direct effects using a Sobel test. The Sobel test was run using a website developed by Preacher et al. (2010). The results are based on an alpha of 0.05. The regression model results are presented in Table 25 and Table 26. The Sobel test calculation is displayed in Figure 8.

Table 25

Results for the Regression on Quantity of Sleep

Variable	*B*	*SE*	*t*	*p*
(Intercept)	6.91	0.15	45.41	< 0.001
SE-S	0.03	0.02	1.53	0.130
BMI	0.02	0.02	0.89	0.374

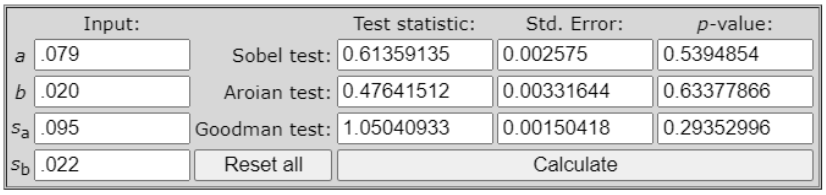
Table 26

Results for the Regression on BMI

Variable	*B*	*SE*	*t*	*p*
(Intercept)	2.93×10^{-15}	0.68	0.00	1.000
SE-S	0.08	0.10	0.83	0.408

Figure 8

Results of Sobel Test for Indirect Effects for Quantity of Sleep



Direct Effect. The average direct effect is not significant, $B = 0.03$, $p = 0.130$. This indicates that SE-S does not significantly predict quantity of sleep.

Indirect Effect. The results of the Sobel test indicated that the average indirect effect for sleep self-efficacy on quantity of sleep through BMI is not significant, $t = 0.613$, $p = 0.539$. These results suggest that the null hypothesis was not rejected.

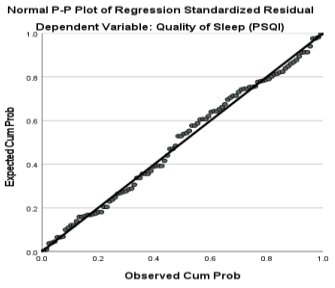
Quality of Sleep

Another causal mediation analysis was conducted to assess if BMI mediated the relationship between SE-S and PSQI. Prior to the analysis, the assumptions of normality, homoscedasticity, multicollinearity, and lack of outliers were assessed.

Normality. The assumption of normality was assessed by plotting a P-P scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. The scatterplot suggests that the assumption was met. Figure 9 presents a P-P scatterplot of model residuals.

Figure 9

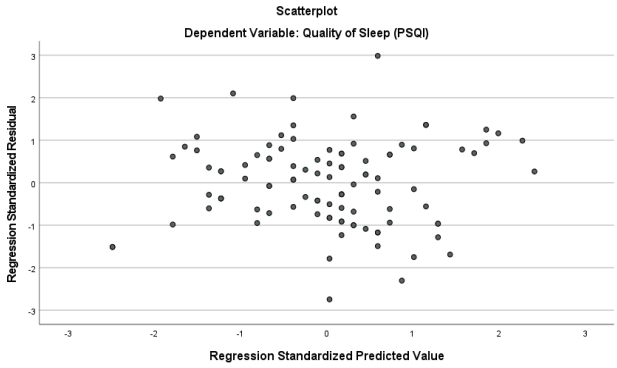
P-P scatterplot for normality of the residuals for the regression model.



Homoscedasticity. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. The scatterplot suggests the assumption was met. Figure 10 presents a scatterplot of predicted values and model residuals.

Figure 10

Residuals scatterplot testing homoscedasticity



Multicollinearity. Variance Inflation Factors (VIFs) are calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model had VIFs of less than 10 (1.01 for both SES and BMI).

Outliers. To identify influential points, Cooks distances are calculated and assessed. Outliers are defined as any value over the 50th percentile (Cook, 1977). There was one outlier present. The outlier was identified and subsequently removed from the analysis.

Results. Mediation is examined based on the indirect and direct effects using the Sobel test. The Sobel test was run using a website developed by Preacher et al. (2010). The results are based on an alpha of 0.05. The regression model results are presented in Table 27 and Table 28. The mediation model diagram can be seen below in Figure 11.

Table 27

Results for the Regression on PSQI

Variable	*B*	*SE*	*t*	*p*
(Intercept)	9.52	0.31	30.60	< 0.001
SE-S	-0.27	0.04	-6.16	< 0.001
BMI	0.008	0.05	0.18	0.859

Table 28

Results for the Regression on BMI

Variable	*B*	*SE*	*t*	*p*
(Intercept)	-1.20×10^{-15}	0.68	-0.00	1.000
SES	0.08	0.10	0.80	0.427

Figure 11

Node diagram for the mediation analysis

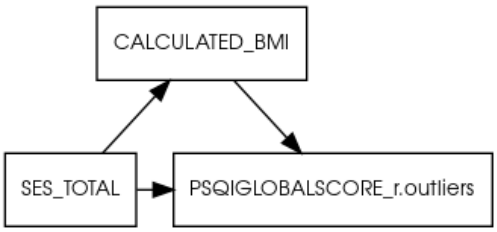
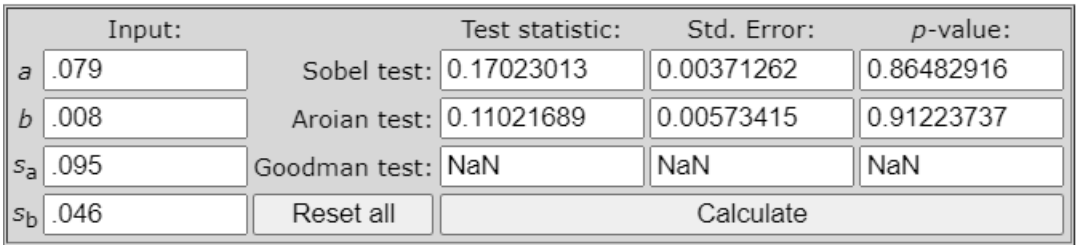


Figure 12

Results of Sobel Test for Indirect Effects for Quality of Sleep



Direct Effect. The average direct effect is significant, $B = -0.27$, $p < 0.001$, meaning that SE-S significantly predicted PSQI. This indicates that for every one unit increase in sleep self-efficacy, quality of sleep decreases by 0.27 units.

