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The work environment of healthcare professionals requires them to be physically fit. This study examined physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals using secondary data from Wave V data of the National Longitudinal Study of Adolescent to Adult Health conducted from 2016 to 2018. Findings demonstrated that these health care professionals engaged in slightly more physical activity than the national norm for US adults (56.7% vs. 50%). As supported by the literature, engaging in physical activity reduced stress scores. There was a high prevalence of obesity in these healthcare professionals (63.7%). Those persons who engaged in more physical activity and had higher education had lower BMIs. Physical activity was not associated with depression scores. This study demonstrated an ongoing gap with inclusion of racial disparities in physical activity research.

Increasing physical activity among healthcare professionals is a significant issue. There is a need for additional research, especially interventions, to increase physical activity in healthcare workers. While healthcare workers have responsibility for their own health, the healthcare system must do more to support the health of their workforce, to include assuring that physical activity recommendations are able to be met.

THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, STRESS, OBESITY, AND DEPRESSION AMONG HEALTHCARE PROFESSIONALS IN THE NATIONAL LONGITUDINAL STUDY OF ADOLESCENT TO ADULT HEALTH

by

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Dr. Susan Letvak
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DEDICATION

I dedicate this dissertation to my mom and dad, who taught me the importance of lifelong learning. I miss you more than words can say. Thank you for believing in me and guiding me to better myself. I look forward to the day I will see you both again. To my daughter, Breanna, and husband, Mark, who believed in me more than I did at times, I love you so much!

APPROVAL PAGE

This dissertation written by Maria R. Busam has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I: INTRODUCTION

In 2010 the United States (U.S.) Office of the Surgeon General declared the lack of regular physical activity among all people of all ages as one of the greatest health concerns in the U.S. This declaration led to a call to action to improve physical activity in children and adults (U.S. Office of the Assistant Secretary for Health and Surgeon General, 1983). Engaging in physical activity and stretching improves strength, balance, and overall health (Medline Plus, 2020). According to the U.S. Bureau of Labor Statistics (2021a) Occupational Requirements Survey (ORS) report on strength levels needed for specific job roles, healthcare professionals were identified as a set of workers whose job roles have very heavy strength level requirements. Activities performed by healthcare professionals putting them in this category are related to the job requirements of lifting and moving patients, bending, stretching, standing for extended periods of time, and walking for periods of time (U.S. Bureau of Labor Statistics, 2021b). The categories for strength level included sedentary, light, medium, heavy, and very heavy (U.S. Bureau of Labor Statistics, 2021b).

Regular physical activity has other documented health benefits such as weight control, improved mood, enhanced libido, improved sleep, and increased energy (WHO 2021a). Regular physical activity can improve flexibility and posture and is pivotal in the prevention of chronic diseases such as cardiovascular disease, overweight and obesity, cancer, and diabetes (ODPHP, 2021f). Other benefits of physical activity include its ability to strengthen bones and muscles, thus improving a person's ability to perform the activities of daily life, thereby decreasing instances of falls and injury (ODPHP, 2021f).

The World Health Organization (WHO) (2020) showed data to support insufficient activity in adults worldwide without significant improvement from 2001 (31.6%) to 2016

(36.8%) in high income countries. AOHP (2021c), reports that 23.2% of adults, 18 and older, in the U.S. meet the recommended guidelines for both physical activity and muscle strengthening, while 53.3% meet the guidelines for physical activity without strengthening exercises. This lack of physical activity was one of ten factors leading to global mortality (WHO, 2020). The WHO (2020) attributes the decrease in or lack of physical activity in sedentary behavior during work time and while at home, and the use of passive modes of transportation such as Uber, buses, and the decrease in the number of people walking or riding bikes. By following the 2018 Physical Activity Guidelines for Americans (ODPHP, 2021f), adults can avoid the 20 to 30% increase in risk factors associated with insufficient activity (WHO, 2020). Physical activity guidelines and information related to the importance of physical activity has been available since 1979 (ODPHP, 2021d), yet little or no physical activity is one of the leading health risk factors for mortality in the world and is responsible for four to five million deaths annually (WHO, 2021b). The health risks related to not engaging in physical activity carries a great financial burden. In 2018 approximately $54 billion was spent for healthcare because of the consequences of individuals not engaging in physical activity (WHO, 2021b). The need to improve physical activity for everyone, has led to other calls to action and activities to improve physical activity such as work led by the American College of Sports Medicine and Kaiser Permanente to look at physical activity as a vital sign and to consider the assessment and prescription of physical activity as a standard of care delivery (Sallis et al., 2016).

Physical activity, diet, and nutrition are the focus of many research studies related to lifestyle behaviors in countries around the world (Alothman et al., 2021; Cho & Han, 2018; Keele, 2019; Yao et al., 2019). Efforts were increased to improve physical activity over the past forty years as a result of the 1979 publication *Healthy People: The Surgeon General's Report on*

Health Promotion and Disease Prevention when the first Healthy People objectives were developed (ODPHP, 2021d). The purpose of these national objectives was to build a society of individuals who live longer, healthier lives. The objectives would enable researchers to identify health disparities (ODPHP, 2021d). This information would be used to increase public awareness of health behaviors and allow for the development of measurable goals for healthy behavior that would affect society at a local, state, and national level (ODPHP, 2021d). Physical activity was one of the original goals set by Healthy People. This impact goal has been in place for Healthy People from its start in 1979 ODPHP, 2021d) and is a Healthy People 2030 impact goal (ODPHP, 2021b). The current 2030 impact goal, related to physical activity, is to increase activity in those who report no engagement in physical activity (ODPHP, 2021b).

Healthcare professionals in medical facilities are responsible for providing care and promoting a healthy lifestyle for their patients (Hossain & Clatty, 2021; Keele, 2019; Marques-Sule et al., 2021; Saridi et al., 2019). Maintaining a healthy lifestyle includes eating well, physical activity, obtaining seven to nine hours of sleep, and decreasing stress (Hossain & Clatty, 2021; Keele, 2019; Marques-Sule et al., 2021; Saridi et al., 2019). Healthcare professionals have the body of knowledge necessary to educate and promote a healthy lifestyle behavior with their patients, such as the benefits of physical activity, a healthy diet, the necessity of an adequate amount of sleep, and taking a preventative approach to self-care (Keele, 2019; Rocha et al., 2018; Saridi et al., 2019). Nevertheless, studies show healthcare professionals need increased physical activity and self-care (Couser et al., 2020; Hossain & Clatty, 2021, Saridi et al., 2019). Self-care is necessary for supporting one's physical, mental, and spiritual health (Couser et al., 2020). Healthcare professionals work in an environment consisting of long hours, shift work, increased physical demands and emotional demands (Couser et al., 2020; Hossain & Clatty,

2021; Saridi et al., 2019), and combined with personal life stressors can make a person vulnerable to avoiding physical activity (Couser et al., 2020; Hossain & Clatty, 2021; Saridi et al., 2019; Teall & Melynk, 2021). Poor coping mechanisms and increased stress can lead to a lack of physical activity and depression (Hossain & Clatty, 2021; Teall & Melynk, 2021; Torquati et al., 2017).

Physical activity is important to healthcare professionals for many reasons. Regular physical activity can improve the ability of healthcare professionals to perform their work duties and decrease the risks for injury, improve mood, and decrease stress (Keele, 2019; Rocha et al., 2018; Saridi et al., 2019). The data shows healthcare professionals need to improve their self-care behaviors such as physical activity.

Definition of Physical Activity

The World Health Organization (WHO) defines physical activity as any movement made by the body that involves the use of skeletal muscles and requires energy expenditure (WHO, 2021a). The 2018 Physical Activity Guidelines for Americans (ODPHP, 2021f) recommends a frequency and intensity of physical activity for adults between the ages of 18 and 64 years of age will improve health. The recommendation calls for adults to engage in 150 minutes of moderate-intensity aerobic activity per week (ODPHP, 2021f). In addition, the guidelines require two or more days of muscle strengthening activities to work all the major muscle groups in the body twice per week (ODPHP, 2021f). Another option to meet the guidelines is to perform 75 minutes of vigorous-intensity aerobic activity per week (ODPHP, 2021f). In addition, each individual should complete two or more days of muscle strengthening activities to work all the major muscle groups in the body (ODPHP, 2021f). The ODPHP (2021f) recommends 300 minutes of moderate aerobic physical activity or 150 minutes of combined moderate and vigorous aerobic

physical activity per week to increase the health benefits received from physical activity. Physical activity which does not meet the 2018 Physical Activity Guidelines (ODPHP, 2021f) can lead to a multitude of health issues (ODPHP. 2021f) and chronic diseases. Diseases include hypertension, cardiovascular disease, diabetes, depression, overweight and obesity (Keele, 2019; Ross et al., 2017; Zheng et al., 2017), cancer, and chronic back pain from musculoskeletal injury in the workplace (McPhail & Nyman, 2018; ODPHP, 2021a). Research shows healthcare professionals are not meeting the 2018 Physical Activity Guidelines for Americans (ODPHP, 2021f). It is important to note, however, that people will see benefits even without reaching the full recommendation for physical activity (ODPHP, 2021f).

The commitment to meet the guidelines would require healthcare professionals to increase their physical activity and improve their health. In 2017, the American Nurses Association (ANA) launched a program called Healthy Nurse, Healthy Nation (Healthy Nurse Healthy Nation, 2022). The Healthy Nurse Healthy Nation, program was designed to create national change in healthcare behaviors and improving the health of nurses (Healthy Nurse Healthy Nation, 2022). The program addressed five key areas important to good health: nutrition, physical activity, sleep, quality of life, and safety (Healthy Nurse Healthy Nation, 2022). The ANA recognized nurses' health behaviors are as poor as the general population and contributes to poor health outcomes (Healthy Nurse Healthy Nation, 2022). The ANA also recognized that changing behaviors are not simple, and the program was designed as a competition while making positive changes in health behaviors and to make being healthy fun (Healthy Nurse Healthy Nation, 2021). Participants who completed the survey, received a document outlining their health risks. Participants were asked to take the survey at varying times to collect data of changes in status over time (Healthy Nurse Healthy Nation, 2022). Groups of 25 or more affiliated with

ANA partners, taking part in the survey, will receive quarterly reports with deidentified data for their group (Healthy Nurse Healthy Nation, 2022). Many other healthcare professionals could benefit from similar programs since there are similarities in their self-care and physical activity behaviors.

In summary, the need to increase physical activity has been a global concern for many years leading to different calls to action, research, and monitoring of physical activity across the lifespan, different populations, races, job roles, education, and gender. Despite all this work, we still have difficulty increasing physical activity globally. Healthcare professionals are a population trained on health promotion, yet they do not apply their training to their own health. There is significant importance in gaining a better understanding of healthcare professionals' level of engagement in physical activity before action can be taken to promote interventions in physical activity. Research showing the number of healthcare professionals engaging in physical activity and how it affects areas of stress, overweight and obesity, and depression will help in in the development of interventions, related to physical activity, in this population of healthcare professionals in future studies.

Background and Significance of the Problem

There are currently 3,080,100 million registered nurses (RNs), 49,100 physical therapists (PTs), approximately 131,600 occupational therapists (OTs), 49,000 therapists' aids and assistants in the United States (Association of Occupational Health Professionals in Healthcare [AOHP], 2019). The number of people working in those roles are projected to grow by 2030 (U.S. Bureau of Labor Statistics, 2021a). Women continue to outnumber their male counterparts in healthcare professions. There are 9.4% of male RN's (Smiley et al., 2021), 33% of male PT's (U.S. Bureau of Labor Statistics, 2022b), 29% of male PT aids/assistants, 15.1% of male

occupational therapists in the U.S. (American Physical Therapy Association [APTA], 2020; U.S. Bureau of Labor Statistics, 2022b).

A part of healthcare professionals will be aging out of work and retiring for the workforce. Currently 19.0% of RN's are aged 65 years or older (Smiley et al., 2021). In five years, approximately one-fifth of the nurses currently working, will be retiring (Smiley et al., 2021). As of 2020, the average age of an RN was 52 years of age (Smiley et al., 2021). The average age of physical therapists is 41.2 years and occupational therapists mean age is 41.8 years according to the AOHP (2019).

Healthcare consists of a diverse group of professionals, yet there continues to be disparities related to race and gender with healthcare professionals. As of 2022, 74.9% of RN's, 81% of PTs, and 87.9% of OTs is Caucasian (APTA, 2020; U.S. Bureau of Labor Statistics, 2022b). African Americans make up 13.3% of RN's which is an increase from 2020, 5.4% of PTs, and 4.1% of OT's (U.S. Bureau of Labor Statistics, 2022b). Asians make up 8.6% of RN's, 6.8% of OTs, and 12.6 of PTs. Finally, Hispanic/Latinx population make up 8.8% of RN's, 4.2% of OTs, and 5.3% of PTs (AOHP, 2019). As adults age, there is a decline in their ability to perform intense physical activity, which usually starts to occur after the age of 30 (ODPHP, 2021f). Recent studies (McCarthy et al., 2018; Raney & Zanten, 2019; Rocha et al., 2018; Roskoden et al., 2017; Ross, 2017) show that healthcare professionals participate in less than adequate amounts of physical activity, based on the 2018 Physical Activity Guidelines for Americans (ODPHP, 2021f; Tornero-Quiñones, 2020). Avoiding time to engage in physical activity is a risk factor for future disability related to decline in physical function and health as people age (ODPHP, 2021f). By including physical activity in daily health promotion behaviors, individuals can decrease their risk for frailty, falls, and disability as aging occurs (Tornero-

Quiñones et al., 2020). As healthcare professionals age, their ability to be as physically active may no longer be possible if they have not maintained adequate physical activity and engaged in activities that encourage muscle strengthening such as lifting weights and stretching (Tornero-Quiñones et al., 2020). Using resistance bands (Lopes et al., 2019), tai chi, and yoga can strengthen multiple muscle groups and provide a full body workout (Harvard Health Publishing, 2021; ODPHP, 2021f). The use of weights is comparable in health benefits as using resistance bands for strength training (Lopes et al., 2019). Failure to engage in physical activity can create health risks affecting nurses (ODPHP, 2021f), all of which can affect quality of life and the care they provide.

