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Factors that Predit Levels of Sleepiness of Advanced Practice Nursing Students

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FACTORS THAT PREDICT LEVELS OF SLEEPINESS OF ADVANCED PRACTICE NURSING STUDENTS

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Abstract

Background: Due to arduous demands of graduate education, advanced practice nursing (APN) students who are classified as adult learners are at risk for suffering sleep deprivation. Factors contributing to sleep deprivation include stress, expected academic challenges, and everyday life stressors.

Purpose: This study investigated if APN students' grade-point average (GPA), gender, and employment status predicted levels of daytime sleepiness.

Theoretical Framework. The psychological well-being model selected for this study was consistent with the theory that sleep is a resource essential to well-being; adequate sleep is the resource needed to optimally manage stressful life demands.

Methods. Bivariate and multiple regression were employed to examine the relationship between GPA, gender, and employment status with daytime sleepiness on a sample of APN students ($N = 123$) in their second academic year. The Epworth Sleepiness Scale and a demographic questionnaire were used to record data on GPA, gender, and employment status.

Results. Results showed ESS and GPA were negatively correlated and statistically significant ($r = -.24$, $p < .05$). This indicates that as the tendency for sleepiness increased, GPA decreased, thereby supporting the alternative hypothesis. Although not statistically significant, employed participants reported greater daytime sleepiness, as did women.

Conclusions: When GPA, gender, and employment were combined, multiple correlation showed a statistically significant shared variance of 8% with daytime sleepiness, due primarily to the correlation between GPA and daytime sleepiness. The effect size of shared variance was between small and medium with respect to magnitude of importance.

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To my husband Keith, I am profoundly grateful for your love, friendship, encouragement and dedication. To my son Andrew, I want you to know that learning is life-long and that I am forever thankful and proud to be your Mom. I love you both so much.

To my Mom, I am living in a world full of purpose and possibilities because of you.

Table of Contents

List of Tables

List of Figures

Chapter One

The Problem and Domain of Inquiry

The relationship between academic performance and sleep behaviors is gaining interest in the medical community. Due to arduous demands of graduate education, advanced practice nursing (APN) students who are classified as adult learners are at risk for suffering sleep deprivation. Many factors contribute to sleep deprivation including stress, expected academic challenges, and everyday life stressors (S. Y. Lee, Wuertz, Rogers, & Chen, 2013). Little doubt exists of the prerequisite of healthy sleep for students to optimize physical and psychological health (Azad et al., 2015).

A review of the literature exhibited the negative consequences of sleep deprivation and its impact on the immune system and ability to concentrate, maintain motivation, and enhance overall well-being (Ferreira & De Martino, 2012; Hershner, & Chervin, 2014; Goel, Abe, Braun, & Dinges, 2014). Despite individual differences, the average recommended amount of sleep for an adult is 7–8 hours per night (Luyster, Strollo, Zee, & Walsh, 2012; National Sleep Foundation [NSF], 2014; Watson et al., 2014). Approximately one in three U.S. adults sleep less than 7 hours per night; an amount, that can produce physiological and neurobehavioral deficits (Luyster et al., 2012). The overall prevalence of insufficient sleep has been estimated in 20% of the population (Goel, Rao, Durmer, & Dinges, 2009).

Sleep loss is becoming a significant public health concern for all age groups in the United States (Sullivan, 2015). Approximately one fourth of the population experiences

sleep loss on occasion and 1 in 10 in the U.S. population suffers from chronic insomnia (Centers for Disease Control and Prevention [CDC], 2013; NSF, 2014). The number of medical office visits for individuals over the age of 24 with any sleep-related diagnosis ranged from 3.3 million visits in 1999 to 12.1 million visits in 2010, a 266% increase (Ford et al., 2014). The *Diagnostic and Statistical Manual of Mental Disorders* defined insomnia as a complaint lasting at least 1 month, with difficulty initiating or maintaining sleep, or of nonrestorative sleep for more than 3 nights per week (American Psychiatric Association, 2013; McCrae, Bramoweth, Williams, Roth, & Mosti, 2014).

Sleep loss may result from such underlying health issues as poor sleep hygiene, anxiety, life stressors, and medications. Habitual sleep loss is common; however, many are unaware of the potential adverse health risks precipitated by accumulated sleep deprivation (NSF, 2009). Sleep deprivation is prominent among college students due to increased stressors such as coursework, employment, and social demands (Todd & Mullan, 2014). At least 11% of students report good sleep and 73% of students were found to have sleep problems (Brown University, 2014). Of college students, 50%, and of all students, 70.8% have reported daytime sleepiness, reporting less than 8 hours of sleep (Hershner & Chervin, 2014).