Indirect Effect. The results of the Sobel test (Figure 12) indicated that the average indirect effect for SE-S on PSQI through BMI is not significant, $t = 0.170$, $p = 0.864$. This suggests that BMI does not significantly mediate the relationship between sleep self-efficacy and quality of sleep. The null hypothesis was therefore accepted, and we can conclude that BMI does not mediate the relationship between sleep self-efficacy and the quantity and quality of sleep among RNs working a 12-hour shift.

RQ3 Statistical Analysis and Results

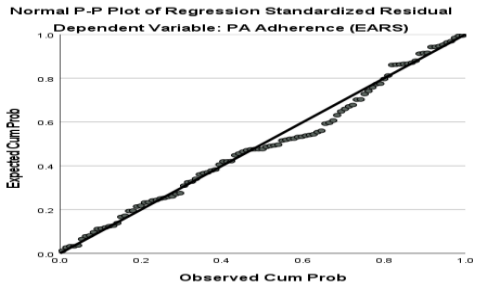
To answer the third research question, a multiple linear regression analysis was conducted to assess whether ESE and BMI significantly predicted EARS. Prior to the analysis, the assumptions of normality, homoscedasticity, multicollinearity, and lack of outliers were assessed.

Normality

The assumption of normality is assessed by plotting a P_P scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. The scatterplot suggests that the assumption was met. Figure 13 presents a P-P scatterplot of the model residuals.

Figure 13

P-P scatterplot for normality of the residuals for the regression model.

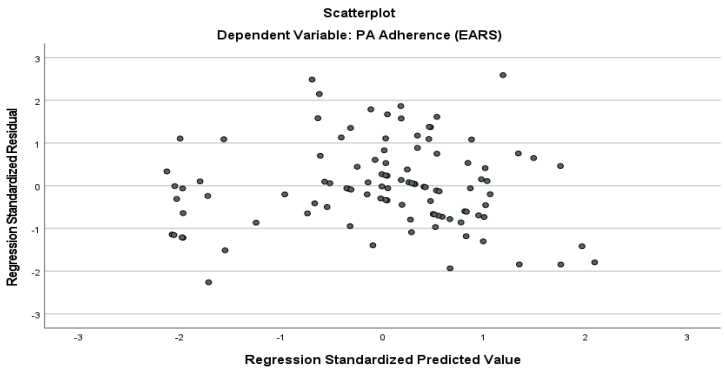


Homoscedasticity

Homoscedasticity is evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. The scatterplot suggests that the assumption was met. Figure 14 presents a scatterplot of predicted values and model residuals.

Figure 14

Residuals scatterplot testing homoscedasticity



Multicollinearity

VIFs are calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). Both predictors, ESE and BMI, have VIFs of 1.13.

Outliers

To identify influential points, Cooks distances were calculated and assessed. An outlier is defined as any value over the 50th percentile (Cook, 1977). There were no outliers present within the data.

Results

The results of the linear regression model are significant, F (2,100) = 25.65, p < 0.001, R^2 = 0.34, indicating that that the variables of ESE and BMI collectively predicted EARS. The goodness of fit measure of R^2 tends to overestimate model fit as it does not account for the number of predictors in the model. Therefore, the adjusted R^2 was calculated as a more accurate measure of goodness of fit for the linear regression model. For this regression model, adjusted R^2 = 0.327. This suggests that approximately 33% of the variance in EARS is explainable by ESE and BMI collectively. Since the overall model was significant, the individual predictors were examined further. Specifically, ESE significantly predicted EARS, B = -0.40, t (100) = -6.48, p <0 .001. This indicates that on average, a one-unit increase of exercise self-efficacy would decrease the value of PA adherence by 0.40 units.

These results indicate that the null hypothesis was rejected in favor of the alternative. The answer to RQ3: There is a predictive relationship between self-efficacy for PA and BMI and PA adherence among RNs working 12-hour shifts. Table 29 summarizes the results of the regression model.

Table 29

Results for Linear Regression with ESE and BMI predicting EARS

Variable	*B*	*SE*	β	*t*	*p*
(Intercept)	21.63	2.70	0.00	8.02	<0.001
ESE	-0.40	0.06	-0.56	-6.48	< 0.001
BMI	0.04	0.05	0.06	0.71	0.478

RQ4 Statistical Analysis and Results

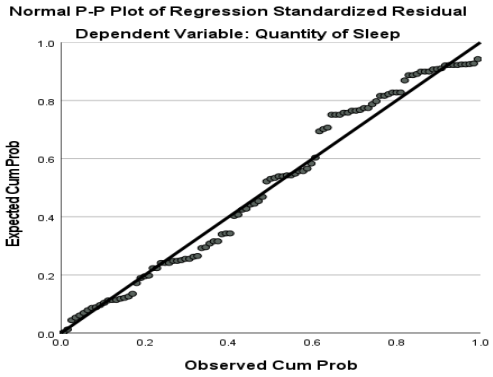
To answer the fourth research question, a multiple linear regression analysis was conducted to assess whether SES and shift worked significantly predicted quantity of sleep. Prior to the analysis, the assumptions of normality, homoscedasticity, multicollinearity, and lack of outliers were assessed.