Musculoskeletal Injury

Healthcare professionals work in an ergonomically demanding job requiring them to spend much time on their feet, walking in their worksites, lifting patients, moving patients, twisting, and bending, which has the potential to lead to injury if not physically fit and flexible enough to meet their work demands (AOHP, 2019; Kaiser Permanente, 2022; Ou et al., 2021; Yao et al., 2019). The prevalence of work-related musculoskeletal injuries is a great concern for the healthcare industry. The WHO (2021c), defines a musculoskeletal disorder as, "Musculoskeletal conditions are typically characterized by pain (often persistent) and limitations in mobility, dexterity, and overall level of functioning, reducing people's ability to work." Injuries can have a variety of causes such as injury, spinal deformities, spinal cord issues and more (AOHP, 2019; NIH, 2021). Risk factors for back pain and injury include not being physically fit, weight gain, depression, jobs requiring heavy lifting, twisting, bending, and pulling (NIH, 2021). Those working as health professionals, RN's, PT's, OTs, are considered high-risk occupations for on-the-job injuries (AOHP, 2019; Ou et al., 2021). The number of

injuries requiring days away from work increased 59,580 cases in 2020, raising the total number of cases to 78,704 cases (Ou et al., 2021; Krishnan et al., 2021). Healthcare professionals across differing job types such as hospital, ambulatory sites, and long-term care (U.S. Bureau of Labor Statistics, 2018) and healthcare professionals in other countries (Yao et al., 2019), report a much higher prevalence and incidence of work-related musculoskeletal injuries and pain than any non-healthcare job type (Association of Occupational Health Professionals in Healthcare [AOHPH], 2019; U.S. Bureau of Labor Statistics, 2020; Yao et al., 2019) with the exception of nursing assistants who reported 96,480 cases in 2020 (U.S. Bureau of Labor Statistics, 2021a). According to the U.S. Bureau of Labor Statistics (2021c), RNs in hospitals report 74.1% more non-life-threatening injuries than all non-health care job types. Musculoskeletal injuries are not limited to hospital-based healthcare professionals (U.S. Bureau of Labor Statistics, 2018b). Nurses working in ambulatory settings reported a 16.2% rate of injury, while those in residential care reported a rate of 7.5% work related injuries (U.S. Bureau of Labor Statistics, 2018b). Physical therapists reported 38.5% of work-related injuries (Cornwell et al., 2021).

With the vast amount of stretching, bending, and lifting that is required as part of the job, in addition to long hours, and shift work, healthcare professionals are vulnerable to back injuries and other musculoskeletal injury (Association of Occupational Health Professionals in Healthcare [AOHPH], 2019; Ou et al., 2021; U.S. Bureau of Labor Statistics, 2021b; U.S. Bureau of Labor Statistics, 2022c; Yao et al., 2019). Lifting patients, aiding patients with movement, and transferring patients is the primary cause for musculoskeletal injuries to healthcare professionals (Occupational Safety and Health Administration [OSHA], n.d.; Ou et al., 2021; Richardson et al., 2019; U.S. Bureau of Labor Statistics, 2021b; U.S. Bureau of Labor Statistics, 2022a; Yao et al., 2019). The risks increase in worksites that do not supply adequate

staffing, lack polices related to patient lifting or transferring, or lack equipment required to move or lift patients (OSHA, n.d.; Ou et al., 2021; Richardson et al., 2019). Physical activity, including the recommended muscle stretching, can increase physical endurance and muscle strength for all ages (ODPHP, 2021f). Physical activity improves health, decreases injury (ODPHP, 2021f) leading to decreased costs for the worksites and insurance (Davis et al., 2020) and loss of work for the healthcare professional (OSHA, n.d.).

Many of the debilitating injuries sustained by healthcare professionals in the workplace can leave a healthcare professional unable to perform the duties of the job temporarily, or have a long-term effect on physical abilities, in some cases, career ending injuries leading to increased turnover in nursing staff (OSHA, n.d.; Ou et al., 2021; Yao et al., 2019). Musculoskeletal injuries among healthcare professionals such as back injuries are on the rise and are costing approximately $20 billion each year for treatment, loss of work, in addition to disability, absenteeism, and may lead to them leaving their job permanently (OSHA, n.d.). In a workers' compensation study (Davis et al., 2021) reviewing 5234 injury claims from home health nurses, hospital nurses, home health nursing aids, and long-term care nursing aides in Ohio, found home health nurses had the highest costs of health per claim, $15,000 per claim. Hospital nurses' total claims costs were higher than the home health nurses at $5 million per year. These costs only include the medical costs and not the cost of leave benefits and paying another nurse to fill in for the out of work nurse (Davis et al., 2021).

The prevention of and recovery from workplace injuries may be positively affected if healthcare professionals take part in physical activity. Physical activity is used to treat and improve musculoskeletal injury after it has occurred (Lin et al., 2019; Yao et al., 2019). Positive impact includes decreased pain, better mobility, and ability to engage in required healthcare

duties (Lin et al., 2019; Taulaniemi et al., 2019; Yao et al., 2019). The decrease in pain will allow the healthcare professional to continue working and to work comfortably (Lin et al., 2019; Taulaniemi et al., 2019; Yao et al., 2019). The risks of not engaging in physical activity, on the other hand, can lead to many health issues for healthcare professionals such as overweight and obesity, stress, and depression (ODPHP, 2021a; ODPHP, 2021f; Oshunbade et al., 2020).

Overweight and Obesity

The overweight and obesity epidemic in the United States (U.S.) continues to be one of the nation's leading health problems related to limited or no engagement in physical activity (National Institute of Health [NIH], 2021b; ODPHP, 2021a; ODPHP, 2021f; Oshunbade et al., 2020). In 2016, the direct medical cost related to overweight and obesity in adults in the U.S. was $260.6 billion (Cawley et al., 2021). According to the NIH (2021b), 42.4% of adults in the U.S. aged 20 and older in the United States are identified as overweight or obese, with obesity making up 39.8% of this number (Hales et al., 2020; NIH, 2021b). National Institute of Health, 2021bhis information is based on data collected between 2017-2018. These data are based on Body Mass Index (BMI) which is used to measure for overweight and obesity (Hales et al., 2020; NIH, 2021b). Those considered overweight or obese have a body mass index (BMI) of 25.0 kg/m^2 or higher (NIH, 2021b). An added 9.2% of the adult population identified as being severely obese, with a BMI greater than $40kg/m^2$ (Hales et al., 2020; NIH, 2021b).

Stress and Depression

Those working as healthcare professionals are in a stressful and demanding occupation due to the challenges of meeting the expectations of management, demands to meet productivity, carrying heavy workloads, the working environment, and patients of a higher acuity level (Chen & Meier, 2021; Maharaj et al., 2018; Zhang et al., 2017). Depression is a significant health issue

for healthcare professionals around the world (Chen & Meier, 2021; Huang et al., 2018; Maharaj et al., 2018; Park & Park, 2017; Yona et al, 2022). One study in Australian healthcare professionals reported a depression prevalence rate greater than 30% in nurses and only 4% in the general population (Maharaj et al., 2018). The rate of depression in healthcare professionals prior to the COVID-19 pandemic was double that in other professions (Huang et al., 2018). Depression been found in all healthcare professions (Yona et al., 2022).

Managing stress is important for supporting health and physical well-being. Healthcare professionals have a significant amount of stress at work, but also must juggle the stress in their personal lives (American Psychiatric Association, 2020; Yona et al. 2022; R. Zheng, Zhou, et al., 2021). Physical activity such as stretching and walking, has showed a positive effect on stress, mood, and depression (Yona et al., 2022; R. Zheng, Zhou, et al., 2021). Physical activity was shown to improve pain perception such as back pain, mood, and fatigue (Yona et al., 2022; Zhang et al., 2018) and decreased depression (R. Zheng, Zhou, et al., 2021).

As discussed earlier, physical activity offers many benefits such as decreased risk of overweight and obesity (ODPHP, 2021a; ODPHP, 2021f; Oshunbade et al., 2020), improving and decreasing the risk for depression and anxiety (R. Zheng, Zhou, et al., 2021), strengthening the body to prevent musculoskeletal injuries (Association of Occupational Health Professionals in Healthcare [AOHPH], 2019, and preventing risk factors for comorbid diseases over the lifespan such as cardiovascular disease, stroke, cancer, and diabetes (ODPHP, 2021f; WHO, 2020a). Healthcare professionals are vulnerable to overweight and obesity, depression, anxiety, musculoskeletal injury due to their stressful jobs (Couser et al., 2020; Hossain & Clatty, 2021), leading to chronic diseases. Physical activity reduces the risk factors for these health issues (ODPHP, 2021f).

Statement of the Problem

Despite the abundance of research related to assessing and improving physical activity (PA) in many different populations of the U.S., the efforts have not contributed to significant improvement in physical activity in adults or children in the U.S. (ODPHP, 2021f, WHO, 2021b). This lack of improvement in physical activity performance has left society with a sizable percentage of the population that is inactive or does not meet the recommended frequency and intensity of physical activity to impact health changes (ODPHP, 2021f; WHO, 2021b). Despite efforts to implement community and workplace programs promoting physical activity, the level at which adults are engaging in physical activity is at an all-time low with only 23.2% of adults 18 and older having met the 2018 Physical Activity guidelines (ODPHP, 2021f).

Healthcare professionals have received training to educate patients on methods to increase physical activity, yet healthcare professionals are not performing PA that meets current PA guidelines (McCarthy et al., 2018; Raney & Zanten, 2019; Rocha et al., 2018; Roskoden et al., 2017; Ross, 2017). For this reason, continued research is needed to develop interventions to promote physical activity in healthcare professionals. To develop interventions, one must first understand the scope of the problem among this often-overlooked vulnerable population. Studies involving a variety of healthcare professionals which include the measure of physical activity behavior, frequency, duration, and the barriers that keep them from performing physical activities in health promotions programs have used a variety of instruments such as the Global Physical Activity Questionnaire (GPAQ) (Saad et al., 2020) and International Physical Activity Questionnaire (Mahony et al., 2019). In addition, varied theories used with different constructs of importance, such as the Theory of Planned Behavior (Lin et al., 2018), Grounded Theory (Cilar et al., 2017) and studies which the guiding theory is not clearly identified. The use of

different instruments and theories has created challenges when comparing the results of physical activity across studies and using data to guide in developing interventions. This study will use data from Wave V of the National Longitudinal Study of Adolescent to Adult Health, to better under the physical activity behaviors of healthcare professionals and the relationship between physical activity, stress, and overweight and obesity (Harris et al., 2018).

Theoretical Framework of the Study

The theoretical basis for the Add Health Study is from a human development theory called the Life Course Theory (Elder, 1998; Hutchison, 2019) (See Appendix A). This theory was previously called the Life Perspective Theory (Elder, 1998; Hutchison, 2019). In 1960, a sociologist, Glen H. Elder Jr., developed this theory from research from the Oakland Growth Study and observed changes among families of the participants, which led him to focus on social change, life pathways, and individual development as they related to behavior change (Elder, 1998; Hutchison, 2019). All people follow different paths for growth, called trajectories, based on their lived experiences (Elder, 1998; Hutchison, 2019). Those experiences include advantages and disadvantages experience through life. The theory looks at the effects of biological, psychological, and socio-cultural factors on individuals independently, cumulatively, and interactively on the individual to build upon their trajectory through life (Hutchison, 2019). In addition, this theoretical framework is different from most theories as it does not follow a singular linear path through life but is a collection of many theories used to explain how health occurs differently for everyone at different stages of the lifespan (Halfon et al., 2018). Differences are a result of interactions between biological, psychological, socio-cultural, and environmental experiences, and how an individual adapts to those experiences. Depending on how they adapt and the decisions they make from those interactions can lead to disease (Halfon

et al., 2018; Hutchison, 2019). The goals of researchers using this theoretical framework are to integrate the work of modern medicine and public health to develop multilevel interventions going beyond how health of individuals and population health are viewed (Halfon et al., 2018; Hutchison, 2019). The framework focuses on the importance of the impact of earlier life experiences and the influence of those experiences on health over different periods across the lifespan from birth to death (Alwin, 2012; Black et al., 2009; Hutchison, 2019). The Life Course Framework is based on five principles and five concepts (Alwin, 2012; Black et al., 2009; Hutchison, 2019).

Elder (1998) developed interrelated principles to this theory. Prior to this theory, the complexities of life and their impact on an individual was overlooked (Hutchison, 2019). The importance of the combination of body and mind working together are taken into consideration in this theory (Hutchison, 2019). An assumption of the Life Course Theory is individuals live their lives in an orderly fashion and are shaped by several events, outside of their control, such as age, social structures, and historical change (Elder et al., 2003). Those principles include, time and place, life span development, timing, human agency, and linked lives.

Linked lives is the first principle of Elder's (1998) Life Course Theory. According to Elder (1998), linked lives refers to interdependence within our relationships during our lifespan that influence our behaviors. The controls that other have over others can be good or bad and be in the form of rewards or punishments (Black et al., 2009; Elder, 1998; Hutchison, 2019). The controls can also be in the form of others' expectations (Black et al., 2009; Elder, 1998; Hutchison, 2019). The emotions and beliefs of others we are in relationships with can influence behaviors as the behaviors of an individual can influence their family members (Black et al., 2009; Elder, 1998; Hutchison, 2019).

Timing of lives is the second principle to the Life Course Theory. Timing is defined by individual time, generational time, and historical time (Black et al., 2009; Elder, 1998; Hutchison, 2019). Individual time refers to the chronological time of an individual life or periods of their life including infancy, childhood, adolescence, young adults, middle age, and old age (Black et al., 2009; Hutchison, 2019). These different time periods can influence role and place in society based on culture norms or beliefs (Black et al., 2009; Elder, 1998; Hutchison, 2019). Generational time refers to the period you were born. For example, those born between 1946 – 1964 referred to as Baby Boomers or those born between 1965-1980 referred to as Gen X (Perdue Global, 2022). The beliefs of those in the same time periods can influence decisions of a group of people born in a similar timeframe (Black et al., 2009; Elder, 1998; Hutchison, 2019).

Time and place are the third principle of the theory. This principle is related to historical events occurring during the timeframe of an individual's life such as war, social and cultural beliefs, poor economy, and geographical location where the individual lives. The events of time and place can impact an individual's decisions (Black et al., 2009; Elder, 1998; Hutchison, 2019). The influence of the family dealing with the same events can also influence the individual (Black et al., 2009; Elder, 1998; Hutchison, 2019).

Human agency describes an individual ability make their own decisions and influence outcomes in their life and is the fourth principle of the theory (Black et al., 2009; Elder, 1998; Hutchison, 2019). This means an individual's life is not only influenced by social structure, but the decisions and planed goals set by the individual can influence social structure (Black et al., 2009; Elder, 1998; Hutchison, 2019). Individuals could assess their situation, needs, long term goals, and resources available to make those decisions (Black et al., 2009; Elder, 2019; Hutchison, 2019).