Studies demonstrated that excessive daytime sleepiness contributes to the risk of sickness, work absence, and reduced work productivity (Lallukka et al., 2014; Omachi, Claman, Blanc, & Eisner, 2009). Estimated annual costs related to sleep deprivation, lost job productivity, insomnia-related accidents, and increased medical problems exceed $100 billion (Daley, Morin, LeBlanc, Grégoire, & Savard, 2009; McCrae et al., 2014). Sleep deprivation is prevalent in the global population in such large proportions that the

Institute of Medicine (IOM), recommended the need to educate academic leaders, government advocates, students, and the general population about sleep and its impact on health (Ulmer, Wolman, & Johns, 2009). As a result of recent reports and related information on the role of sleep in health, the IOM (Ulmer et al., 2009) report suggested that exposure to sleep education ought to begin prior to entering medical-residency programs and be included in medical-school curricula; however, the IOM does not make this recommendation for APNs (Ulmer et al., 2009).

Problem Statement

Current healthcare students experience significant levels of pressure as a result of laborious academic demands and rigorous course schedules, causing an increase in their levels of daytime sleepiness (Ahrberg, Dresler, Niedermaier, Steiger, & Genzel, 2012). Sleep disturbance and stress inextricably link and can negatively impact well-being (S. Y. Lee et al., 2013). To best prepare APNs, educational programs must collaborate and coordinate between APN faculty, healthcare professionals, government agencies, and policymakers to boost awareness of excessive daytime sleepiness and its impact on academic performance.

Purpose of the Study

The purpose of this study was to determine APN students' level of sleepiness and to correlate their level of daytime sleepiness with grade-point average (GPA), gender and employment status. Gender, employment status, and levels of sleepiness of APN students working toward a degree and gainfully employed are of particular importance. Developing an understanding of APN students' levels of sleepiness aligns with the IOM's (Colten & Altevogt, 2006) vision that calls to heighten surveillance regarding sleep

behaviors by targeting healthcare professionals and increasing their awareness of the adverse effects of sleep deprivation. A demographic-information sheet was used to obtain information from participants about their gender, work status, and GPA. The Epworth Sleepiness Scale (ESS) was used to measure general levels of sleepiness. The ESS differentiates between average sleep and significant issues with sleepiness that may require medical interventions (Johns, 1991; see Appendix B).

Research Question and Hypotheses

Research Question

Are levels of daytime sleepiness predicted by APN students' GPA, gender, and employment status?

Hypotheses

Ho1: GPA, gender, and employment status are not significant predictors of levels of daytime sleepiness.

Ha1: GPA, gender, and employment status are significant predictors of levels of daytime sleepiness.

Significance to Nursing Education

The significance of the study was its aim to determine if a relationship exists among levels of sleepiness reported by APN students, academic performance as measured by GPA, and employment status. Research is required to guide academicians to gain a better understanding of the impact of sleep on learning and health. Increased awareness of beneficial sleep behaviors to improve students' quality and sleep habits could significantly impact APN students' ability to establish sleep habits that extend into their professional careers (Hershner & Chervin, 2014; Zeek et al., 2015). APN students

and nursing faculty ought to be well informed about changes in APN programs that may be used to promote quality sleep, which may improve motivation and enhance education quality. Research is needed to provide APN students with tangible evidence about their sleep so they can use the information to make daily decisions regarding their sleep as it relates to their academic success (Zeek et al., 2015). One of the most common causes of daytime sleepiness is sleep deprivation due to students going to bed late and waking early (Hershner & Chervin, 2014). Currently, APN graduate students and faculty do not have data to inform them about potential consequences of not adhering to sleep recommendations to promote optimal physical and psychological health while enrolled in APN programs.

Research regarding sleepiness and academic performance, gender, and employment status provides understanding of the dynamic relationship between program demands and healthy sleep behaviors. Universities may need to gain a better understanding on how to best educate students about the importance of sleep hygiene and the consequences it may have on their academic performance.