Normality

The assumption of normality was assessed by plotting a P_P scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. The scatterplot suggests that the assumption of normality was met. Figure 15 presents a P-P scatterplot of the model residuals.

Figure 15

P-P scatterplot for normality of the residuals for the regression model. P-P scatterplot for normality of the residuals for the regression model.

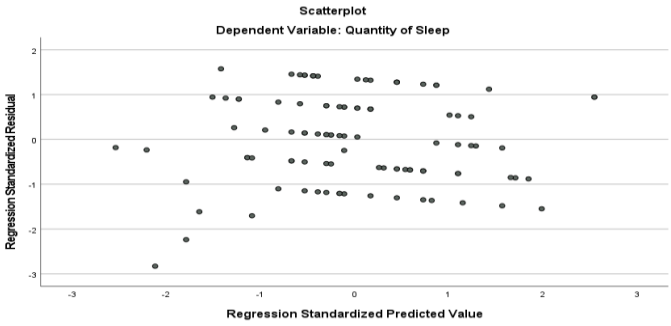


Homoscedasticity

Homoscedasticity is evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. The scatterplot suggests the assumption is met. Figure 16 presents a scatterplot of predicted values and model residuals.

Figure 16

Residuals scatterplot testing homoscedasticity



Multicollinearity

VIFs are calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs of less than 10. Table 30 presents the VIF for each predictor in the model.

Table 30

Variance Inflation Factors for SES_TOTAL and Shift Worked

Variable	VIF
Sleep Self-Efficacy (SES)	1.00
Shift Worked (reference category- 12 Hour Day Shift)	
12 Hour Night Shift	1.00

Outliers

To identify influential points, Cooks distances were calculated and assessed. An outlier was defined as any value over the 50th percentile (Cook, 1977). There were no outliers present in the dataset.

Results

The results of the linear regression model were not significant, F (2,100) = 1.29, p = 0.279, indicating SE-S and shift worked does not explain a significant proportion of variation in quantity of sleep. Since the overall model is not significant, the individual predictors are not examined further, and the null hypothesis was not rejected. The answer to RQ4: There is no predictive relationship between SE-S and shift worked and quantity of sleep among RNs. The results of the regression model are summarized in Table 31.

Table 31

Results for Linear Regression with SE-S and Shift Worked predicting Quantity of Sleep

Variable	*B*	*SE*	β	*t*	*p*
(Intercept)	5.94	0.65	0.00	9.18	<0 .001
SE-S	0.03	0.02	0.16	1.60	0.113
Shift Worked (reference category- 12 Hour Day Shift)					
12 Hour Night Shift	0.05	0.33	0.01	0.14	0.888

RQ5 Statistical Analysis and Results

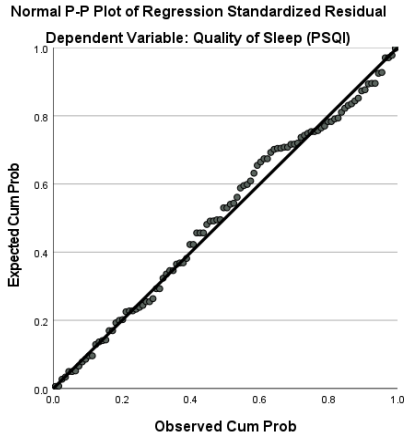
To answer the fifth research question, a multiple linear regression analysis was conducted to assess whether SE-S and shift worked significantly predicted quality of sleep (PSQI). Prior to the analysis, the assumptions of normality, homogeneity of variance, multicollinearity, and lack of outliers were assessed.

Normality

The assumption of normality was assessed by plotting P-P scatterplot (DeCarlo, 1997). For the assumption of normality to be met, the quantiles of the residuals must not strongly deviate from the theoretical quantiles. Strong deviations could indicate that the parameter estimates are unreliable. The scatterplot suggests that the assumption was met. Figure 17 presents a P-P scatterplot of the model residuals.

Figure 17

P-P scatterplot for normality of the residuals for the regression model

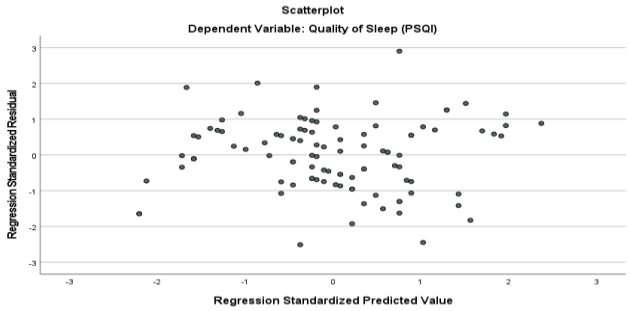


Homoscedasticity

Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity is met if the points appear randomly distributed with a mean of zero and no apparent curvature. The scatterplot suggests that the assumption was met. Figure 18 presents a scatterplot of predicted values and model residuals.

Figure 18

Residual scatterplot testing homoscedasticity



Multicollinearity

VIFs were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs of less than 10. Table 32 presents the VIF for each predictor in the model.

Table 32

Variance Inflation Factors for SE-S and Shift Worked

Variable	VIF
SE-S	1.00
Shift Worked (reference category- 12 Hour Day Shift)	
12 Hour Night Shift	1.00

Outliers

To identify influential points, Cooks distances were calculated and assessed. An outlier was defined as any value over the 50th percentile (Cook, 1977). There was one outlier present within the dataset. The datapoint was identified and subsequently removed from the analysis.