Life span development explains human development and the aging process are lifelong. This principle also describes how our past can influence or shape our future. The decisions we made in the past can directly shape what we do in the present and in the future. Hutchison (2019) refers to this as a ripple effect on our decisions. Influences of the other principles can also be included in this principle.

Human agency consists of three different modes (Code, 2020; Hutchison, 2019). The first is personal agency. Personal agency is the individual's ability to use their own influence to shape their own behaviors (Hutchison, 2019). Second, is proxy agency being the individual's ability to influence others to help the individual meet their needs and accomplish the behaviors (Hutchison, 2019). The individual can influence those who have resources which help the individual accomplish the behaviors (Hutchison, 2019). Finally, the last mode is collective agency in which the individual influences at the group level (Hutchison, 2019). This mode allows the group to act as one to meet their needs and accomplish their desired goals (Hutchison, 2019).

Finally, there are five key life course concepts associated with the Life Course Theory. Those concepts include transition, trajectory, cohorts, life events, and turning points (Elder, 1998; Hutchison, 2019). Transition refers to the changes in an individual's discrete change in a role or status across the lifespan. An individual may experience many transitions over their lifetime (Elder, 1998; Hutchison, 2019). The transitions in an individual's create the life trajectories of that individual (Elder, 1998; Hutchison, 2019). Trajectory is the pathway transitions lead an individual over time. Trajectories are not always linear, but do follow a pattern (Elder, 1998; Hutchison, 2019). Cohorts are those individuals born in the same timeframe, experienced the same social beliefs and culture also referred to as a generation (Elder,

1998; Hutchison, 2019). A life event refers to a notable event leading to a sudden change having the potential to have long lasting impact on an individual or group (Elder, 1998; Hutchison, 2019). Finally, a turning point describes a major change in a life-course trajectory (Elder, 1998; Hutchison, 2019). This event can change the way an individual views risks versus opportunities in life (Elder, 1998; Hutchison, 2019).

Life Course Theory considers many aspects of an individual's life that influence their current actions, and future actions. Actions taking place early in life also influence what an individual does later in life. Everyone will take a different path or trajectory based on lived events throughout the lifespan. This does not mean that an individual cannot make a conscious decision to change the trajectory of their life in a positive direction. Yet, one bad decision can move an individual down a path they did not plan for.

For this study, the principle of personal agency was used to evaluate the participants' decision to engage in physical activity and the relationship between stress, overweight and obesity, and depression (see Appendix A). Information known prior to reviewing the data is the chronological time and generational time of the participants based on their age when they entered the longitudinal study. The participants' ages range from 31 to 42 years, and they are either entering or are in the early part of their fourth decade of life (Harris et al., 2019) and are part of a generational group known as Millennials born between 1981-2000 (Perdue Global, 2022). These participants were shaped by three major events in their lives, Columbine, the September 11, 2000, attack on the U.S., and the internet (Perdue Global, 2022).

Purpose of the Study

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity,

and depression in healthcare professionals using secondary data from Wave V data of the National Longitudinal Study of Adolescent to Adult Health conducted from 2016 - 2018 (Chen & Harris, 2020).

Research Questions and Hypothesis

The study research questions are:

1. **RQ1:** What is the prevalence of healthcare professionals engaging in moderate to vigorous physical activity five times or greater a week?
    a. Hypothesis 1: Healthcare professionals do not engage in moderate to vigorous physical activity 5 times or greater a week.
2. **RQ2**: What is the effect of physical activity on stress among healthcare professionals?
    a. Hypothesis 2: Physical activity decreases stress in healthcare professionals.
3. **RQ3:** What is the effect of physical activity on overweight and obesity among healthcare professionals?
    a. Hypothesis 3: Physical activity decreases overweight and obesity in healthcare professionals.
4. **RQ4:** What is the effect of physical activity on depression among healthcare professionals?
    a. Hypothesis 4: Physical activity decreases depression in healthcare professionals.

Definition of Terms

1. **Healthcare Professionals**—For this study, healthcare professionals will consist of registered nurses, nurse anesthetists, nurse midwives, nurse practitioners, exercise physiologists, all other therapists, health practitioners, support technologists and technicians, and miscellaneous health technologists and technicians who work in a hospital setting or ambulatory care settings including clinics, urgent cares, cancer centers, and specialty physicians' offices such as orthopedic offices.
2. **Physical activity**—Movement or activity that require the use of the large muscles and expend high levels of energy (World Health Organization [WHO], 2022). For this study, physical activity consisted of the physical activity behaviors participants engaged in the week before responding to the survey and was scored by adding the number of times each participant participated in physical activities over the seven days.
3. **Stress**—Stress is how an individual's body responds to pressures or tension which can cause sadness, fear, anger, worry, frustration, difficulty sleeping, and difficulty concentrating (Kar et al., 2021).
4. **Overweight/Obesity**—Overweight/Obesity will be a BMI equal or greater than 25kg/m^2 on the BMI classifications (NIH, 2021b).
5. **Depression**—Depression is a mood disorder that creates a loss of interest in activities and feelings of sadness (American Psychiatric Association, 2020). For this study, depression will be those participants who score four (4) or greater on the modified four question Center for Epidemiologic Studies Depression (CES-D) Scale. The score will be dependent on responses for the following self-reported information such as

not being able to shake off the blues, even with the help of family and friends; feeling depressed; feeling happy; and feeling sad over the seven-day period prior to them responding to the questions.

Summary

Researchers and government health agencies continue to search for a resolution to the intention-behavior gap to increase engagement in physical activity worldwide (ODPHP 2021c; ODPHP, 2021f). There are multiple theories, questionnaires, and interventions with noticeable inconsistency in their findings which do not allow for comparison or generalizations across the studies. A good research study is based on a theoretical model that fits the population intended to study (Adom et al., 2018). The Life Course theory is a human development theory that has been used to follow participants over the life span continuum, with a focus on factors that mold people into who they are and their health outcomes. Those factors included in the Life Course theory consists of biological, behavioral, social, environmental, and psychological factors. This study looked at the relationship between physical activity, stress, overweight and obesity, and depression. Health professional's physical activity is important to measure because the findings increase knowledge to improve physical activity, allowing the healthcare professional to perform work activities without injury and improve overall health. Physical activity can improve mood and decrease stress. Finally, physical activity can decrease overweight and obesity and risks for diseases such as cardiovascular disease, diabetes, and cancer. This study will add to science by looking at physical activity in healthcare professionals. This knowledge will enable health providers, researchers, and health promotions leaders to tailor interventions that are more precise to the needs of healthcare professionals as individuals, thereby improving the potential for success of health promotions programs designed for this population.

CHAPTER II: REVIEW OF THE LITERATURE

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals. The following areas will be discussed based on existing literature: Healthcare professionals and physical activity, effects of race and ethnicity on physical activity in healthcare professionals, effects of age on physical activity and health, stress, and depression, and overweight and obesity.

Healthcare Professionals and Physical Activity

Living a lifestyle without physical activity can be deadly and may lead to avoidable health issues (Hales et al., 2020; Ross et al. 2017). According to the American Nurses Association (ANA) Healthy Nurse Healthy Nation Challenge, nurses are less healthy than the average American (Couser et al., 2020; Healthy Nurse Healthy Nation, 2021; Teall et al., 2021). One area identified by the ANA Challenge as needing improvement, is time spent engaging in physical activity (Healthy Nurse Healthy Nation, 2021). Positive changes from physical activity can be seen instantly such as changes in mood, decreases in blood pressure, reduced anxiety, and even better sleep (ODPHP, 2021f).

Benzo et al., (2021) found hospital-based healthcare professionals walked 8172 $\pm$ 2276 steps in one twelve-hour shift. The intensity for this would be considered light to moderate intensity physical activity which indicates the healthcare professionals were meeting the low end of the recommended activity to be physically fit. Benzo et al. (2021) also mention the amount and intensity of work activity may not offer the health benefits of leisure time physical activity. This assumption was based on an earlier study by Henwood et al. (2012), involving healthcare professionals from Australia and New Zealand, which found those with increased activity at

work, but decreased leisure time activity had a greater body mass index and were sicker more than their cohorts who had greater leisure time physical activity. This is referred to as the physical activity paradox (Gupta et al., 2020). The study by Gupta et al., (2020), found participants who spent more time engaging in moderate to vigorous activity during leisure time had decreased risk of a long-term sick absence from work compared to those who spent more time in moderate to vigorous activity during their work time.

The range of healthcare professionals engaging in physical activity was 13.5% (Albelbeisi et al., 2021) to 50% (Gabal et al., 2020; McCarthy et al., 2018; McDonald & Salisbury, 2019; Schneider et al, 2019; Torquati et al., 2017). The Saad et al. (2020) study of healthcare professionals (N = 261), 45.6% of the participants reported not engaging in physical activity. This study found the general population (67%) spent more time engaged in physical activity (Saad et al., 2020). According to the Keele (2019) study, healthcare professionals scored similarly to the general population on maintaining healthy behaviors. Both groups scored poorly in the areas of stress management and physical activity (Keele, 2019). Couser et al., (2020) found 64% of the healthcare professionals in his study reported not exercising as recommended (Couser et al., 2020).

A lack of or little physical activity among healthcare professionals is not limited to those in the United States but is a problem for healthcare professionals all over the world. The studies from Brazil found 40.3% - 52.1% of the healthcare professionals in the study engaged in physical activity (Rocha et al., 2018). Those participants with a higher education engaged in greater amount of time in physical activity (Rocha et al., 2018). In this study, Rocha et al (2018), findings indicated that women engaged in greater amount of physical activity than men. Gender comparisons across studies was made difficult due to the low number of male participants in the

studies reviewed and the lack of information comparing males to females. Due to the low numbers of men working in the healthcare field (U.S. Bureau of Labor Statistics, 2022a), most of the studies of healthcare professional's health behaviors reviewed consisted primarily of women. The percentage of women participants in the studies ranged from 72.3 to 100%. The age range for the participants in the studies reviewed was 17–70 years of age, with a mean age range of 25.36–52.5. Most of the participants in the studies were Caucasian, ranging from 62 to 100% in each of the studies.

In England (Kyle et al., 2017), the studies provided similar outcomes as the other studies, regarding overweight, obesity and physical activity in healthcare professionals. When surveyed about perceived weight, 14.4% - 44% of the healthcare professionals in the studies reported being overweight. Ireland has three policies aiming to increase physical activity across all the populations in Ireland, communities, and workplaces based on evidence-based strategies (WHO, 2021e). Those policies include: (1) Get Ireland Active; National Physical Activity Plan to promote awareness of the benefits of physical activity by increasing the amount by 1% yearly, (2) The National Sports Policy 2018–2027 consisting of objectives and aims for improving performance, increasing participation, and building skills in different sports, (3) Finally, the Healthy Ireland Strategic Action Plan 2021–2025, based on earlier work with the Healthy Ireland Framework, was initiated to improve healthy behaviors in the population such as decreasing smoking, improving dietary choices, increasing physical activity, and decreasing overweight and obesity during the COVID Pandemic (WHO, 2021e). The study from Ireland (McCarthy et al., 2018), had the lowest percentage of healthcare professionals (9%) reporting engagement in the recommended amount physical activity. With older healthcare professionals engaging in less physical activity than younger healthcare professionals. For this study population, BMI ranged

from 17 to 1kg/m^2. There was no breakdown of the levels of overweight versus obesity (McCarthy et al., 2018).

The healthcare professionals in Kurdistan (Ghaderi et al., 2018), demonstrated the highest rate of limited or no engagement in physical activity (66.6%) of all the countries reviewed. There was not a significant difference in physical activity between the males and females. For this study, the healthcare professionals engaged in less physical activity than the general population of Kurdistan. Similarly, healthcare professionals participating in a study in Taiwan were physically active less than 30 minutes per week (Lin et al., 2018).

Healthcare professionals work in careers that require physical and emotional fitness to meet job demands (Saridi et al., 2019; Teal & Melnyk, 2021). The value of leisure time physical activity versus physical activity in performing work activities brings new information regarding the type of physical necessary to good health (Benzo et al., 2021; Gupta et al, 2020; McCarthy et al., 2018). Therefore, continued research is necessary to define the type of physical activity to be promoted, studied, and develop interventions from. Efforts must be made in U.S. Healthcare facilities for those working to care for patients, to allow for time to engage in physical activity (Saridi et al., 2019; Teall & Melnyk, 2021). A culture of health and allowing for physical activity in the worksite will increase safety for healthcare professionals and the patients they care for. The benefits of physical activity are well known and should be considered a valuable part of nurses' self-care behaviors.

Effects of Race and Ethnicity on Physical Activity and Health

Despite the progress in equality women have made over the years, disparities in race and ethnicity continue to be related to participation in and the effects of physical activity in the United States (Saeed et al., 2020; U.S. Bureau of Labor Statistics, 2018b). Individuals of lower

socioeconomic status, those in minority groups, and persons with disabilities have difficulty engaging in physical activity due to fewer available facilities to go to for exercise, substandard or unsafe environments in which to be active, or a lack of information as to how to access low cost or not cost facilities (Bull, 2020). Based on current data, overweight and obesity and limited or non-participation in physical activity are greater in African American women (American College of Cardiology 2018; Saeed et al., 2020). According to the American College of Cardiology (2018), women, especially African American women, tend to have a higher prevalence of disease such as stroke, cardiovascular disease, diabetes, and kidney failure. These disease processes can be related to African American women not meeting recommendations for physical activity (Rodriquez et al., 2018). Limited or non-participation of physical activity has elevated the risk of cardiovascular disease in African American women to the point there is a major focus on the issue at a national level with the introduction of impact goals, which focus on health equity and physical activity (Buschmann et al., 2018). There is a paucity of research to evaluate physical activity among the African American population. For that reason, the most current studies of African American participants are from earlier studies identified from 1999 (Guidry & Wilson, 1999), 2000 (Adderley-Kelly & Green, 2000), and 2015 (Upchurch et al., 2015). Upchurch et al (2015) found that 63% of their study population (n = 1680) was either inactive or engaged in limited physical activity. Yet those who were active, decreased their allostatic load which decreased their chances of disease (Upchurch et al., 2015). Allostatic load refers to how a person's body has adapted to stressors over time that can affect health (Buschmann et al., 2018). African Americans in the U.S. carry a greater burden of disease while finding little in the way of assistance to conquer those diseases (Buschmann et al., 2018; Rodriquez et al., 2018). For example, rates of hypertension on African Americans aged 20 and older are 40.5% in men and

41.0% in women (American College of Cardiology, 2018). In addition, overweight and obesity rates for African American women is also high at 56.1%. African American women die earlier than for Caucasian, Hispanic, or Asian women (Saeed et al., 2020).