Advanced Nursing Practice

The significance of this study for nursing practice is to better prepare nurse educators on the interrelationships among gender, employment status, and GPA on levels of sleepiness of APN students. According to the American Academy of Nurse Practitioners (2015), more than 205,000 APNs practice in the United States, with an average of two thirds of U.S. patients encountering an APN to meet their primary-care needs. A current shortage of primary-care providers exists, and APNs are expected to fill this gap; however, no previous researchers described efforts to enhance APN knowledge

regarding the impact of sleep deprivation and its impact on APN education (Odell, Kippenbrock, Buron, & Narcisse, 2013).

Healthcare professionals exposed to shift-work schedules such as APNs are at increased risk for chronic disruption of biological sleep timing, which contributes to daytime sleepiness (Luyster et al., 2012). Excessive daytime sleepiness negatively affects mood and motivation and links to poor health outcomes (Ford, Cunningham, Giles, & Croft, 2015). Shift work aligns with elevated risk of cardiovascular morbidity and mortality including ischemic heart disease, myocardial infarction, and atherosclerosis (Haupt, Alte, Dorr, Robinson, & Volzke, 2008).

Sleep loss may negatively affect the overall wellness of the student while also impacting academic performance and efficiency as a health practitioner (Fortier-Brochu, Beaulieu-Bonneau, Ivers, & Morin, 2012). APNs must be mindful of potential factors contributing to their own sleep loss and their patients' loss of sleep. Improving sleep awareness is essential to nursing care. Awareness of contributing factors impacting a patient's sleep can be used to enhance their sleep quality (Edwards et al., 2010). Awareness of a person's sleep habits may benefit sleep and overall health to facilitate the formulation of treatment plans. APNs with an increased awareness of the importance of quality sleep may be more likely to incorporate sleep education into their APN practice and effectively improve health outcomes in patients.

The IOM (Colten & Altevogt, 2006) reported that sleep problems align with performance deficits in occupational and educational settings. These deficits include attention, vigilance, and other measures of cognition, including memory and complex decision making. Educators and college authorities ought to take an active role and

consider sleep disturbances in the context of academic performance, and heighten awareness of good sleep hygiene (BaHammam, Alaseem, Alzakri, Almeneessier, Sharif, & 2012).

Nursing Research

The significance of this study for nursing research is to gain understanding of how sleep behaviors may impact academic performance. A paucity of research exists regarding sleep loss for APN students as the cause of poor academic performance (Tran et al., 2014). Additionally, an understanding of sleep and its relationship to illness and well-being as consequences of poor sleep on mental health is emerging (Azad et al., 2015; Bandla et al., 2012; Fernandez-Mendoza et al., 2015). This emerging knowledge opens an area of research that ought to develop and expand for APN clinicians and other healthcare providers. Sleep is multifaceted, multidimensional, and critical to understand thereby maintaining optimal health for providers and patients in the community (Vgontzas, Liao, Bixler, Chrousos, & Vela-Bueno, 2009).

Investigating APN students' levels of daytime sleepiness and analyzing how it correlates with APN students' academic performance may broaden appreciation of the impact poor sleep may have on students (Azad et al., 2015). Increased understanding of APN students' sleep behaviors may facilitate a dialogue with APN faculty that can be used to translate effective communication strategies for student learning to heighten awareness of the critical nature of sleep on overall health and academic performance. Due to continuous academic demands on APN students, researchers need to identify variables that may lead to poor sleep quality in this group of students. Educators and students typically do not realize the impact sleep habits may have on academic performance

(BaHammam et al., 2012).

Public Policy

The significance of this study relates to public policy by providing information on the relationship between sleep and academic performance for APN students and heightening faculty awareness in APN programs. Individual nurses, including all levels of practice, need to protect their own health and safety as well as the safety of those in the community. Professional nursing organizations ought to take the lead in creating standards that will protect APN students. Nursing organizations must recognize and address sleep deprivation as a serious health issue and collaborate with nursing organizations as advocates to ensure the safety of APN students.

Researchers supported the concept that excessive daytime sleepiness negatively impacts an individual's performance, safety, and quality of life (Mitler et al., 1988). Sleep loss can have a substantial economic impact (McCrae et al., 2014). Globally, errors in nursing practice resulting from sleep deprivation can have significant economic consequences (Hasson & Gustavsson, 2010).