Results

The results of the linear regression model were significant, F (2,99) = 21.26, $p <$ 0.001, $R^2 = 0.30$, indicating that the predictor variables of SE-S and work shift collectively predicted quality of sleep (PSQI). The goodness of fit measure of R^2 tends to overestimate model fit as it does not account for the number of predictors in the model. Therefore, the adjusted R^2 was also calculated as a more accurate measure of goodness of

fit for the linear regression model. For this regression model, adjusted $R^2 = 0.286$. This suggests that approximately 29% of the variance in quality of sleep (PSQI) was explainable by SE-S and shift worked collectively. Since the overall model was significant, the individual predictors were examined further. Specifically, SE-S significantly predicted PSQI, $B = -0.27$, $t\,(99) = -6.28$, $p < 0.001$. This indicated that on average, a one-unit increase of SE-S decreased the value of quality of sleep by 0.27 units. The results of this analysis suggest that the null hypothesis can be rejected in favor of the alternative.

We can therefore reject the null hypotheses and conclude that SE-S and shift worked significantly predicted PSQI. Answer to RQ5: There is a predictive relationship between sleep self-efficacy and the shift worked to projected sleep quality among RNs. Table 33 summarizes the results of the regression model.

Table 33

Results for Linear Regression with SE-S and Shift Worked predicting PSQI

Variable	*B*	*SE*	β	t	p
(Intercept)	16.06	1.29	0.00	12.44	< 0.001
SE-S	-0.27	0.04	-0.53	-6.28	< 0.001
Shift Worked (reference category- 12 Hour Day Shift)					
12 Hour Night Shift	1.19	0.66	0.15	1.80	0.075

RQ6 Statistical Analysis and Results

To answer research question six, an Ordinal Logistic Regression was conducted to determine if the odds of observing each response category of activity level could be explained by the variation in ESE and shift worked. Prior to the analysis, the assumptions of multicollinearity, and proportional odds were assessed.

Variance inflation factors

VIFs were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs of less than 10. Table 34 presents the VIF for each predictor in the model.

Table 34

Variance Inflation Factors for ESE and Shift Worked

Variable	VIF
ESE	1.00
Shift Worked (reference category- 12 Hour Day Shift)	
12 Hour Night Shift	1.00

Proportional Odds

To test the assumption of proportional odds, a likelihood ratio test was conducted between a model with the proportional odds assumption and a model without the proportional odds assumption. When proportional odds are not assumed, separate parameters are estimated for each pair of levels in the outcome variable. If proportional odds can be assumed, these additional parameters are not necessary, and a single parameter can be estimated for each predictor. The likelihood ratio test was not significant, $\chi^2(2) = 0.83$, $p = 0.659$, indicating that proportional odds can be assumed, as the data did not have significantly different fit between models.

Results

The model was evaluated based on an alpha of 0.05. The results of the model were significant, $\chi^2(2) = 11.08$, $p = 0.004$, suggesting the observed effects of exercise

self-efficacy (ESE) and shift worked on activity level were unlikely to occur under the null hypothesis. Therefore, the null hypothesis can be rejected. McFadden's R-squared was calculated to examine the model fit, where values greater than 0.2 are indicative of models with excellent fit (Louviere et al., 2000). The McFadden R-squared value calculated for this model was 0.05. Since the overall model was significant, the individual predictors were examined further. Specifically, the regression coefficient for ESE was significant, $B = -0.11$, $\chi^2 = 9.82$, $p = 0.002$, suggesting that a one-unit increase in exercise self-efficacy would decrease the odds of observing a higher category of activity level by 10.34%. Table 35 summarizes the results of the ordinal regression model.

Table 35

Ordinal Logistic Regression Results for ESE and Shift Worked PA Level

Predictor	*B*	*SE*	χ^2	*p*	*OR*
(Intercept):1	-2.88	0.91	9.97	0.002	-
Intercept):2	-1.18	0.88	1.81	0.178	-
ESE	-0.11	0.03	9.82	0.002	0.90
Shift Worked (reference category- 12 Hour Day Shift)					
12 Hour Night Shift	0.21	0.41	0.26	0.613	1.23

Summary

Overall, the purpose of this quantitative study is to:

Purpose 1: The first aim of this study was to investigate how demographic factors relate to self-efficacy for sleep (maintaining 7-9 hours of sleep per night) and PA self-efficacy for adherence (achieving 150 minutes of moderate-intensity PA per week) among RNs nurses who work 12-hour shifts in hospitals.

This purpose was assessed through research question one. This analysis

showed that Males have a higher level of EARS but not impacted by ESE. The measures of self-efficacy (exercise self-efficacy, sleep self-efficacy, PSQI scores) and exercise adherence were not impacted by age, employment status or shift worked, ethnicity, cohabitation status or gender. There was an inverse correlation between sleep self-efficacy and exercise self-efficacy. There was a negative relationship between ESE and exercise adherence. ESE and BMI showed a negative relationship. As ESE increased, BMI decreased. However, a positive relationship was observed between PA adherence and BMI. This suggests that as BMI increased, PA adherence increased.

Purpose 2: The second objective was to examine the connection between BMI and self-efficacy for sleep in relation to the self-reported amount and quality of sleep among RNs who work 12-hour shifts.

The relationship between these variables was assessed through research question two and question three. BMI and ESE collectively accounted for over one third of the variance observed self-efficacy for quality and quantity of sleep. However, as SES increased, there was a decrease in the quality of sleep.

Purpose 3: The third goal was to determine if RNs who work different shifts (day or night) have varied levels of self-efficacy for sleep and report different amounts of sleep per day.

This relationship was assessed in questions two, four and five. The results of research question two suggested that there was a significant direct effect of sleep-self efficacy and quality of sleep. However, there was not a significant mediating effect of BMI on this relationship. The results of research question four were not significant,

indicating that there was not a significant predictive relationship of sleep self-efficacy and shift worked on quantity of sleep. The results of research question five were significant, indicating that there was a significant negative effect of sleep self-efficacy on quality of sleep.