There is limited information about physical activity based on racial or ethnic differences among healthcare professionals in the United States. This should be of great concern due to the increased morbidity and mortality related to lack of or no physical activity within racial or ethnic minorities (Guidry & Wilson, 1999; Adderley-Kelly & Green, 2000). Of the studies reviewed for this literature review, a description of the racial and ethnic differences of the participants was greatly underreported. Several of the studies did not offer information related to the ethnicity of the participants in the U.S. to allow for comparison of results (Kurnat-Thoma et al., 2017; Ross et al., 2017). Several of the studies identified only the country where the study was conducted without specifically stating the race or ethnicity of the participants (Ghaderi et al., 2018; McCarthy et al., 2018; Rocha et al., 2018). Of the studies that described the ethnic breakdown, most of the participants were Caucasian and ranged from 54.8% to 100% of the total sample (Torquati et al., 2017; Zheng et al., 2017). No current articles focused on African American healthcare professionals with the exceptions of two. One of those articles was from 1999 (Guidry & Wilson, 1999) and another from 2000 (Adderley-Kelley & Green, 2000). In the two older articles, it was found that African American healthcare professionals reported decreased participation in physical activity (Guidry & Wilson, 1999; Adderley-Kelley & Green, 2000). In the Guidry and Wilson study (1999) only 32% (N=49) engaged in occasional physical activity with 19.5% not participating in any type of physical activity. In the Adderley-Kelley and Green study (2000), 39% (N=214) reported regular physical activity, while 12.3% did not engage in physical activity. The number of participants in each of these studies is small, indicating a need

to focus research with this population. Nevertheless, when considering the population of African American women in the United States, there continues to be an increased risk of developing chronic diseases or death in African American women from lack of recommended engagement of physical activity (Nyenhuis et al., 2019). It will be important to gain a better understanding of the amount of physical activity and barriers to engaging in physical activity in this population by including more non-Caucasian participants in physical activity research. This information will aid in developing better interventions for this population.

Effects of Age on Physical Activity and Health

Individual health and physical activity can decline over the lifespan for many reasons including the individual's lifestyle, health behaviors, activity levels, dietary intake, and environmental factors that lead to chronic diseases and a further decline in ability to be active, healthy, and lead a normal life (Moreno-Agostino et al., 2020). Physical activity can improve muscle mass, therefore improving strength and decreasing damage to joints, risk of arthritis and other musculoskeletal injury (Lewis et al., 2019). Taking into consideration 55% of healthcare professionals are 50 years old or older the aging of healthcare professionals in the United States will lead to the majority retiring in the next 10–15 years (Richardson et al., 2019; Smiley et al., 2021; U.S. Bureau of Labor Statistics, 2022b), and decreased physical activity among health care professionals (Couser et al., 2020; Saad et al., 2020; Healthy Nurse Healthy Nation, 2021; Teall et al., 2021) at the physical ability to perform the tasks defined by the healthcare professional role, may change. Older healthcare professionals may not be well versed with new strategies for lifting and moving patients, therefore may incur injury related to lack of muscle mass, decreased strength, and decreased function of their joints due to lack of physical activity (Richardson et al., 2019).

Decline in physical ability and musculoskeletal injury are not the only risks for those not engaged in regular physical activity. Limited activity can also lead to overweight and obesity (Ross et al., 2017; Torquati et al., 2017; Zheng et al., 2017). McCarthy et al., (2018) found in their study of healthcare professionals' leisure time and work physical activity, that those greater than 40 years old were less likely to report having engaged in the recommended amount of physical activity weekly.

A study of German healthcare professionals had similar findings of older nurses who did not report engaging in the recommended amounts of physical activity (Roskoden et al., 2017). The older healthcare professionals (41.6 ± 2.0) were also more likely to work a non-shift schedule, meaning they worked day hour shifts (Roskoden et al., 2017). Women with increased age, 49–52 years of age, reached menopause, had birthed children had a significant association with increased weight and being overweight or obese (Zhu et al., 2018). Older healthcare professionals are reporting less regular physical activity in addition to decreased amounts of stretching exercises (Roskoden et al., 2017). In the Blake et al., (2017) study, the participants in the low physical activity group were significantly older than those who were in the high physical activity group and were attaining the physical activity recommendations.

Consideration needs to be given to the impact of declining physical abilities in performing healthcare activities such as lifting patients or moving patients. This is important for the safety of the patient and the healthcare professional. There are also some factors that a person does not have control over that can influence an individual's ability to be active. For this reason, it is important, to promote physical activity with the aging healthcare professionals to prevent injury and increase job safety.

Stress and Depression

Stress is a normal reaction to the physical and psychological demands of life. In most cases, people deal with these stressors without event or treatment (Schultchen et al., 2019). Each person handles stress differently (Schultchen et al., 2019). The stressful work environment, job responsibility, high workloads, and long hours in which healthcare professionals' work can contribute to poor health behaviors, poor sleep patterns (Jalilian et al., 2019) and poor health status (Belingheri et al., 2021). This harmful stress is referred to by the WHO (2020d) as job stress. Job stress is defined as the physical and emotional reaction occurring when your job requirements exceed what you can do. Reactions to job stress can be harmful to an individual (WHO, 2020d). Job stress can create emotional distress which can lead to poor health behaviors or other poor coping behaviors, burnout, depression, and musculoskeletal pain (Hatch et al., 2018). The Sahebi et al. (2021) meta-analyses of depression found an overall prevalence of depression to be 24.83% among healthcare workers. This emotional stress is a consequence of exhaustion, perceived lack of accomplishment, inadequate staffing, lack of social support, lack of leadership support lack of work life balance, and low job satisfaction (Hatch et al., 2018). The healthcare professional may experience increased blood pressure, increased blood glucose levels, mood and sleep disturbances, headaches, and upset stomach (Hatch et al., 2018). In addition, stress can lead to disruption in personal relationships and family life (SAMHSA, 2022).

Psychological stress can lead to decreased physical activity in adults (Schultchen et al., 2019), except for those who participate in regular exercise, in which they increased physical activity when stressed (Brockman & Ross, 2020). According to Celemece and Menekay (2020), healthcare professionals who engaged in physical activity had less symptoms of depression, anxiety, and burnout. For those who did not initially engage in physical activity, but increased

their physical activity, they showed improvement in symptoms of depression, anxiety, and burnout over time (Brockman & Ross, 2020; Celmece & Menekay, 2020).

Dressner and Kissinger (2018) found healthcare professionals believed that stress and overworking were top reasons for workplace injury. Chronic stress is associated with overweight and obesity, binge eating, and the intake of excessive amounts of sugar, salt, and fat (Hatch et al., 2018). Healthcare professionals reported frequent musculoskeletal pain associated with increased stress and decreased self-care (Hatch et al., 2018).

Stress and depression can affect a healthcare professionals' ability to work and is the reason for lower productivity and the increased use of sick time and decline further as a healthcare professionals age (Hatch et al., 2018; Mohony et al., 2019). Stress related burnout can lead to greater decline in work ability and productivity in older healthcare professionals and is related to the emotional, physical, and cognitive exhaustion from the stressful work environment (Hatch et al., 2018). In a national study of U.S. healthcare workers in 2019, 30% reported work related stress (Prasad et al., 2021). There is evidence that healthcare professionals working night shifts or rotating shifts have a higher incidence of increased stress (Ross et al., 2017) and work-family conflict (Zhang et al., 2017).

By engaging in physical activity, eating a healthy diet, and being active in disease prevention throughout life can decrease the decline in work ability, stress, and burnout (Hatch et al., 2018). Healthcare professionals related stress not only affects the nurse, but also impacts the organization the healthcare professional works with. Stress in healthcare professionals can lead to turnover, workplace aggression, physical exhaustion, emotional exhaustion, and lack of alertness which can interfere with patient safety such as increased risk of errors and lead to poor patient outcomes (Kakemam et al., 2021).

Overweight and Obesity

The Scottish Health Survey data indicated there was a significant correlation between those healthcare professionals who did not report engaging in physical activity and being overweight or obese (Schneider et al., 2019). Healthcare professionals (46%) in this study did not meet the guidelines for physical activity. The studies of health behaviors among healthcare professionals reviewed for this paper, reported high rates of overweight and obesity ranging from 55% to 62 % (Kunyahamu et al., 2021; Torquati et al., 2017).

The WHO (2018) defines overweight in adults as having a body mass index (BMI) greater than or equal to 25 kg/m^2. Obesity in adults is defined as a BMI greater than or equal to 30 kg/m^2 (WHO, 2018a). The increase in overweight and obese adults has been found to exist in healthcare professionals who do not actively engage in the recommended amount of physical activity on a regular basis (Kunyahamu et al., 2021; Torquati et al., 2017). The 2018 Physical Activity Guidelines for Americans encourages adults to participate for a minimum of 30 or more minutes of moderate intensity physical activity at least five days a week (ODPHP, 2021f). In the Belingheri et al., (2021) study, there was a significant correlation between those nurses who did not report engaging in physical activity and being overweight or obese.

Healthcare professionals work requirements usually include shiftwork. There is evidence that healthcare professionals working night shifts or rotating shifts have a higher incidence of overweight and obesity (Ross et al., 2017). Approximately 15% of the working general population are shift workers (Chen et al., 2020). Shift work can have a negative effect on health. Dependent on the shift that the healthcare professional works, the greater the potential impact on his/her health behaviors. For example, healthcare professionals working night shifts demonstrated health behaviors such as poor diets and decreased time spent engaging in physical

activity (Kyle et al., 2017; Rocha et al.,2018). The trend indicates and increase in overweight and obesity in healthcare professionals around the world (Kelly & Wills, 2018; Kyle et al., 2017; Walsh et al., 2018). This is very concerning when you consider the intensity of work healthcare professionals endure, the aging of the nursing workforce, and the impact overweight and obesity have on the body.

Brum et al. (2020), study of healthcare professionals in a university hospital, found that working nights had greater abdominal fat, weighed more, and had poor sleep practices compared to their day shift coworkers. Of the night shift workers, 65% did not participate in regular physical activity (Brum et al., 2020). Woynarowska-Soldan et al., (2018) found that poor sleep habits such as those working night shift, could lead to being overweight or obese (Woynarowska-Sołdan et al., 2018).

Healthcare professionals working night shift hours are at higher risk for being overweight or obese with BMI's greater than 30kg/m^2 (Kelly & Wills, 2018; Kyle et al., 2017; Peplonska et al., 2019; Walsh et al., 2018). Abdominal obesity was found in those healthcare professionals who worked frequent or regular night shifts (Peplonska et al., 2019). Limited or no physical activity has contributed to weight gain in night shift healthcare professionals (Peplonska et al., 2019).

Disruption in sleep can lead to significant health problems. Healthcare professionals working night shifts reported their circadian rhythms were disrupted by unhealthy schedules, making them too tired to exercise (Ross et al., 2017). Regular physical activity can improve sleep patterns and prevent sleep deprivation and the negative health outcomes (Kelly & Wills, 2018; Kyle et al., 2017; NIH, 2019; ODPHP, 2021f; Walsh et al., 2018).

Healthcare professionals working night shifts are more apt to report having musculoskeletal injuries and low back pain. Healthcare professionals sustain injuries due to the heavy lifting, bending, and twisting of the torso required to perform tasks and provide care for patients (Rezaei et al., 2021). Shift work is posited to be a contributing factor in low back pain in healthcare professionals (Hatch, 2018) and shoulder pain (Yao et al, 2019). Shift work can increase the risk of low back pain by 54.8% (Rezaei et al., 2021). Physical activity can improve all the disorders and injuries sustained by healthcare professionals who work shift work. Physical activity has been shown to improve coordination, delay the effects of aging that that diminishes muscle strength, decreases work related musculoskeletal injuries, and increases brain function (Yao et al., 2019). Therefore, healthcare professionals working night shift could improve overall health by engaging in regular physical activity that meets the 2018 Physical Activity Guidelines.

For this reason, researchers and organizations need to focus on methods to improve the condition and health of healthcare professionals to decrease the continued loss of healthcare professionals, particularly at a time of staffing shortage. Leaders need to review policies and standards of work related to work/life balance, time during work hours to walk or engage in other forms of physical activity to improve safety (Tariq et al., 2022).

Summary

Limited or no participation in physical activity continues to be problematic all over the world. Healthcare professionals who are trained to promote and educate patients about the benefits of physical activity may not practice healthy lifestyle behaviors which includephysical activity. Despite their knowledge they do not engage in sufficient self-care. As many healthcare professionals will soon be retiring and leaving their positions or continue to work as they age, physical activity is of immense importance in keeping them conditioned to perform their work

safely and without injury. Physical activity challenges occur in healthcare professionals who are obese, have mental or emotional challenges, are older, or are a different race/ethnicity. There is limited current research related to healthcare professionals' self-care even though many continue to engage in physical activity less than is recommended (Healthy Nurse Healthy Nation, 2021). There is a great need for additional research around minority groups who are often unaccounted for in research (Buschmann et al., 2018; Rodriquez et al., 2018). This population has greater health disparities and higher mortality rates and disease states resulting from related to little or no physical activity (American College of Cardiology, 2018; Buschmann et al., 2018; Rodriquez et al., 2018). For this reason, few strategies have been identified which consistently lead to positive changes in healthcare professionals' behavior related to physical activity. Therefore, physical activity research is much needed for this population.

CHAPTER III: METHODOLOGY

Over the last 4 decades, action has been taken to improve physical activity with very little change. t Research has demonstrated how stress, obesity, and depression are linked together (Tomiyama, 2019). Yet there is a paucity of research of healthcare professionals which study the relationship of physical activity and its impact on stress, obesity, and depression. This study investigated engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals. This chapter describes methodology of this research study to include research design, setting, sampling, protection of subjects, and the data analysis procedures used.

Design

This study was a cross-sectional study of secondary data from Wave V of the National Longitudinal Study of Adolescent to Adult Health [Add Health] (Harris et al., 2019). The Add Health study data was from a mixed mode survey design of web/mail survey, in-home interviews, and telephone calls for non-response follow-up (Harris et al., 2019). Wave V data was collected between 2016 to 2018. Wave V participants were approaching adulthood, 31– 42 years of age at the time of data collection (Harris et al., 2019). This is a period when the participants may see the development of chronic diseases.