The high prevalence of excessive daytime sleepiness, affecting 30% of the population, and its association with substantial personal and occupational sequelae, has headed the release of the IOM's 2008 report on resident hours, resulting in aggressive action adopted by the Accreditation Council for Graduate Medical Education (as cited in Fernandez-Mendoza et al., 2015). Ulmer et al. (2009) reported that the IOM's 2008 report included new recommendations to limit resident physician work hours and workload (Blum, Shea, Czeisler, Landrigan, & Leape, 2011). A parallel effort targeting APN students may lead to new studies and research to improve understanding of the

causal relationships between fatigue, sleep, health, and safety outcomes. These data suggest that an increase in students' awareness of fatigue may be important targets for sleep-intervention education for APN students. Furthermore, some regulations may be necessary to encourage change such as redesigning APN educational programs, limiting APN students' work hours, requiring a minimum of off-duty hours between clinical shifts, and redesigning student schedules to adhere to principles of sleep and circadian science (Blum et al., 2011).

Philosophical Underpinnings

The philosophy that underpinned this study is postpositivism. This philosophy reflects the positivist paradigm with emphasis on well-defined concepts, distinct variables, precise instrumentation, and empirical testing (Guba & Lincoln, 1994). Assumptions of the postpositivist paradigm are directed by what governs knowledge. The aim of a postpositivist research approach is to expand science through a richer understanding of the dimensions that influence observable human phenomena (Forbes et al., 1999). The knowledge that develops through the postpositivist paradigm is based on careful observation and measurement of objective reality that exists in the open free world (Creswell, 2014). To conceptualize truth, scientific research is imbued with discernibles, has existence, and has the capability to explore functions through observable phenomenon (Clark, 2008). For example, scientific research includes the notion that beliefs are observable and the context of discovery is not separate from scientific justification (Forbes et al., 1999). Inquiry through the postpositivism lens begins with a theory and the research congregates data that yields information to either support or refute the theory (Creswell, 2014).

The postpositivist paradigm provides a framework to conduct disciplined research. The postpositivist researcher views reality as an open system and views the world as a creative composition of the people being studied. In essence, the postpositivist views the world as having many conceivable constructions of reality (Hughes, 1997). The postpositivism philosophy concerns searching for evidence that is valid and aligns with the existence of the phenomena (D. C. Phillips & Burbules, 2000).

Popper (1972) challenged the view that positivist researchers were neutral observers. Averring that observations are not passive, but rather are a function of ideas limited by senses, Popper claimed that observation is theory dependent, and that the starting point of science is never pure observation. For this study, the assumption is that reality for the participants is believed individualized and the participants rationalize their own experiences in the social world.

Theoretical Framework

Psychological Well-Being Model

Ryff (1989) developed a set of measured scales representing multiple facets of psychological well-being (PWB). The theoretical foundation of the PWB model was generated from multidimensional frameworks of positive psychological functioning proposed by Erikson (1959), Maslow (1959) and Aristotle (as cited in Ryff & Keyes, 1995). Aristotle's concept of eudemonism or self-realization supports contentment, ease, and well-being as the underpinnings for this model. Aristotle's eudaimonic approach to well-being is defined by the degree to which a person functions in daily life activities (Tomas, Sancho, Melendez, & Mayordomo, 2012). The PWB model (Ryff, 1989; Ryff & Keyes, 1995) includes six components of positive functioning and eudemonic well-being:

(a) autonomy, (b) environmental mastery, (c) personal growth, (d) purpose in life, (e) self-acceptance, and (f) positive relations with others.

The PWB model was selected for this study because it is consistent with the theory that sleep is a resource essential to well-being (Hamilton, Nelson, Stevens, & Kitzman, 2007). Researchers suggested that adequate sleep is the resource needed to optimally manage stressful psychological and life demands (Gedefaw, Tilahun, & Asefa, 2015; Goel et al., 2014; Wells & Vaughn, 2012). For the purpose of this study, sleep was the resource. Adequate sleep provides the energy necessary to manage stress and work toward important goals (Hamilton et al., 2007; Ryff, 1989).

The six components of the PWB model were expanded in this study. Autonomy refers to self-determination; the ability to resist social demands. Environmental mastery refers to the capacity to possess a sense of competence while participating in daily life activities (Ruini & Fava, 2012). Personal growth is the ability to face new life challenges and tasks while considering one's personal growth over time. The component of purpose in life refers to one's personal goals or as a sense of working toward a meaningful life. Self-acceptance refers to possessing a positive attitude toward the self, recognizing various parts of oneself such as one's good and bad qualities, feeling self-confident, and accepting one's past life and all its positive and negative experiences (Ruini & Fava, 2012, p. 293; Ryff, 1989; Ryff & Singer, 1996). The component of positive relations with others signifies one's ability to have trusting relationships, empathy, and care for others. The six components of the PWB model suggest continued personal determination that requires continuous active engagement for students that may be heightened by optimal sleep behaviors (Hamilton et al., 2007).