Purpose 4: The final objective was to determine the correlation between exercise self-efficacy and the reported level of exercise among shift workers, categorized by their work shift (day or night).

The results of research question three were significant, indicating that there was a significant negative effect of sleep self-efficacy on PA adherence. The results of research question six were also significant, indicating that there was a significant negative effect of exercise self-efficacy on activity level.

To accomplish this, an online survey was administered through Survey Monkey to a sample of RNs who work a 12- hour shift. This survey measured participants' quality of sleep and exercise, self-efficacy for sleep and exercise, as well as some demographic information such as age and ethnicity. Once the dataset was obtained, it was then uploaded to SPSS version 28 for analysis.

To prepare for the data analysis, the data was cleaned for any missing data and outliers. There was one outlier present that was subsequently removed from the dataset. Additionally, composite scores were calculated for the variables of sleep self-efficacy, quality of sleep, exercise self-efficacy, and PA adherence according to instrument instructions. To answer the six research questions, a series of correlations, chi squared tests, mediation analyses, and regressions were conducted and presented within the

chapter. The results of the first research question suggested that there were significant negative relationships between sleep self-efficacy and exercise self-efficacy, exercise self-efficacy and BMI, and PA adherence and BMI. Additionally, the results indicated that there was a positive relationship between gender and PA adherence.

Finally, the results indicated that ethnicity and BMI were related to one another. The implications of these results are further examined in chapter 5.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Best practice dictates organizations become active in exploring methods of fostering a health-oriented atmosphere among their staff. This includes research exploring current work environments and a focus on designing and executing programs intended to improve the health of RNs with a focus on self-efficacy for both sleep and exercise. Mechanisms must not only be put in place to initiate health enhancing systems within facilities, but also methods for monitoring and revising those programs to optimize efficacy and sustainability. The information gained through this research can be used to determine employees' perceptions of the usefulness, accessibility, and effectiveness of implemented strategies designed to manage weight and sleep. Without further and continued study of interventions, it cannot be determined if implemented strategies are unswervingly effective.

Investigations by Soldevila-Domenech et al. (2021) have displayed that consistent health behaviors are achieved through modifying an individual's environment in conjunction with significant components of their cognitive schema. It may not suffice to simply make outlets available, but to facilitate and generate involvement in these programs. The perceptions and engagement of employees towards interventions are greatly influenced by the attitudes of stakeholders. Therefore, it is crucial for stakeholders to have a positive outlook towards such interventions (Sovold, et al., 2021). Understanding the factors that influence self-efficacy for sleep and self-efficacy for exercise acceptance is key to securing the success of beneficial intercessions and to

bolstering employee support. By utilizing their understanding of personality, professionals can increase the effectiveness of interventions and improve response rates.

Interpretation of the Findings

Albert Bandura defined self-efficacy as an individual's assessment of their ability to formulate a plan of action based on beliefs about their ability to adhere to that plan (Bandura, 1994). Through his research Bandura exposed that when applied, the SCT is comparably more successful in predicting exercise behaviors (Bandura, 1997). Past research indicates that the concept of self-efficacy can be efficiently applied to controlling several adverse behaviors such as smoking, alcohol abuse, and eating disorders (Diclemente, 1986; Shadel et al., 2017). This study shows that self-efficacy did not enhance an employee's potential for health maintenance where appropriate for this population. Future studies should concentrate on putting mechanisms in place which encompass all these traits aligned with ongoing support and training. For this training must be guided by future researchers to authenticate the validity and reliability of formed programs.

As stated in Chapter 2, nurses working the 12-hour night shift are particularly vulnerable to weight gain associated with variations in PA and hours of sleep. The conflict between conditions which predispose nightshift nurses to obesity and a financial need to work this shift, compromises the individuals need for health maintenance. As heightening awareness of this problem was one goal of this study, incorporating concepts of self-efficacy into the culture of these workers could heighten the probability of cultivating a culture of self-care within the working community. This would not only

increase awareness of the risk associated with working nightshifts, but also provide a network for shift workers to design and implement programs for social change among the nurses themselves. Altering the beliefs of this population would increase compliance and support for implementing effective programs designed to support optimal health.

Individual intercessions are effective in empowering RNs to a heightened awareness of the benefits of sleep and exercise thus improving and sustaining a healthy longevity. Research by Baxter et al. (2016) indicates that the workplace is the venue for promoting positive health behaviors. Perceptions of an administration's interest in the well-being of its employees can significantly influence the attitudes and perceptions an individual has of that organization. To be effective these interventions must be guided by an effective theoretical framework.

Limitations of the Study

The respondents to this survey showed a high minority representation when compared to the national averages for nursing employment. The responses were generated through snowballing, which limits the population to known acquaintances. Although the results are limited for generalization to the entire population, the results could prove equitable for already underserved minority populations.

The survey used for this analysis was distributed through electronic media. It is impossible to ensure the trustworthiness of the information collected. There are multiple areas of deceit that could lead to issues related to the trustworthiness of this study. These include but are not limited to the identification of the respondent related to the validity of the proclaimed profession, multiple submissions to the survey, as well as threats to

internal validity such as reporting of actual and truthful information. There is also potential for invalid information related to confusion or uncertainty related to the questions within the survey. Issues related to trustworthiness can affect the reliability of a study and limit the usefulness of findings (Connelly, 2016). The length of the survey would limit the likelihood that anyone would fill out the survey more than once. As I have gotten multiple responses related to the length, filling out the survey once was enough.

To ensure clarity in both questions and responses, I am using validated instruments for this analysis. The surveys employed in this study have been validated for several decades. The items for SE-S, EARS, and ESE have a Cronbach's alpha coefficient of 0.70 or higher, indicating acceptable to good reliability. However, the items for PSQI had a Cronbach's alpha coefficient of 0.68, which suggests questionable reliability among this population.