Setting and Sampling

Data for this study were gathered from public use data from the Wave V Add Health Study collected during 2016 – 2018. For Wave V of the study, the total number of participants consisted of (*N*= 12,300) (Harris et al., 2019). Deidentified public use data was approximately one third of the total number of participants (*N* = 4,196) (Harris et al., 2019). Inclusion criteria for this study included healthcare professionals who were currently working in the field of health

care at the time of the study (N = 274). With a sample size of n = 274, there is sufficient statistical power (≥80%) to detect a Cohen's f^2 = 0.029 (small size) for a single regression coefficient (physical activity) in a regression model adjusting for other sample characteristics, assuming a two-sided type I error = 0.05. Due to the method Add Health used to protect the information of their participants, employment data were grouped by several 2010 U.S. Census Occupation codes (Harris et al., 2019). The codes below were clustered in a larger group and cannot be broken down into individual groups. The term 'healthcare professionals', for this study, included those participants in the cluster containing the following 2010 U.S. Census Occupational codes: registered nurses (code 3255), nurse anesthetists (code 3256), nurse midwives (code 3257), nurse practitioners (code 3258), exercise physiologists (code 3235), therapists-all other (code 3245), health practitioner support technologists and technicians (code 3420) and miscellaneous health technologists and technicians (Harris et al., 2019).

Wave I – Wave V used a clustered sample which was representative of the population of students from all regions of the United States to allow for a rich sample of diverse participants (Harris et al., 2019). This type of sampling is a method of probability sampling to measure the characteristics of an exceptionally large population (Huck, 2012). The subgroups requiring oversampling for the Add Health Study were African American students from a with highly educated parents, Cuban, Chinese, Puerto Rican students, and students categorized as disabled (Harris et al., 2019). In addition, the other subgroups oversampled consisted of students with certain genetic qualities such as twins (mono and dizygotic), siblings with the same parents, half siblings, and unrelated people living in the same house (Harris et al., 2019). The Add Health longitudinal study followed the students from their early adolescent years through adulthood and is still an ongoing study (Harris et al., 2019).

Protection of Human Subjects

IRB approval was obtained from the University of North Carolina at Greensboro (UNCG) prior to the start of the study and was considered to not constitute human subject's research. The Add Health data consists of public use data and restricted data (Harris et al., 2019). The data used for this study consists of the public-use data made available by Add Health. The available data does not contain any personally identifiable information and is grouped with other occupational groups to prevent participant identification (Harris et al., 2019). To assist researchers who are using data across waves, the data contained de-identified ID numbers to link data across the waves without identifying the individual participant (Harris et al., 2019). Any data collected electronically is still password protected. Those who will have access to the data are only the researcher and the dissertation committee members.

Data Collection

For this study, data for select questions were taken from the original Wave V Questionnaire to obtain information relevant to the research questions. Data used for the demographic information included participants self-reported age, gender, race, highest level of education, marital status, and perceived overall health status. The demographic information for this study provided a description of the characteristics of the participants of this study (Appendix B). Other measures included depression, stress, physical activity and BMI. The purpose of these measures was to determine the relationships between physical activity, depression, stress, and BMI (Appendix B).

Measures

Age

Wave V data of the Add Health Study captured the participants in their fourth decade of life and to address the onset of chronic diseases (Harris et al., 2019). Age was obtained by two questions within the survey. "What is your date of birth (month)," and "What is your date of birth (year)." Answer selections were "1 = January", "2 = February", "3 = March", "4 = April", "5 = May", "6 = June", "7 = July", "8 = August", "9 = September", "10 = October", "11 = November", and "12 = December." The birth years entered ranged from 1974 through 1983. Add Health has added data for constructed age using the year and month from the questionnaire and using a universal birthday of the 15th of the month (Harris et al., 2019).

Gender

The gender question was "What is your gender?" The answer responses were "1 = male" and "2 = female." This question is limited to two responses of male and female (Harris et al., 2019). According to Vanderbilt University (2022), including survey questions related to sex, gender, sexual orientation, and sexual identity, should only be used when it is necessary to ask due to the sensitivity of the information (Vanderbilt University, 2022). If questions are to be used, then the inclusive language should be used (Vanderbilt University, 2022).

Race

Race data in the Add Health Survey included detailed subgroups for the race categories, Hispanic, Asian, and Pacific Islander. The Hispanic subgroups included, Mexican, Puerto Rican, Cuban, Central American, South American, and Hispanic-Other. The Asian subgroup consisted of Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, and Asian-Other (Harris et al., 2019). Finally, the race category of Pacific Islander was divided into the subgroups of Native

Hawaiian, Samoan, Guamanian/Chamorro, and Pacific-Other The question used for race was "What is your race or ethnic origin? Mark one or more boxes." For this study, the subgroup data included the primary answer options that fell under to create only seven race categories. The race categories were, "White," "Black/African American," Hispanic," "Asian," "Pacific Islander," "American Indian/Alaskan Native," and "Other" (Harris et al., 2019).

Highest Level of Education

The question used to determine the highest level of education was "What is the highest level of education that you have achieved to date?**"** Answer options for this question included the following" "5 = some/technical training (after high school)" "6 = some community college," "7 = completed vocational/technical training (after high school)," "8 = associate or junior college degree," "9 = some college," "10 = completed college (bachelor's degree)," "11 = some graduate school," "12 = completed a master's degree," "13 = some graduate training beyond a master's degree," "14 = completed a doctoral degree," "15 = some post baccalaureate professional education (such as law school, medical school, nursing)," "16 = completed a post baccalaureate professional degree such as law, medicine, nursing (Harris et al., 2019). Because of a smaller number within some education levels, education was further grouped as bachelor's degree or higher versus less for regression modeling analysis to investigate RQ2 – RQ4.

Marital Status

Marital status questions provided more information about a family than exclusively the marital status of a couple (United States Census Bureau, nd). When combined with other questions, researchers could gather information such as marriage trends, benefits coving spouses, future needs for assistance programs, how families change, and the families' well-being. The questions used for marital status for this study included, "Are you currently…," with the

response options, “1 = married,” “2 = widowed,” “3 = divorced,” “4 = separated,” and “5 = never married (Harris et al., 2019).” Because of a smaller number within some marital status categories, marital status was further grouped as married versus not married for regression modeling analysis to investigate RQ2 – RQ4.

Physical Activity

Physical activity consisted of six of the ten original self-reported questions asking about sedentary activities, activities requiring moderate to vigorous physical activity, and differences in previous weeks’ physical activity compared to a normal week of physical activity (Harris et al., 2019). The following questions were included in the study as they related to actual moderate to vigorous physical activity, “In the past 7 days, how many times did you bicycle, skateboard, dance, hike, hunt, or do yard work?”, “In the past 7 days, how many times did you roller blade, roller skate, downhill ski, snowboard, play racquet sports, or do aerobics?”, “In the past 7 days, how many times did you participate in gymnastics, weightlifting, or strength training?”, “In the past 7 days, how many times did you participate in individual sports such as running, wrestling, swimming, cross-country skiing, cycle racing, martial arts, or in strenuous team sports, such as football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey?”, “In the past 7 days, how many times did you play golf, go fishing or bowling, or play softball or baseball?”, and “In the past 7 days, how many times did you walk for exercise? (Harris et al., 2019)” This study began as an adolescent study and later followed the participantes as adults, therefore some of the questions are directed to younger individuals.

Finally, several questions were not used, including, “In the past 7 days, how many hours did you watch television, movies, or videos, including DVDs or music videos? and, “Were the past seven days typical in terms of your physical activity” (Harris et al., 2019).

This study focused on actual physical activity behaviors participants engaged in the week prior to responding to the Wave V survey. Physical activity frequency was created by adding the number of times each participant responded to each of the questions above to create a total number of physical activity behaviors for each participant. Specifically, this number shows the number of times they engaged in moderate to vigorous physical activity for a week. For further description, frequency was additionally grouped into 5 or more times versus less than 5 times.

Stress

Sheldon Cohen and colleagues (Cohen et al., 1983) developed the Perceived Stress Scale to measure a person's perception of their level of stress. The original scale consisted of 14 items. To test the validity and reliability of the tool, Cohen et al, (1983) used three samples consisting of two college student groups and one smoking cessation community group (Cohen et al., 1983). The 10-item version of the instrument has been widely used with different age groups, races, and different countries, with the psychometric properties considered superior to the 14-item and 4-item version of the scale (Eun-Hyun, n.d; Mitchell et al., 2008). The study by Mitchell et al.(2008), evaluated validity and reliability of the four-item, 10-item, and the 14-item scale and the Cronbach's alpha were 0.82, 0.91, and 0.89. The Add Health study used a modified version of the Cohen's Perceived Stress Scale to create a four-item scale. The PSS 10 and 14-item scale have previously shown adequate reliability and validity among a sample of males and females participating in a study of stress in survivors of suicide (Mitchell et al., 2008; Wu et al., 2013). The following four questions were used to assess stress, "In the past 30 days, how often have you felt that you were unable to control the important things in your life," "In the past 30 days, how often have you felt confident in our ability to handle your personal problems," "In the past 30 days, how often have you felt that things were going your way," and "In the past 30 days, how

often have you felt that difficulties were piling up so high that you could not overcome them?" All questions used the same answer responses, "0 = Never"; "1 = Almost never"; "2 = Sometimes"; "3 = Fairly often"; and "4 = Very often". Scoring for the questions in this section requires questions 1 and 4 to be scored as, "0 = Never"; "1 = Almost never"; "2 = Sometimes"; "3 = Fairly often"; "4 = Very often". For questions 2 and 3 the scoring is, "4 = Never"; "3 = Almost never"; "2 = Sometimes"; "1 = Fairly often"; and "0 = Very often". The scores for each question were added together to obtain a total score. The range for this score was from 0 – 16. The scoring cutoff was a value of six. Any score six or greater indicated a higher level of stress.

Overweight and Obesity

The Add Health Wave V data for height and weight was obtained by trained and certified field interviewers who measured height and weight used to compute the body BMI of participants (Whitsel et al., 2020). Height and weight taken by trained researchers demonstrates more accuracy than self-reported height and weight which may indicate an underestimation of a report of overweight or obese (Karchynskaya et al., 2020). BMI was defined by the NIH (2021b) as a screening tool, based on height and weight, to determine overweight and obesity in a person to indicate at risk for certain health problems (Hales et al., 2020; NIH, 2021b). BMI was calculated using the weight of a person in kilograms (kg) and the height of a person in meters (m) in the following calculation: BMI weight (kg) / [height (m)]^2 x 703 (NIH, 2021b).

BMI was used to decide if the participant was obese. The height and weight data were converted into BMI using this formula: weight (kg) / [height (m)]^2 = BMI. Overweight and obesity were determined by any BMI of 25 kg/m^2 or greater as it is considered by the (National Institute of Health, 2021b) as a risk factor to cardiovascular disease, diabetes, osteoarthritis, sleep apnea, depression, anxiety, and pain (NIH, 2021b).

Depression

Depression was measured using a modified four question version of the Center for Epidemiologic Studies Depression Scale (CES-D). Participants were asked if "(1) During the past 7 days, I felt that I could not shake off the blues, even with the help from my family and friends, (2) During the past 7 days, I felt depressed, (3) During the past 7 days, I was happy, (4) During the past 7 days, I felt sad." Responses consisted of a four-point Likert scale, "0 = never or rarely," "1 = sometimes," "2 = a lot of the time," and "3 = most of the time or all the time." Reverse scoring was needed for question number three, "3 = never or rarely," "2 = sometimes," "1 = a lot of the time," and "0 = most of the time or all the time." Scoring for all questions required adding the scores for each question for a total depression score. Scoring ranged from 0 – 12. The cutoff for the scoring was four. Any score four or greater indicated depressive symptomology.

The complete CES Depression Scale consists of twenty questions and has been used to measure depression in adolescents through adulthood and in the elderly (Blodgett et al., 2021). The validity and reliability of the 20-item and 10-item CES-D scale has been verified in many studies (Blodgett et al., 2021). The four-item scale demonstrated variable validity and reliability for measuring depression ranging from Cronbach $\alpha = 0.61$ to 0.80 (Moullec et al., 2011; Sørensen et al., 2022).

Data Analysis

STATA statistical software version 17 (StataCorp, College Station, TX) was used for statistical analysis of the data. Data were first cleaned and reviewed for missing data. Univariate Analysis was used to prepare the descriptive statistics used to summarize the characteristics of participants, physical activity, stress, depression, and BMI. Descriptive statistics were used to

describe variables using mean (*M*), standard deviation (*SD*) or frequencies (*n*) and percentages (%). This allowed the investigator to analyze descriptions of the sample and differences in groups. Univariate analysis was performed to calculate frequencies, percentages of categorical variables and examine the distribution/central tendency, and variability of continuous variables. Cronbach's alpha was used to measure internal consistency reliability of measures where $\alpha \geq 0.70$ is considered adequate.

Multivariable regression analyses were used to model the level of physical activity and its effect on depression, stress levels, and overweight and obesity in participants. During the checking of assumptions to perform the linear regression analysis, the histograms for the dependent variables of stress, depression and BMI were found to be positively skewed. Therefore, the data dictated a need to find a better method for analyzing. In depth discussion about the change was included in the analysis in Chapter IV about the actions taken to analyze data for the research questions two through four. All analyses accounted for survey weighting, clustering, and stratification based on the complex survey sampling design of Add Health as recommended by their guidelines (Chen & Harris, 2020). A two-sided p value < 0.05 was considered statistically significant. Data analysis methods by each research question were as follows:

RQ1. What is the prevalence of healthcare professionals engaging in moderate to vigorous physical activity five times or greater a week?

Analysis: Descriptive statistics were used to summarize physical activity frequency and the percent engaging in physical activity five times or greater a week.

RQ2: What is the effect of physical activity on stress among healthcare professionals?

Analysis: Because assumptions of multivariable linear regression for stress were not met, stress scores were modeled using negative binomial regression, and scores ≥ 6 modeled using logistic regression.

RQ3: What is the effect of physical activity on overweight and obesity among healthcare professionals?

Analysis: Because assumptions of multivariable linear regression for BMI were not met, BMI was modeled using Gamma regression, and BMI categories of ≥ 25 kg/m^2 versus < 25 kg/m^2 were modeled using logistic regression.

RQ4: What is the effect of physical activity on depression among healthcare professionals?

Analysis: Because assumptions of multivariable linear regression for depression were not met, depression scores were modeled using negative binomial regression, and scores ≥ 4 modeled using logistic regression.