The components of psychological well-being have been correlated with demographic characteristics and indicators of overall health. For example, psychological well-being correlated with gender, age, race, ethnicity, and levels of educational attainment; however, academic performance and employment status were not studied previously (Hamilton et al., 2007; Ryff et al., 2012). The variables examined in this study were gender, employment status, and GPA with a goal to investigate if these variables predict students' levels of sleepiness. The components of the PWB model are pertinent to APN students and the model's constructs suggest that well-being is highly individualized. APN students have distinctive combinations of strengths, weaknesses, and vulnerabilities (Ryff et al., 2012).

The definition of well-being by Dodge, Daly, Huyton, and Sanders (2012) was used in this study as the conceptual model. It assumes a balance between resources and challenges, shown in Figure 1.

Figure 1. Defining well-being.
Source: "The challenge of defining wellbeing," by R. Dodge, A. P. Daly, J. Huyton, & L. Sanders, 2012, *International Journal of Wellbeing, 2,* 230. Used with permission (see Appendix D).

The Dodge et al. (2012, p. 230) definition of well-being is "the time when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge." The meaning of well-being

demonstrates a dynamic equilibrium necessary to foster well-being. In this study, the psychological, social, and physical components were in a constant struggle for balance when academic challenges were present and resources, such as sleep, were threatened. Physical resources include the skills necessary to maintain homeostasis such as sufficient amounts of sleep. Rigorous life-related demands, along with educational demands, may contribute to a lack of sleep, thereby increasing daytime sleepiness resulting in disequilibrium of students' wellness. An escalation in life challenges may result in unfavorable psychological, social, and physical factors, ultimately impacting students' homeostatic state.

The see-saw (see Figure 1) depicts the desire for an individual to be compelled toward a set point for well-being. As individuals encounter challenges and their resources are set off balance, they must adapt to maintain their state of homeostasis (Dodge et al., 2012). For example, if students encounter lack of sleep and increased personal demands in their attempts to meet APN school requirements, the see-saw will become lopsided. A slant or dip in the see-saw depicts a change in students' well-being or their ability to perform at their full potential. For this study, the challenges were APN program requirements and sleep was the resource being investigated to test whether the outcomes demonstrate a tipping of the see-saw, thereby affecting student well-being, measured by students' levels of sleepiness.

Theoretical Assumptions

Well-being is a dynamic concept that includes subjective, social, psychological, and health-related behaviors. Ryff's model of psychological well-being (1995) emphasized behavioral factors that lead to heightened overall well-being, optimal

emotional processing and the prevention of psychological dysfunction. Well-being is a multifaceted concept; personality traits, gender, demographics such as employment status and academic performance have been linked to psychological well-being (Ryff, 2013).

Figure 2 depicts a conceptual model for the constructs of this study. In this study GPA, gender, and employment status are the variables examined to see if they predict levels of sleepiness. As a consequence, levels of sleepiness may affect a student's well-being. The see-saw illustrates how GPA, gender and employment status may predict levels of sleepiness causing an imbalance in psychological well-being. The six components, positive relations, environmental mastery, self-acceptance, autonomy, personal growth, and purpose in life of the PWB model represent how levels of sleepiness can predict well-being and impede performance of daily activities.

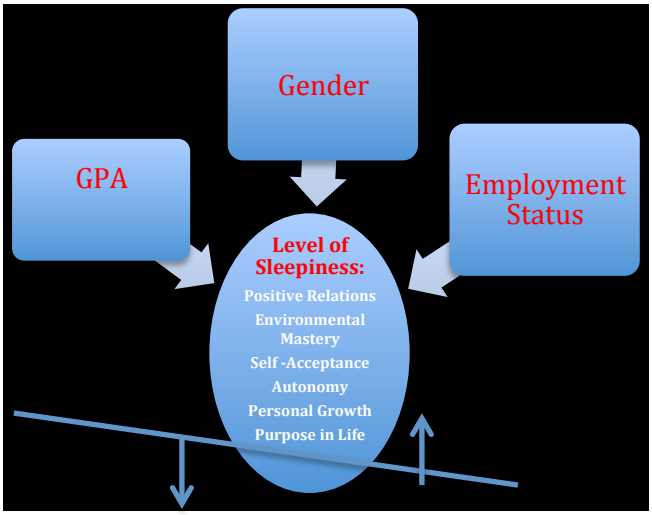

Figure 2. Conceptual model of levels of sleepiness as predicted by gender, GPA and employment status.