Small sample size in multivariable statistics could lead to falsely concluding that a result is true that is false and could limit generalizability and replicating the study. According to Roscoe (1975) for behavioral studies a sample size of greater than 30 is suitable for avoiding type one errors. Green (1991) has a minimal sample recommendation formula of $N \geq 50 + 8(m)$ (where m is the number of predictors) in the study. For this study, the analysis of the 12-hour sample would translate to a sample size of 66. According to Gay and Diehl (1992), the number of respondents needed for a study depends on the type of research involved- descriptive, correlational, or experimental.

According to their research, in a correlational study, at least 30 subjects are required to establish a relationship (Gay & Diehl, 1992). There are 103 respondents for this study.

Recommendations

The findings of this study could serve as a foundation for researchers exploring ways to promote self-sufficiency in exercise and sleep among night shift employees. Previous research has highlighted the inadequacies of current programs that need to incorporate relevant theoretical concepts for sleep or exercise in their design (Grimani et al., 2019; Hutchinson & Wilson, 2011). According to Bandura (1977), self-efficacy plays a critical role in shaping attitudes and driving performance. Employers can positively impact employees' response to interventions by understanding the bio-social cultural factors that hinder participation, such as home life challenges, physical limitations, and coping mechanisms of individual staff members. Establishing peer groups can be an effective way to motivate and empower less successful employees. Peer-guided interventions are especially beneficial for less enthusiastic staff, as peers encourage them to perform to the best of their ability. By fostering a supportive environment where colleagues can share advice and experiences, employers can help their team members grow and develop their skills.

Ultimately, creating a supportive environment benefits the employees and the entire company. As staff members observe their peers' improved health and lifestyle, these successes can serve as a stimulus and enhance motivation to participate in work-based programs. However, it is essential to note that understanding and incorporating the components of the SCT may not address the individual need for alternative coping

mechanisms that challenge deeply ingrained health beliefs. The results of this study should be a starting point for future research on identifying factors that inspire a practical and methodical approach to support behavioral interventions.

Upon examining research question one, I found that there is a negative correlation between sleep self-efficacy and self-efficacy for PA in the studied population. As sleep self-efficacy improves, self-efficacy for exercise declines. Moreover, there is a negative correlation between exercise self-efficacy and BMI, indicating that improving self-efficacy for PA to lower BMI may also lower sleep self-efficacy. Future research should focus on balancing sleep, PA, and BMI interventions to promote optimal health among nurses working 12-hour shifts.

The findings of this study can be used to create customized programs for job sites that support the overall well-being of night shift workers. By raising awareness of the negative impact of night shift work on health and promoting healthy habits, workers can improve their quality of life. The study also highlights the importance of self-inspiration in maintaining healthy habits, as simply having confidence is not enough to stay consistent. Encouraging healthy behaviors such as exercise and sleep can decrease BMI, and night shift workers can benefit from adopting healthy practices. By understanding how healthy habits affect mortality and morbidity, workers can find motivation to maintain their health. However, further research is needed to assess the limitations of these findings for different populations. It is recommended that organizations incorporate self-motivating theories to encourage healthy habits among night shift workers. To promote the health of their current active workforce, employers should examine theories

such as Maslow's theory of Hierarchical needs, Hertzberg's two-factor theory, or the McClelland's theory of needs as methods for promoting and validating the effectiveness of programs. Competent program designs enhance workers' acceptance, probable adoption, ease of use, and satisfaction with these interventions. This information is especially beneficial to unit managers as shareholders who make decisions about implementing and approving PA-related programs.

A longitudinal study would be more appropriate to further validate this study's findings. Such a study could accurately predict and record the impact of incorporating these study factors into changes that aim to prevent ill health among shift workers. It is recommended to conduct studies that utilize sleep and physical activity variables while also considering the additional barriers associated with shift work. Identifying these barriers will help in the development of effective programs that cater to the 12-hour shift worker demographic. Future research should focus on different institutional practices and alternative methods of implementing these factors to accommodate diverse populations. A robust longitudinal analysis will generate information on the effects of self-motivation on sustaining healthy practices and the long-term impact on the night-shift nursing population.

A longitudinal study will also provide insight into how individual practitioners comprehend the concepts of this study and their acceptance or rejection of the insights gained from it. It is recommended that follow-up studies utilize a longitudinal qualitative analysis over an extended period rather than the quantitative method used in this study. Future research should concentrate on using technology to enhance physical activity and

sleep behaviors in nurses working 12-hour shifts. By ensuring that technology is user-friendly, researchers can explore the usefulness of the information collected for research into applying self-motivation principles for sleep and physical activity in adapting and adhering to healthy behaviors.

After examining the effectiveness of self-efficacy in minority populations, it has been shown that this theory is ineffective in ensuring compliance with health regimens. Therefore, future research is needed to explore the impact of personal motivators in sustaining healthy behaviors. Factors such as age, education level, and access to technology should also be examined to understand their effects on program engagement. Ongoing assessments of worker health and beliefs are crucial to validate the timeliness of interventions. Future research should also examine the correlation between intervening variables, such as spiritual conviction, for exercise and sleep. These studies can be conducted at timed intervals or staggered over a longer period to extend the present work. However, findings should be tailored to individual organizations before limiting work hours or consecutive days worked.

Implications for Positive Social Change

The implications for positive social change gleaned from the results of this study would include knowledge useful for doctors, nurses, therapists, and families, as well as any organization impacted by shift work. This includes store workers, truck drivers, and police officers, who are among the top professions impacted by shiftwork and obesity. Shift workers who have failed to embolden themselves to redirect the adverse effects of working nightshifts can find direction and encouragement for themselves and others into

healthier ways of living. Programs inspired by this research could create opportunities directed specifically for the shift working population. Knowledge of the limitations of self-efficacy on minority populations could inspire alternative interventions into lowering the burdens associated with working this shift and enable workers to remain healthier throughout their years of working within the institution.