Weighting of the Data

The purpose of calculating sample weights for the Add Health Wave V data was to allow for inferences from persons included in the sample to the populations from which they were drawn, and to have the tabulations reflect estimates of the population totals. Sample weighting was carried out 1) to allow for unbiased estimates, taking into account the fact all persons in the population did not have the same probability of selection; 2) To bring data up to the measures of the population totals; 4) To minimize biases arising from differences between cooperating and non-cooperating persons in the sample. To produce unbiased estimates, different weights must be used for various subsets of the population, whenever these subsets have been sampled at different rates. Add Health provided the process for weighting the data. Weighting was required to account for the Add Health Study oversampling of African American students with highly

educated parents, Cuban, Chinese, Puerto Rican students, and students categorized as disabled (Harris et al., 2019). In addition, the other subgroups oversampled consisted of students with certain genetic qualities such as twins (mono and dizygotic), siblings with the same parents, half siblings, and unrelated people living in the same house (Harris et al., 2019). Weighted measures will be included in the tables.

Conclusion

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals. Secondary data from Wave V of the Add Health Study was used. The Life Course Theory was used to guide this study, which is different than most studies measuring physical activity. The fourth principle of the theory, personal agency, was used to study the outcomes (amount of physical activity, stress, overweight and obesity, and depression) based on their relationship to physical activity. The Add Health Survey has protections built in the method for data distribution to prevent exposure of a participant (Harris et al., 2019). All data are also being protected for this study.

CHAPTER IV: RESULTS

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals participating in Wave V of the National Longitudinal study conducted by the Carolina Population Center (CPC) at The University of North Carolina at Chapel Hill (UNC), National Longitudinal Study of Adolescent to Adult Health (Harris et al., 2019). This chapter will present management of the data, the sample characteristics, and study findings.

Management of the Data

Inclusion criteria for this study included healthcare professionals who were working in the field of health care at the time of the study and met the following 2010 Census codes at the time of the survey. The 2010 U.S. Census Occupational codes included in the analysis consisted of: registered nurses (code 3255), nurse anesthetists (code 3256), nurse midwives (code 3257), nurse practitioners (code 3258), exercise physiologists (code 3235), therapists-all other (code 3245), health practitioner support technologists and technicians (code 3420) and miscellaneous health technologists and technicians (Harris et al., 2019). These codes are grouped together as one group in Add Health for healthcare professionals to protect anonymity (Harris et al., 2019)-. A total of 274 participants in the public use data were included in this study. Study variables were entered into STATA statistical software version 17 (StataCorp, College Station, TX) for data analysis. A two-sided p-value < 0.05 was considered statistically significant.

Sample Characteristics

Demographic data from the Wave V Add Health survey were collected and analyzed to describe the characteristics of the study participants. Univariate analysis was performed for

descriptive statistics to include the means, standard deviations or frequencies and percentages. Accounting for cross-sectional analysis sampling weights, clustering, and stratification was performed to account for the Add Health's complex sampling survey design and generalize to the target population being studied (See Table 1).

Much of the sample identified as being White (80.9%). The gender most identified by healthcare professionals was female (79.1%). The mean age for the healthcare professionals was 37.2 years (95% CI = [36.8, 37.6]). Over half of the health care professionals included in this study had obtained a bachelor's degree or higher (56.9%) and were married (69.1%).

The range of scores for the perceived stress scale was 0 to 16 with a score equal or greater than 6 was the cutoff percentage indicating feelings of perceived stress. The mean perceived stress score was 4.6 (95% CI = [4.16, 5.10]). The percentage with stress scores equal or greater than 6 was 35.7%.

The mean for BMI was 28.6 kg/m^2 (95% CI = [27.4, 29.8]) with the percentages by BMI category resulting in, <18.5 kg/m^2 Underweight (0.94%), <18.5 kg/m^2 to >25 kg/m^2 Normal (35.5%), 25 kg/m^2 to <30 kg/m^2 Overweight (28.3%), 30 kg/m^2 to <40 kg/m^2 (8.6%), Obesity I, 35 kg/m^2 to <40 kg/m^2 (8.2%) Obesity II, and 40 or greater as Obesity III. The weighted percentage with a BMI $\geq$ 25 kg/m^2 was 63.6%.

The range of scores for depression were 0 to 12 with a score equal or greater than 4 the cutoff percentage indicating feelings of depression. The mean score for depression was 2.0 (95% CI = [1.67, 2.29]). The percent reporting feelings of depression with a score equal or greater than 4 was 20.6%.

Table 1. Sample Characteristics (*N* = 274 unweighted)

Characteristic	Unweighted *n* (%) or *M* ± *SD*	Weighted % or *M* [95% CI]
Gender		
Female	227 (82.9)	79.1
Male	47 (17.2)	20.9
Missing	0	
Age (mean ± SD)*	37.2 ± 2.0	37.2 [36.8, 37.6]
Race Ethnicity		
American Indian	2 (0.7)	0.2
Asian	10 (11.3)	2.47
Black	31 (11.3)	6.68
Hispanic	10 (3.7)	4.61
More than one race	18 (6.6)	5.06
White	203 (74.1)	80.9
Race/Ethnicity		
Non-White	71 (25.9)	19.1
White	203 (74.1)	80.9
Education		
Bachelor's or higher degree	167 (61.2)	56.9
Less than a bachelor's degree	106 (38.8)	43.1
Missing	1 (0.3)	
Marital Status		
Married	189 (69.0)	69.1
Not Married	85 (31.0)	30.1
Missing	0	
Physical Activity frequency (times/week)	6.5 ± 5.5	6.5 [5.61, 7.30]
Physical Activity Groups		
5+ times	143 (54.8)	56.7
<5 times	118 (45.2)	43.3
Missing	13 (4.7)	
Perceived Stress Score (range = 0 to 16)	4.6 ± 4.1	4.6 [4.16, 5.10]
Perceived Stress Score Cut point		
Score ≥ 6	94 (35.3)	35.7

Characteristic	Unweighted *n* (%) or *M* ± *SD*	Weighted % or *M* [95% CI]
Score < 6	172 (64.7)	64.3
Missing	8	
Body mass index (BMI; kg/m^2)	28.5 ± 27.7	28.6 [27.4, 29.8]
BMI Categories		
<18.5 kg/m2 (Underweight)	4 (1.5)	0.94
18.5 kg/m2 to <25 kg/m2 (Normal)	97 (35.7)	35.5
25 kg/m2 to <30 kg/m2 (Overweight)	78 (28.7)	28.3
30 kg/m2 to <35 kg/m2 (Obesity class I)	46 (17.0)	18.5
35 kg/m2 to <40 kg/m2 (Obesity class II)	26 (9.6)	8.61
≥ 40 kg/m2 (Extreme Obesity class III)	21 (7.7)	8.22
Missing	2 (0.7)	
BMI Overweight/Obesity		
> 25 kg/m2	171 (62.9)	63.6
< 25 kg/m2	101 (37.1)	36.4
Missing	2 (0.7)	
Depression Score (range = 0 to 12)	2.0 ± 1.6	2.0 [1.67, 2.29]
Depression Score Cut point		
Score ≥ 4	49 (17.9)	20.6
Score < 4	225 (82.1)	79.4
Missing	0	

Note. * Weighted extrapolations for the data in this table was *N* = 192,690

For bivariate relationships, the correlation matrix shows the correlation coefficients between the study measures in Table 2. The correlation matrix shows the correlation coefficients between the study measures (see Table 2). The correlation between physical activity and stress (r = -0.182, p<0.01) indicates they are weakly negatively correlated, where greater frequency of physical activities engaged in is associated with lower stress. The correlation between physical activity and BMI (r = -0.153, p<0.01) indicates a weak negative correlation. More physical activities is associated with lower BMI. The correlation between stress and depression indicates a strong positive correlation (r = 0.644, p<0.001). Higher perceived stress is correlated with higher

depression levels. No significant pairwise correlation is noted between physical activity and depression, stress and BMI, or BMI and depression.

Table 2. Correlation Table of Study Measures (Weighted)

Measure	1	2	3	4
1. Physical activity	1.000			
2. Stress	-0.182**	1.000		
3. BMI	-0.153**	0.126	1.000	
4. Depression	-0.117	0.644***	0.112	1.000

Note. *p<0.05; **p<0.01; ***p<0.001. Weighted extrapolations for the data in this table was N = 192,690

Findings for Study Research Questions

Results of the statistical analysis of the research questions data for this study are below.

RQ1. What is the prevalence of healthcare professionals engaging in moderate to vigorous physical activity five times or greater a week?

Results: Univariate analysis was performed with descriptive statistics to describe means, standard deviations for physical activity (see Table 1). Subjects were asked to report the number of times they performed activities listed in each of the survey questions for physical activity, during the previous week, the mean number of activities was 6.5 activities per week (95% CI = [5.61, 7.30]). The activities were of moderate to vigorous physical activity.

Using frequencies and percentages for two groups, those who engage in five or more physical activities a week and those who engage in less than five physical activities per week allows for consideration of "high" versus "low" activity groupings. The number of healthcare professionals engaging in more than five activities per week (56.7%) was slightly higher than those who engage in less than five physical activities per week (43.3%).

For **RQ2 – RQ4**, assumptions were checked prior to analyzing the data using linear regression. Histograms suggested positive skewness for the dependent variables of stress, depression, and BMI. Due to the skew noted on the histograms, it was not surprising that a regression residual-versus-fitted plot also revealed skewed regression residuals. Regression assumptions were checked with analysis of residuals for stress, overweight/obesity, and depression. Then a residual vs. fitted plot with the Y-line inserted was checked for each dependent variable. The plot indicated heteroskedasticity for all three variables. Histograms of the residuals also indicated positive skew. The assumption of normal distribution was rejected for the residuals for all models of these three dependent variables. A negative binomial regression was used to model stress scores and again separately for depression scores with the independent variables of name, gender, age, race/ethnicity, education, marital status, and physical activity. Gamma regression was similarly performed to model continuous BMI. Finally, logistic regression was used to estimate odds ratios for the dichotomous cut-off points for stress scores equal or greater than six, BMI of 25 kg/m^2 or greater with the same independent variables and depression scores equal or greater than four,

RQ2: What is the effect of physical activity on stress among healthcare professionals?

Results: Weighted negative binomial regression to analyze the data for perceived stress scores given in Table 3.

Table 3. Weighted Negative Binomial Count Regression of Perceived Stress (*N* = 183,146)

Independent variable	exp(*b*)	95% CI for exp(*b*)	*P*-value
Age (years)	.979	(.923, 1.04)	0.481
Gender			
Female	1.19	(.908, 1.57)	0.203

Independent variable	exp(*b*)	95% CI for exp(*b*)	*P*-value
Race/Ethnicity			
Non-White	.772	(.612, .974)	0.029
Education			
Bachelor's or above	1.07	(.862, 1.32)	0.541
Marital Status			
Married	.904	(.738, 1.11)	0.327
Physical activity	.975	(.952, .999)	0.038

Note. * Weighted extrapolations for the data in this table was *N*= 183,146

Here, the exp(*b*) for physical activity frequency was 0.975 (95% CI = [0.952, 0.999], p = 0.038) as seen in Table 3. This implies for every additional time of moderate/vigorous activity, the predicted mean stress scores decrease by 2.5%, adjusting for the other independent variables in the model. Race/ethnicity was also significantly associated with perceived stress scores in this modeling (p = 0.029). Specifically, the predicted mean stress score was 22.8% lower for Non-White participants compared to White participants in the adjusted modeling (exp(*b*)=0.772, 95% CI = [0.612, 0.974]). No independent variables of age, gender, education, or marital status were associated with stress scores in this modeling.

Weighted logistic regression was used to analyze the odds of having a stress score of 6 or higher and is presented in Table 4. Here, none of the independent variables were statistically significantly associated with the odds of having a perceived stress score of 6 or higher. For physical activity frequency, for every additional time of moderate/vigorous activity, the odds of having a stress score of 6 or greater decrease by 5.7%, adjusting for the other independent variables in the model (albeit, not statistically significant with p = 0.082).

Table 4. Weighted Logistic Regression of Perceived Stress Scores ≥ 6 (*n* = 183,146)

Independent variable	Odds ratio	95% CI for OR	*P*-value
Age	.933	(.765, 1.14)	0.493
Gender			
Female	1.34	(.519, 3.45)	0.544
Race/Ethnicity			
Non-White	.868	(.418, 1.80)	0.702
Education			
Bachelor's or above	1.00	(.472, 2.13)	0.993
Marital Status			
Married	.664	(.314, 1.40)	0.280
Physical activity	.943	(.882, 1.01)	0.082

Note. Weighted extrapolations for the data in this table was *N*= 183,146

RQ3: What is the effect of physical activity on overweight and obesity among healthcare professionals?

Results: Results from weighted Gamma regression for BMI are given in Table 5.

Table 5. Weighted Gamma Regression of BMI by Physical Activity (*N* = 183,360)

Independent variable	exp (b)	95% CI for *b*	*P*-value
Age	1.00	(.984, 1.02)	0.883
Gender			
Female	1.02	(.952, 1.10)	0.557
Race/Ethnicity			
Non-White	1.03	(.844, .966)	0.527
Education			
Bachelor's or above	.903	(.844, .966)	0.003
Marital Status			
Married	.963	(.873, 1.06)	0.448
Physical activity	.993	(.988, .997)	0.002

Note. * Weighted extrapolations for the data in this table was *N*= 183,360

Here, the exp(*b*) for physical activity frequency was 0.993 (95% CI = [0.988, .997], p = 0.002) as given in Table 5. This implies that for every additional time of moderate/vigorous activity, that the predicted mean BMI in kg/m^2 decreases by 0.7%, adjusting for the other independent variables in the model. Education of a bachelor's degree or higher was also significantly associated with BMI in this modeling (p = 0.003). Specifically, the predicted mean BMI in kg/m^2 was 9.7% lower for those with an education of a bachelor's degree or higher compared to those with lower education levels in the adjusted modeling (exp(*b*)=0.903, 95% CI = [.844, .966]).

Weighted logistic regression was used to analyze the odds of having a BMI of 25 kg/m^2 or greater and is presented in Table 6 below. The adjusted odds ratio for physical activity frequency was AOR=0.933 (95% CI = [0.876, .994], p = 0.032). This implies that for every additional time of moderate/vigorous activity, that the odds of having a BMI of at least 25 kg/m^2 decrease by 0.7%, adjusting for the other independent variables in the model. Education of a bachelor's or above was also significantly associated with BMI scores in this modeling (p = 0.003). Specifically, the odds of having a BMI of at least 25 kg/m^2 68.2% lower for those with an education of a bachelor's degree or higher compared to those participants without a bachelor's degree in the adjusted modeling (exp(*b*)=0.318, 95% CI = [.149, .679]).