The definition of well-being supports the assumption that sleep plays a vital role in maintaining the equilibrium of psychological, social, and physical well-being. Well-being is tangible, operationalized, measurable, and universally applicable for all

individuals, regardless of age, culture, or gender (Dodge et al., 2012). To maintain psychological well-being, individuals must cultivate an attitude of optimism and acquire the resources to maintain a homeostatic state. For this study, adequate sleep was a resource defined in the model, definition of well-being, and academic program requirements were the challenge defined in the same model. A reported level of sleepiness, measured by the ESS, was a negative outcome affecting the imbalance of a student's well-being.

Operational Definition

The ESS, developed in 1991 by Johns, was used to measure levels of daytime sleepiness, sleep propensity, or likelihood of falling asleep as opposed to remaining awake (Johns, 1992). The ESS is commonly used in sleep research and in clinical healthcare settings (Kendzerska, Smith, Brignardello-Petersen, Leung, & Tomlinson, 2014). The ESS measures an individual's propensity to sleep by subjectively assessing the impact that sleepiness has on various aspects of daily life. The ESS is an eight-item 4-point Likert scale ranging from 0 (would never doze) to 3 (high chance of dozing). Scores were recorded as a number ranging from 0 to 3 written in a single box for each item as would never doze = 0; slight chance of dozing = 1; moderate chance of dozing = 2 and high chance of dozing = 3. Total scores were the sum of all the item scores that ranged between 0 and 24; the higher the score, the higher the person's level of daytime sleepiness. The total score provided is a subjective report of daytime sleepiness across eight life situations.

Definition of Terms

Challenges refers to "life events" such as a demanding circumstances that arouse

or stimulate an individual (Daley et al., 2009, p. 228; Dodge et al., 2012).

Daytime sleepiness is the recurrent uncontrollable desire or inclination to sleep; the inability to stay awake and alert when required results in diminished attention (Ohayon, 2008).

Employment status is the state of a person who performs a service for another person or organization for compensation over various amounts of time in the day or night, measured in hours per week (Salamonson, Everett, Koch, Andrew, & Davidson, 2012).

Equilibrium means the state of homeostasis (Daley et al., 2009; Dodge et al., 2012).

Gender comprises the biological and physiological characteristics that define men and woman, along with the self-identification of membership in a male or female social group (Ballantyne, Kayser, & Grootegoed, 2012; Martin & Ruble, 2010).

Sleepiness is the ease or likelihood of falling asleep as opposed to remaining awake (Kendzerska et al., 2014).

Well-Being:

Theoretical definition of well-being based upon Ryff's (2013) cognitive model of psychological well-being model is multidimensional and includes the six components of positive relations, environmental mastery, self-acceptance, autonomy, personal growth, and purpose in life.

Well-being is a state when individuals have the psychological, social, and physical resources they need to meet a particular psychological, social or physical challenge (Dodge et al., 2012).

Operational definition of well-being for this study was the levels of sleepiness

measured by the ESS (Johns, 1991).

Chapter Summary

APN students are in a position to carry a large academic load and be gainfully employed, which may contribute to poor sleep quality, resulting in excessive daytime sleepiness. Levels of sleepiness are not understood for APN students. Information about APN students' levels of sleepiness may be essential to improve the overall quality of APN students' well-being and academic performance. The World Health Organization (2009) identified fatigue as a leading factor in medical error and injury in health care. The Accreditation Council for Graduate Medical Education has twice recommended reductions in work time for medical trainees, due in part to concerns about fatigue (Nasca, Day, & Amis, 2010). Knowledge of APN levels of sleepiness and their academic performances may be essential to optimize schedules for students and accommodate outside influences that impact their academic performances. The information from this study can also be used for faculty to gain an understanding on the implementation of new teaching strategies for the delivery of instructional content for students, aimed to improve sleep.