Empowering individuals to enhance their sleep and PA confidence through Inventiveness and behavior modification techniques can significantly benefit society. By instilling an understanding of the necessity for change and furnishing the tools to overcome negative habits through introspection, shift workers can decrease their risk of obesity and associated health problems. Knowledge obtained from this study would make material available to workers exploring means for generating or maintaining optimal health throughout retirement. Applying the concepts of self-motivation for sleep and PA, through altering attitudes surrounding health preservation personnel could find more positive mechanisms self-regulating and enhancing their own physical condition and wellbeing. An informed assessment of the work environment and night shift work on overall health, with guidance to interventions to curtail the undesirable effects of being allocated to work this shift. This study offers insights into the inadequacy of self-efficacy as an individual motivator and the properties which should be included in their personal health assessment.

Organizations at the local, state, federal, and institutional levels can utilize the findings of this study to collaborate and promote healthy practices among their staff. Exploring new approaches to current or future programs is necessary to offer new

opportunities for organizational learning. These learning interventions can help institutions, states, and national agencies create programs that reduce the physical and mental strains of shift work on employees. By improving the health of shift workers, associated costs for communities and organizations, such as sick days, job injuries, stress, and poor sleep, can be reduced. Moreover, promoting health maintenance can stabilize the current and future nursing shortage by extending the longevity of the workforce, particularly as the workforce ages.

Conclusions

Obesity and the associated comorbidities are significant contributors to morbidity and mortality. Studies have shown that working night shifts can exacerbate obesity among workers, increasing the risk of heart disease, hypertension, diabetes, and other illnesses that could lead to hospitalization or disabilities (Sun et al., 2018; McGill & Wright, 2017). Implementing interventions based on the findings of this study could help motivate shift workers to engage in local, state, and national programs, reducing the incidence of these diseases.

Research has revealed that consistent healthy behaviors can be achieved by modifying an individual's environment and cognitive schema (Soldevila-Domenech et al., 2021). Merely making outlets available may not be enough; it is crucial to facilitate and generate involvement in these programs. Stakeholder attitudes play a crucial role in fostering a positive perception of interventions and securing their acceptance and utilization by employees. Understanding the factors that influence self-efficacy for sleep and exercise acceptance is essential in securing the success of these interventions and

bolstering employee support. Professionals can use their knowledge of personality to improve response rates to enacted interventions.

Self-efficacy-based programs would not effectively enlighten and assist workers and their families in developing habits that promote overall health and decrease the cost of care to their families and the community. Strategies can be provided to these workers that offer positive coping mechanisms for dealing with the impact of shift work on the individual and their family. As the nursing population ages, this information will become more valuable as more people take on the challenge of managing family, financial stability, and self-care to reduce their risk of developing subsequent diseases. Changing perceptions can facilitate behavior change and be highly effective in improving health outcomes.

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Appendix A: Invitation flyer

Looking for nurses

- Registered nurses
- Engaged in direct patient care
- With at least one year experience

Please complete this online survey on self-efficacy for exercise and sleep self-efficacy, and shiftwork.
The information gathered from the survey will be used to complete a doctoral dissertation at Walden University.
The survey is entirely anonymous and confidential.
No personal identifying or contact information is needed to complete.
The survey will take 10-15 minutes.
To complete the survey, please access the following link:
[insert link]
Or
LinkedIn
The survey will be open until [date]
If you would like more information, you may contact the researcher at [email address]

GO THE DISTANCE

THANK YOU FOR YOUR TIME

Appendix B: Participation Invitation Letter

Dear survey participant,

My name is Veronica Brock, and I am a doctoral student at Walden University's Public Health Program. I am conducting a study titled: Self-efficacy Facilitated Sleep, Physical Activity, Towards Regulating BMI of Permanent 12-hour shift Registered Nurses. This study is intended to assess the potential for employing self-efficacy in directing participation in health-promoting behaviors among Registered Nurses.

A survey will be conducted utilizing Survey Monkey. The study begins with several baseline demographic questions. It progresses through three validated surveys: The Sleep Self-Efficacy Scale, Pittsburgh Sleep Quality Index (PSQI), and Self-Efficacy for Exercise Behavior Scale. The survey consists of 45 questions but should take no longer than 20 minutes to complete. All responses may be submitted only once but are available to change answers before submission.

Participation in this survey is entirely voluntary. You may withdraw from the study, and your answers will not be included in the analysis. Your answers are completely confidential, and your responses will be coded and encrypted to secure the participant's identity and prevent unauthorized access to the results.

This study is essential to providing a foundation for building productive, effective, and enduring programs within facilities to promote all their employees' health. This assessment is also vital to guiding night shift registered nurses in producing practice-based interventions to curtail the overwhelming rise in obesity and the co-morbidities associated with this condition.

I earnestly request that you participate in this study and complete and submit your reply within the next three weeks. If you agree to participate in the survey, please read and reply to the consent letter below by clicking on the link at the end of this message. In doing this, you agree to consent to the conditions and start the survey. Your time and participation are much appreciated. Thank you in advance.