Table 6. Weighted Logistic Regression of BMI 25 kg/m^2 or Greater (*n* = 183,360)

Independent variable	Odds ratio	95% CI for OR	*P*-value
Age	1.03	(.874, 1.21)	0.722
Gender			
Female	.541	(.208, 1.41)	0.207
Race/Ethnicity			
Non-White	1.34	(.548, 3.28)	0.518

Independent variable	Odds ratio	95% CI for OR	*P*-value
Education Bachelor's or above	.318	(.149, .679)	0.003
Marital Status Married	1.12	(.472, 2.66)	0.795
Physical activity	.933	(.876, .994)	0.032

Note. Weighted extrapolations for the data in this table was $N = 183,360$

RQ4: What is the effect of physical activity on depression among healthcare professionals?

Table 7. Weighted Negative Binomial Count Regression of Depression (n = 183,886)

Independent variable	exp(b)	95% CI for exp(b)	*P*-value
Age	.957	(.880, 1.04)	0.296
Gender Female	1.02	(.681, 1.53)	0.919
Race/Ethnicity Non-White	.754	(.533, 1.07)	0.112
Education Bachelor's or above	.988	(.703, 1.39)	0.943
Marital Status Married	.778	(.573, 1.06)	0.106
Physical activity	.980	(.950, 1.01)	0.181

Note. Weighted extrapolations for the data in this table was $N = 183,886$

Table 7 presents the findings from negative binomial modeling of depression scores. Weighted logistic regression was used to analyze the odds of having a depression score equal or greater to 4 and is presented in Table 8. The findings were similar to the findings above, the independent variables were not statistically significantly associated with the odds of having a depression score equal or greater than 4.

Table 8. Weighted Logistic Regression of Depression Scores ≥ 4 (*n* = 183,886)

Independent variable	Odds ratio	95% CI for OR	*P*-value
Age	.855	(.671, 1.09)	0.201
Gender			
Female	1.23	(.377, 4.04)	0.726
Race/Ethnicity			
Non-White	.536	(.214, 1.34)	0.182
Education			
Bachelor's or above	.834	(.340, 2.04)	0.689
Marital Status			
Married	.707	(.304, 1.64)	0.416
Physical activity	.962	(.879, 1.05)	0.399

Note. Weighted extrapolations for the data in this table was *N* = 183,886

Conclusion

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression. The number of healthcare professionals engaging in more than five activities per week (56.7%) was slightly higher than those who engaged in less than five physical activities per week (43.3%). Race/ethnicity was also significantly associated with stress scores in multivariable modeling ($p = 0.029$). Specifically, the predicted mean stress scores were 22.8% lower for Non-White participants compared to White participants in the adjusted modeling ($\exp(b)=0.772$, 95% CI = [0.612, 0.974]). Physical activity frequency was associated with BMI ($p = 0.032$). For every additional time of moderate/vigorous activity, that the predicted mean BMI in kg/m^2 decreased by 0.7% in adjusting modeling. For this study, none of the independent

variables were statistically significantly associated with predicted mean depression scores or the odds of having a depression score of 6 or higher.

CHAPTER V: DISCUSSION

The purpose of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals. A total of 274 healthcare professionals' data were selected from the Wave V Add Health study to analyze. The purpose of this chapter is to discuss the study findings and how they relate to the study purpose and research questions. This chapter discusses the utilization of the Life Course Theory, limitations of the study, and recommendations for education, research, and workplace support.

Sample Characteristics

The data for this study was abstracted from the public use data of the Wave V Add Health study conducted from 2016 to 2018. The public use data consists of approximately one third of the total participants for Wave V (n = 12,300; Harris et al., 2019). The number of participants for this study was 274. As with many research studies, there continues to be racial/ethnic disparities in research. As seen in Table 9, the findings from the literature review are compared to those of this study. This study had a majority of participants who were White which is interesting considering there was an oversampling of participants who were African American students with highly educated parents, ethnic groups consisting of Cuban, Chinese, Puerto Rican students, students categorized as disabled, and twin pairs (Harris et al., 2019). The gender and racial characteristics of the participants in this study are similar to the samples in previous studies of the national makeup of the different roles for healthcare providers (Harris et al., 2019). It is important to note that there has been a paucity of research focused on African American healthcare professionals, which is concerning when issues such as being overweight or obese, and engaging in little to no physical activity are greater in African American women

(Chinn, 2021) though little or no participation in physical activity has increased risk of cardiovascular disease in African American (Brown et al., 2018; Buschmann et al., 2018). Additionally, there is a need to obtain more data on men in the healthcare professions. It is difficult to compare physical activity between men and women with the limited number of males in the healthcare professional workforce.

Table 9. Comparison of Literature Review Data and Data From This Study

Measures	Literature Review Data			Study Results Healthcare Professionals [Weighted]
	RN	PT (PT aids/assistants)	OT	
Race Ethnicity				
American Indian	NA	NA	NA	0.24
Asian	8.6%	6.8%	12.6%	2.47
Black/African American	13.3%	5.4%	4.1%	6.68
Hispanic	8.8%	6.8%	5.3%	4.61
More than 1 race	NA	NA	NA	5.06
White	74.9%	81%	97.9%	80.9
Gender (Female)*	90.6%	67% (71%)	84.9%	79.1%
Physical Activity**		13.5%–50%		56.7%
Obesity***		55%–62%		63.6%
Depression****		24.8%		20%
Stress*****		30%		35.7%

Note. * (U.S. Bureau of Labor Statistics, 2022b) for literature review data; **(Albelbeisi et al., 2021) and (Gabal et al., 2020; McCarthy et al., 2018; McDonald & Salisbury, 2019; Schneider et al, 2019; Torquati et al., 2017); *** (Sahebi et al., 2021) for literature review data; **** (Prasad et al., 2021) for literature data

Interpretation of the Findings

RQ1. Engagement in Moderate to Vigorous Physical Activity Five Times or More a Week

For this study, the number of activities the participants engaged in was shown to meet the number of physical activities an individual should engage in as suggested by the 2018 National Guidelines (ODPHP, 2021f) for physical activity which is a minimum of five times a week.

Previous studies have found the number of healthcare professionals engaging in physical activity was 13.5% (Albelbeisi et al., 2021) to 50% (Gabal et al., 2020; McCarthy et al., 2018; McDonald & Salisbury, 2019; Perry et al., 2018; Schneider et al, 2019; Torquati et al., 2017). The findings from this study regarding engagement in physical activity (56.7%) was in the upper limits of those rates in the literature (50%) with this study showing a 6.7% greater number of those participating in physical activity. One study indicated the nurses in the study engaged in less activity than the general population (Perry et al., 2018). Even universally, there is a need to increase physical activity in healthcare professionals. For example, studies from other countries like Brazil found that 40.3% - 52.1% of the healthcare professionals engaged in physical activity (Rocha et al., 2018).

While these participants appear to have higher rates of physical activity, it is important to note that there were several physical activity behaviors listed in each physical activity questions of the Add Health Study, but there was no documentation of the particular activities in which participants engaged (Harris et al., 2019). Physical activities in research studies do not always compare equally to each other in as there were studies which measured activity in amount of time (Perry et al., 2019), or simply number of activities (Harris et al., 2019). In addition, the participants in this study were not asked how much time they spent engaging in each specific activity they reported engaging in (Harris et al., 2019). Therefore, the data is difficult to compare across other Waves of the Add Health Study or to compare to other studies from the literature review as the measures for physical activity are defined differently. In addition, the data cannot be compared to the 2018 Physical Activity guidelines stating 150 minutes per week or 30 minutes a day five times a week, due to the data not showing the time spent on the activities (ODPHP, 2021f).

RQ2: Effects of Physical Activity on Stress

Healthcare professionals work in a stressful work environment with great job responsibility, high workloads, and long hours which can lead to harmful levels of stress (Perry et al., 2018; WHO, 2020d). The results for high levels of perceived stress for this study was 35.7% of the study sample which is a 5.7% higher rate than found in the literature. Reactions to job stress can be harmful to an individual (Hatch et al., 2018; Perry et al., 2018; WHO, 2020d) and can create emotional distress which can lead to depression (Hatch et al., 2018). This stress is a byproduct of exhaustion, work life balance, and low job satisfaction (Hatch et al., 2018; Perry et al., 2018). Hofmann (2018) argues that increasing numbers of healthcare workers are at risk from frenetic environments and healthcare leaders are unsure how to deal with increasing levels of stress which is alarming. Mohebbi et al. (2019) found significant improvement in stress in female nurses participating in an eight-week aerobic activity. A review of the literature found a lack of research on interventions that significantly decreased stress in healthcare workers.

Also, study findings demonstrate that for every additional occurrence of moderate/vigorous activity, the predicted mean stress scores decreased by 2.5%, adjusting for the other independent variables in the model. This finding supports the helpful benefits of physical activity in reducing stress levels (Mohebbi et al., 2019; Worley et al., 2022). Finally, an additional interesting finding was the predicted mean stress scores were lower for Non-White participants compared to White participants in the adjusted modeling. However, it must be noted that none of the independent variables were associated with a perceived stress score of equal or greater than 6.

RQ3: Effects of Physical Activity on Overweight and Obesity

Overweight and obesity are prevalent within healthcare professionals, especially those who do not engage in regular physical activity (Chen et al., 2021; Kunyahamu et al, 2021). The literature showed a range for those reporting being overweight and obese was 55–62% (NIH, 2021b; Hales et al., 2020) versus 63.6% in this study which is 1.6% higher than the high end of the range from the literature. This is very concerning when you consider the condition an individual needs to be in to safely perform their healthcare role and the stress being overweight or obese can put on the body and the risk increases as they age (Perry et al, 2018; Worley et al., 2022). For this study, physical activity showed an association with BMI implying that for every additional time of moderate/vigorous activity, that the BMI scores decrease by 0.7%, adjusting for the other independent variables in the model. This supports the positive effects of physical activity on body weight (Yona et al., 2022; Zheng et al., 2021).

Additionally, education of a bachelor's degree and higher was shown to have an association to BMI for the predicted mean BMI scores were 9.7% lower for those with an education of a bachelor's degree or higher compared to those participants without a bachelor's degree in the adjusted modeling (exp(b)=0.318, 95% CI = [.149, .679]). This is consistent with literature that demonstrates that higher education is associated with lower BMI (Witkam et al., 2021).

RQ4: Effects of Physical Activity on Depression

In this study sample, 20% reported depressive symptoms. This is slightly lower than the most recent reported analysis of 65 studies reporting a depression rate of 22% in healthcare workers (Li et al., 2021). The literature demonstrates that healthcare professionals who engaged in physical activity had less symptoms of depression (Celmece & Menekay, 2020). Those who

did not initially engage in physical activity, but increased their physical activity, demonstrated improvement in symptoms of depression (Brockman & Ross, 2020; Celmece & Menekay, 2020). However, for this study, depression was not associated with any of the independent variables, including physical activity.

Theoretical Framework

The theoretical framework for this study was the Life Course Theory. For this study, the principle of personal agency was used to evaluate the participants' decision to engage in physical activity and the relationship between stress, overweight and obesity, and depression (Elder, 1998; Hutchison, 2019). Life Course Theory is complementary to the study of physical activity as it considers the individuals lived experiences and the influence those experiences had on decisions over a lifetime that impact behaviors now (Elder, 1998; Halfon et al., 2018; Hutchison, 2019). Use of the Life Course Theory in the Lounassalo et al. (2021) study found that physical activity trajectories of physical activity over time led to other positive health behaviors. Personal agency was found to be useful in answering this study's research questions. Future research using this theory would allow researchers to address different periods in time and how it related to an individual's history of physical activity and how it influences current physical activity behavior (Elder, 1998; Hutchison, 2019).

Recommendations

Education

There are assumptions healthcare professionals are well educated in physical activity for their personal health (Perry et al., 2018). This study found that while more than half (56.7%) engaged in recommended physical activity behaviors, slightly more than the national average of 50%, this number is still woefully low. Evidence based education on the importance of physical

activity needs to be provided to all healthcare professionals to ensure the most current information is provided for their self-care and for educating patients (Chang & Chen, 2020; Worley et al., 2022). In addition, there is a need for interprofessional physical activity education to promote collaboration between healthcare professionals to share their experiences with physical activity (Worley et al., 2022). Curricula of healthcare professional schools should also include the importance of physical activity for worker physical and emotional health and safety (Chang & Chen, 2020).

Practice

Brown et al. (2018) report that just over 50% of all US worksites offers some type of health promotion or wellness program. However, even if a healthcare employer offers a worksite health promotion program, to include physical activity, it is a challenge to get workers to participate due to high workloads, heterogeneity of work activities and long hours worked (Cheng et al., 2022; Perry et al., 2018; Worley et al., 2022). Changes in the work and work hours of healthcare workers is critical if we are to increase physical activity in this vulnerable group (Worley et al., 2022). The systematic review of 18 studies by Worley et al. (2022), of interventions which included physical activity and diet, showed work interventions are a good strategy for improving health in healthcare professionals, but found the improvement was not a significant change in the amount of physical activity they were engaging in, obesity levels, mental health or stress levels (Worley et al., 2022). What they did find is that interventions increased knowledge of positive health behaviors (Worley et al., 2022).

Despite the unique challenges of increasing physical activity of healthcare workers, there are some specific things healthcare organizations can provide. These include providing paid physical activity breaks (Worley et al., 2022), and onsite gyms and showers. Healthcare care

organizations should offer discounts to gyms and facilities/organizations which provide rigorous physical activity (Worley et al., 2022). Discounts to stores that offer sports equipment, such as cross-country skis (for cold weather climates) or treadmills, may also encourage increased physical activity. Healthcare leaders should lead by example and engage in physical activity and should also create policy that support improved working conditions that would allow for more physical activity outside of work hours.

Research

There is a strong need to close the gaps in physical activity research. The most important change is the need to increase the quality of research studies to produce high quality results to allow for comparison of results (Worley et al., 2022). For example, there are many different theories (Rosenkranz et al., 2020), instruments of measure (Silfee et al., 2018), and definition of concepts used for studies related physical activity (Thivel et al., 2018). The lack of standardized measures, instruments, and guiding theories make it difficult to compare research and develop methods or interventions for improving physical activity and would advance research (Rosenkranz et al., 2020; Silfee et al., 2018). There needs to be clearer definitions of the different types of physical activity and what the health advantages each provides (Thivel et al., 2018).