Sincerely

Veronica Brock, RN, MS, Doctoral Student, Walden University

Appendix C: Research Questionnaires

1. What is your age?
    a. 20-29 years old
    b. 30-39 years old
    c. 40-49 years old
    d. 50-59 years old
    e. Over 60 years old
2. Describe your cohabitation status.
    a. Single
    b. Cohabitation with partner
    c. Widowed
    d. Cohabitation with dependent children
    e. Cohabitation with a partner and dependent children
3. Describe your ethnicity
    a. African American
    b. European American
    c. Asian
    d. Hispanic
    e. American Indian
    f. Other
4. With what gender do you routinely identify?

a. Male

b. Female

5. What is your height (without shoes)?

    a. Height in feet and inches

    b. Height in meters and centimeters

    c. I prefer not to answer

    d. Do not know

6. What is your weight (without shoes)?

    a. Weight in pounds

    b. Weight in kilograms

    c. I prefer not to answer

    d. Do not know

7. What is the status of your employment?

    a. Full time (72 hours or more per 2 weeks’ pay period)

    b. Part-time (36 hours or more but less than 72 hours per 2 weeks' pay period)

    c. Less than part-time (less than 36 hours per 2 weeks' pay period)

8. Do you currently work the night shift (shift starting after 5 PM and culminating after 12 consecutive hours of work)?

    a. Yes

    b. No

9. If yes, how often do you work three or more consecutive shifts in a row in four weeks?

a. Never

b. At least one of the four weeks

c. Two of the four weeks

d. Three or more weeks

10. Approximately how long have you worked on your current shift?

a. 1 to 5 years

b. 6 to 10 years

c. 11 to 15 years

d. 16 to 20 years

e. 21 to 25 years

f. 26 or more years

11. On average, how many hours do you sleep between shifts?

a. 4 hours or less

b. 5 to 6 hours

c. 6 to 7 hours

d. 7 hours or more

12. In an average week, how would you describe your physical activity level?

a. Low (exercise never or less than once a week for 30 minutes or more)

b. Moderate (exercise one to two times a week for 30 minutes or more)

c. High (exercise two to three times a week for 30 minutes or more)

13. Since beginning your current schedule, approximately how much weight have you gained over the years?

a. 0 to 5 pounds
b. 6 to 10 pounds
c. 11 to 20 pounds
d. 21 to 30 pounds
e. 31 to 40 pounds
f. 41 to 50 pounds

51 or more pounds

Sleep Self-Efficacy Scale

For the following nine items, please rate (by selecting a number from 1 to 5) your ability to carry out each behavior. If you feel able to accomplish a behavior sometimes but not always, you should indicate a lower confidence level.

Indicate how confident you are that you can:

1. Lie in bed, feeling physically relaxed.

1 2 3 4 5
Not Confident Very Confident

2. Lie, in bed, feeling mentally relaxed

1 2 3 4 5
Not Confident Very Confident

3. Lie in bed with your thoughts "turned off"

1 2 3 4 5
Not Confident Very Confident

4. Fall asleep at night in under 30 minutes.

1 2 3 4 5
Not Confident Very Confident

5. Wake up at nights fewer than three times.

1 2 3 4 5
Not Confident Very Confident

6. Go back to sleep within 15 minutes of walking in the night.

1	2	3	4	5
Not Confident				Very Confident

7. Feel refreshed upon waking in the morning.

1	2	3	4	5
Not Confident				Very confident

8. Wake after a poor night's sleep without feeling upset about it.

1	2	3	4	5
Not Confident				Very Confident

9. Not allow a poor night's sleep to interfere with daily activities.

1	2	3	4	5
Not Confident				Very Confident

Pittsburgh Sleep Quality Index (PSQI)

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

1. During the past month, what time have you gone to bed at night?
2. During the past month, how long (in minutes) has it usually takes you to fall asleep each night?
3. During the past month, what time have you usually get up in the morning?
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.)

   _____

5.	During the <u>past month</u>, how often have you had trouble sleeping because you …	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a.	Cannot get to sleep within 30 minutes				
b.	Wake up in the middle of the night or early morning				
c.	Have to get up to use the bathroom				
d.	Cannot breathe comfortably				
e.	Cough or snore loudly.				
f.	Feel too cold				
g.	Feel too hot				
h.	Have bad dreams				
i.	Have pain				
j.	Other reason(s), please describe:				
6.	During the past month, how often have you taken medicine to help you sleep (prescribed or “over the counter”)?				
7.	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in the social activity?				
		No problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
8.	During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				
		Very good	Fairly good	Fairly bad	Very bad
9.	During the past month, how would you rate your sleep quality overall?				

Self-Efficacy for Exercise Behavior Scale

1. Stick to your exercise program when your family is demanding more time from you
2. Stick to your exercise program when you have household chores to attend to
3. Stick to your exercise program even when you have excessive demands at work
4. Stick to your exercise program when social obligations are very time consuming
5. Read or study less to exercise more
6. Get up early, even on weekends, to do exercise
7. Get up earlier to exercise
8. Stick to your exercise program after a long tiring day/night at work
9. Exercise even though you are feeling depressed
10. Set aside time for a physical activity program, that is, walking, jogging, swimming, biking, or other continuous activities for at least 30 minutes three times per week
11. Continue to exercise with others even though they seem too fast or too slow for you

Stick to your exercise program when undergoing a stressful life change (e.g., divorce, death in the family, moving, shift change)

Exercise adherence (EARS) scale

01. I do my exercises as often recommended.

0 1 2 3 4

Completely agree Completely disagree

02. I forget to do my exercises

0 1 2 3 4

Completely agree Completely disagree

03. I do less exercise than recommended by my healthcare professional

0 1 2 3 4

Completely agree Completely disagree

04. I fit my exercises into my regular routine

0 1 2 3 4

Completely agree Completely disagree

05. I don't get around to doing my exercises

0 1 2 3 4

Completely agree Completely disagree

06. I do most, or all, of my exercises

0 1 2 3 4

Completely agree Completely disagree

07. I do some, but not all, of my exercises

0 1 2 3 4

Completely agree Completely disagree

Appendix D: Approval for use of EARS

Dear VERONICA BROCK,

Elsevier has approved your recent request described below. Before you can use this content, **you must accept** the license fee and terms set by the publisher.

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Appendix E: Approval for use of PSQI

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