The WHO Guideline Development Group (GDG) on physical activity met in 2019 to make recommendations on future research needs (DiPietro et al., 2020). They specifically stated the need for research on the dose-response curve between physical activity health outcomes, the health benefits of lighter intensity physical activity, differences in the health effects of different types of domains of physical activity, to include occupational, and the joint association between physical activity and sedentary time with health outcomes over a life course (DiPietro et al., 2020). Additionally, as demonstrated in this study, which had too few non-White participants,

more research is needed on how sociodemographic factors, such as race/ethnicity, modify the health effects of physical activity, in order to reduce health disparities, including in healthcare workers (Moody et al., 2021)

It must be noted that this study provided pre-pandemic baseline results for physical activity among healthcare professionals and did not account for the stressors imposed on healthcare workers as well as physical activity restrictions created by the lock-down. Future research must consider the impact of the COVID-19 pandemic on physical activity of healthcare workers.

Limitations

All research has its limitations. It is important to recognize what those limitations are to include methods in the research to minimize them (Ross & Zaidi, 2019). Limitations of this study included using secondary data, which may not be generalizable as it may not be representative of the population to be studied (Prada-Ramallal et al., 2018). The data may not be exactly what is needed, or not measured in the format needed. For this study, physical activity was an imperfect measure. It relied on a count of activities you would see younger people engaging in. This is possibly due to the Add Health Survey being originally designed for use with adolescents and then the study continued through adulthood for the participants. The questions were not updated for use with adults. With secondary data, the researcher does not know if the data was collected properly (Prada-Ramallal et al., 2018).

Another limitation is the use of self-reported data for physical activity. The subjects may not be able to self-reflect and answer questions accurately. If questions require recall, they may not be able to accurately remember what happened prior (Bakker et al., 2020). The participant may be influenced by social desirability and not answer the question honestly. Finally, the

participant may have difficulty understanding the questions or the differences between answers on a scale to be able to answer correctly.

Conclusions

The aim of this study was to examine engagement in physical activity among healthcare professionals and the impact physical activity has on stress, overweight and obesity, and depression in healthcare professionals. Findings demonstrated that these health care professionals engaged in slightly more physical activity than the national norm for US adults (56.7% v. 50%). As supported by the literature, engaging in physical activity reduced stress scores. There was a high prevalence of obesity in these healthcare professionals (63.7%). H

However, those who engaged in more physical activity and had higher education had lower BMIs. Physical activity was not associated with depression scores. This study also demonstrated an ongoing gap with inclusion of ethnic groups in physical activity research.

Increasing physical activity among healthcare professionals is a significant issue. There is a clear need for additional research, especially interventions, to increase physical activity in healthcare workers. While healthcare workers have responsibility for their own health, the healthcare system must do far more to support the health of their workforce, to include assuring that physical activity recommendations are able to be met.

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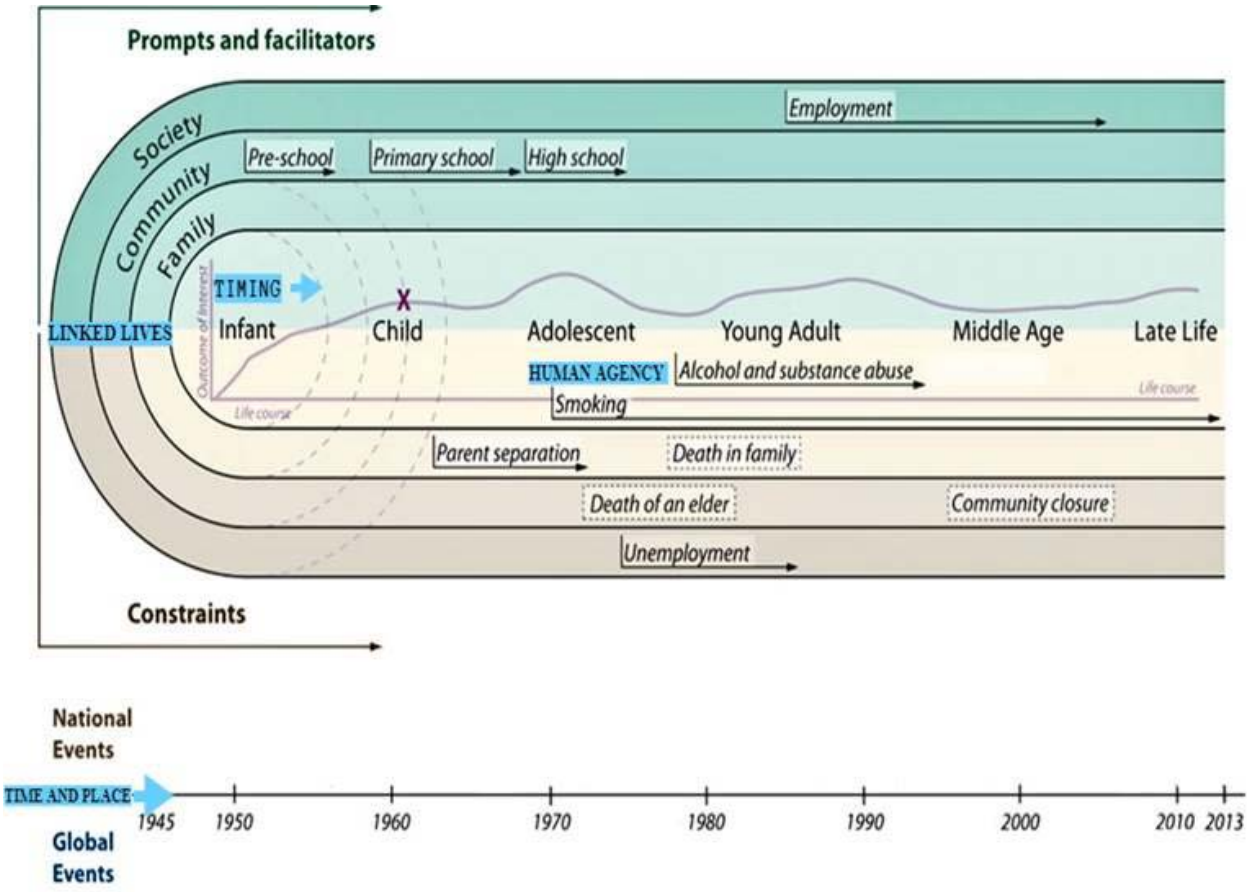
APPENDIX A: LIFE COURSE THEORY MODEL



Life Course Theory Model

APPENDIX B. MEASURES FOR STUDY

Measure	Add Health Variables and Wording	Citation	How it will be analyzed
Age **(Demographic)** **[Nominal]** **INDEPENDENT VARIABLE**	Age is obtained by two questions within the survey. 1. "What is your date of birth (month)." **Answer selections are:** "1 = January," "2 = February," "3 = March," "4 = April," "5 = May," "6 = June," "7 = July," "8 = August," "9 = September," "10 = October," "11 = November," and "12 = December." 2. "What is your date of birth (year)." **Answer selections are**: The birth years entered ranged from 1974 through 1983.	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe means ± SD. Weighted values will also be used per the analysis instructions of Add Health.
Gender **(Demographic)** **[Nominal]** **INDEPENDENT VARIABLE**	1. "What is your gender?" **Answer selections** are: "1 = male" and "2 = female?	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health.
Race **(Demographic)** **[Categorical]** **INDEPENDENT VARIABLE**	1. "What is your race or ethnic origin? Mark one or more boxes." **Answer selections are:** "White," "Black/African American," Hispanic," "Asian," "Pacific Islander," "American Indian/Alaskan Native," and "Other." [For this study, the subgroup data will be included as data for the primary answer options they fall under to create only seven race categories.] • The Hispanic subgroups included Mexican, Puerto Rican, Cuban, Central American, South American, and Hispanic-Other. • The Asian subgroup consisted of Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, and Asian-Other. • Pacific Islander was divided into the subgroups of Native Hawaiian, Samoan, Guamanian/Chamorro, and Pacific-Other.	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health.

Measure	Add Health Variables and Wording	Citation	How it will be analyzed
Highest Level of Education **(Demographic)** **[Nominal]** **INDEPENDENT VARIABLE**	**1.** "What is the highest level of education that you have achieved to date?**"** **Answer selections are:** "5 = some/technical training (after high school)" "6 = some community college," "7 = completed vocational/technical training (after high school)," "8 = associate or junior college degree," "9 = some college," "10 = completed college (bachelor's degree)," "11 = some graduate school," "12 = completed a master's degree," "13 = some graduate training beyond a master's degree," "14 = completed a doctoral degree," "15 = some post baccalaureate professional education (such as law school, medical school, nursing)," "16 = completed a post baccalaureate professional degree such as law, medicine, nursing.	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health.
Marital Status **(Demographic)** **[Nominal]** **INDEPENDENT VARIABLE**	1. "Are you currently…," **Answer selections are**: "1 = married," "2 = widowed," "3 = divorced," "4 = separated," and "5 = never married"	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health.
Physical Activity (Independent Variable) **[Continuous count]** **INDEPENDENT VARIABLE**	1. The following questions are related to actual moderate to vigorous physical activity. a) "In the past 7 days, how many times did you bicycle, skateboard, dance, hike, hunt, or do yard work?," b) "In the past 7 days, how many times did you roller blade, roller skate, downhill ski, snowboard, play racquet sports, or do aerobics?," c) "In the past 7 days, how many times did you participate in gymnastics, weightlifting, or strength training?," d) "In the past 7 days, how many times did you participate in individual sports such as running,	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe means ± SD. Weighted values will also be used per the analysis instructions of Add Health. The correlation between physical activity, stress, BMI, and Depression will be measured. Assumptions will be checked for linear regression. Linear regression analysis will be used to model depression by

Measure	Add Health Variables and Wording	Citation	How it will be analyzed
	wrestling, swimming, cross-country skiing, cycle racing, martial arts, or in strenuous team sports, such as football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey?" e) "In the past 7 days, how many times did you play golf, go fishing or bowling, or play softball or baseball?," and f) "In the past 7 days, how many times did you walk for exercise?" (Harris et al., 2019) **Scoring:** The number of times each participant enters for each of the questions above will be summed to create one number with total events for each participant to indicate the number of times they have engaged in moderate to vigorous physical activity for a week.		physical activity. Shapiro-Wilk tests of normality will be used to assess normality along with normal *Q-Q* plotting. Scatterplots with LOESS smoothers will be used to check for linearity.
Depression (Dependent Variable) **[Categorical/Ordinal]** **DEPENDENT VARIABLE**	1. "During the past 7 days, I felt that I could not shake off the blues, even with the help from my family and friends," 2. "During the past 7 days, I felt depressed," 3. "During the past 7 days, I was happy," 4. "During the past 7 days, I felt sad." **Answer selections for all the questions:** consisted of a four-point Likert scale, "0 = never or rarely," "1 = sometimes," "2 = a lot of the time," and "3 = most of the time or all the time." *Reverse scoring for question 3*: "3 = never or rarely," "2 = sometimes," "1 = a lot of the time," and "0 = most of the time or all of the time." **Scoring:** Sum the scores of all the questions for the total score. The higher the score, the greater the measure of depression. The cut-off for this is 4 - A score greater than 4 will indicates depressive symptomology.	(Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health. Assumptions will be checked for linear regression. Linear regression analysis will be used to model depression by physical activity. Shapiro-Wilk tests of normality will be used to assess normality along with normal *Q-Q* plotting. Scatterplots with LOESS smoothers will be used to check for linearity.
Obesity	Measuring obesity will require measurement data for height and weight in	Whitsel et al., 2020)	Descriptive statistics will be used to summarize the

Measure	Add Health Variables and Wording	Citation	How it will be analyzed
(Dependent Variable) **[Categorical/Ordinal]** **DEPENDENT VARIABLE**	the data and calculate the BMI of participants The data for this will come from responses to the following questions: 1. "How tall are you in feet and inches?" 2. "What is your current weight in pounds?" The height and weight data will be converted into BMI using this formula: **weight (kg) / [height (m)]^2 = BMI** Obesity will be determined by any BMI of **25 kg/m^2** or greater as it is considered by the CDC as a risk factor to cardiovascular disease, diabetes, osteoarthritis, sleep apnea, depression, anxiety, and pain **BMI Scale (CDC, 2021e):** 1. Underweight (<18.5 kg/m^2) 2. Normal weight (18.5 kg/m^2 to 24.9 kg/m^2) 3. Overweight (**25 kg/m^2 to 29.9 kg/m^2**) 4. Obesity class 1 (**30 kg/m^2 to 34.9 kg/m^2**) 5. Obesity class 2 (**35 kg/m^2 to 39.9 kg/m^2**) 6. Extreme obesity class 3 (≥ **40kg/m^2**)		characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health. Assumptions will be checked for linear regression. Linear regression analysis will be used to model depression by physical activity. Shapiro-Wilk tests of normality will be used to assess normality along with normal *Q-Q* plotting. Scatterplots with LOESS smoothers will be used to check for linearity.
Stress **(Dependent Variable)** **[Categorical/Ordinal]** **DEPENDENT VARIABLE**	1. "In the past 30 days, how often have you felt that you were unable to control the important things in your life," 2. "In the past 30 days, how often have you felt confident in our ability to handle your personal problems," * 3. "In the past 30 days, how often have you felt that things were going your way," * 4. "In the past 30 days, how often have you felt that difficulties were piling up so high that you could not overcome them?" **Answer selections for all questions:** 0 = Never; 1 = Almost never; 2 = Sometimes; 3 = Fairly often; 4 = Very often *Reverse scoring for:* **Questions 2 and 3:** 4 = Never; 3 = Almost never; 2 = Sometimes; 1 = Fairly often; 0 = Very often	(Cohen et al., 1983; Harris et al., 2019)	Descriptive statistics will be used to summarize the characteristics of participants. Descriptive statistics will be used to describe frequencies and percentages. Weighted values will also be used per the analysis instructions of Add Health. Assumptions will be checked for linear regression. Linear regression analysis will be used to model depression by physical activity. Shapiro-Wilk tests of normality will be used to assess normality along with normal *Q-Q* plotting. Scatterplots with

Measure	Add Health Variables and Wording	Citation	How it will be analyzed
	Scoring: Sum the scores of all the questions for the total score. The scoring cutoff of 6. Any score greater than 6 indicates higher level of stress.		LOESS smoothers will be used to check for linearity.