Chapter Two

Literature Review

The purpose of this study was to explore APN students' level of sleepiness and to correlate their level of daytime sleepiness with GPA, gender, and employment status. In this chapter, the literature is structured according to the following terms (a) sleep, (b) biological need for sleep, (c) sleep quantity, (d) cognitive performance and excessive daytime sleepiness, (e) sleep and gender, (f) excessive daytime sleepiness and academic performance, (g) excessive daytime sleepiness and medical students, (h) sleep and nurses, (i) employment status and academic performance, and (j) sleep and well-being. Literature searches were conducted with the above terms using the Cumulative Index to Nursing & Allied Health Literature and PubMed databases. The search was narrowed to peer-reviewed articles written between January 2010 and September 2015.

Sleep

Sleep is a fundamental homeostatic process; yet its definition varies in the literature. Sleep can be depicted as a phenomenon; for example, as a comprehensive phenomenon affecting the nervous system and the individual in its entirety (Brown, Basheer, McKenna, Strecker, & McCarley, 2012). Sleep as a phenomenon serves many roles: energy saving, restoration of energy resources, cell tissue repair, thermoregulation, metabolic regulation, and adaptive immune functions (Björn & Born, 2013; Rasch & Born, 2013). While engaging in sleep, the human body carries out vital physiological and psychological functions that affect one's physical and mental state (National Institute of

Neurological Disorders and Stroke, 2014). The precise need for human sleep is unclear (American Sleep Association, 2007); however, animal studies showed that sleep is needed for survival (Cavalcanti, Campos, & Araüjo, 2013).

Sleep can be characterized as a dynamic human behavior. Sleep as a behavior aligns with changes in body posture and eye state; sleep can be evaluated by self-reported, behavioral, physiological, circuit, cellular, and genetic levels of analysis (Buysse, 2014; Irwin, 2015). Sleep is a natural and reversible state of reduced stimuli and inactivity (Rasch & Born, 2013) accompanied by a loss of consciousness (Sullivan, 2015). Essentially sleep as a behavior can be defined as a multidimensional pattern of sleep–wakefulness, adapted to individual, social, and environmental demands that promote physical and mental well-being (Buysse, 2014).

Sleep is a natural human process. Sleep is an active reversible process that is responsible for repair and growth, learning or memory consolidation, and the body's restorative process (Curcio, Ferrara, & Gennaro, 2006). Two independent processes regulate sleep: the homeostatic process (Process S) and the circadian process (Process C) (Pellegrino et al., 2014). One primary regulatory control is the body's necessity for sleep; also known as the homeostatic control mechanism or the homeostatic process (Luyster et al., 2012). Essentially, the longer an individual goes without sleep, the longer they will subsequently sleep. When feeling fatigued or tired, the body's normal homeostatic drive increases its propensity to sleep in efforts to restore its energy supply (Brown et al., 2012; National Institute of Neurological Disorders and Stroke, 2014).

The circadian process organizes sleep and wakefulness alterations over a 24-hour period. These two processes interact while awake. The homeostatic sleep drive is

opposed by the circadian drive while awake and the circadian drive diminishes before sleep. This variation in the homeostatic and circadian process has been studied in mammals across the animal kingdom, and the preservation of Process S and Process C leads researchers to believe that survival is higher by a regular occurrence of sleep (Luyster et al., 2012).

Biological Need for Sleep

Mammals have a biological need for sleep. Evolutionally pressures throughout the animal kingdom resulted in specific homeostatic and circadian patterns that are specie specific (Luyster et al., 2012). In a study on the impact of sleep on rats, total sleep deprivation over a 2- to 3-week period resulted in the demise of the rats (Shepard et al., 2005). The rats became hypermetabolic and exhibited weight loss even though they were fed larger quantities of food throughout the experiment before their death. Additionally, various rats developed skin conditions, gastrointestinal problems, and hypothermia (Shepard et. al., 2005). A study in Finland compared sleep-duration data of adult twins aged 24–101 to a reference group of individuals sleeping 7 to 8 hours per night. The study revealed an increase in mortality risk for men and women who reported < 7 or > 8 hours of sleep (Grandner, Hale, Moore, & Patel, 2010, p. 3). To further ratify human's biological need for sleep, Kripke, Garfinkel, Wingard, Klauber, and Marler (2002) used epidemiologic data collected by the American Cancer Society from more than 1 million individuals to assess the biological need for sleep. The researchers confirmed that mortality rates after 6 years of follow-up were significantly higher for participants reporting less than 4 hours or more than 10 hours of sleep per night at baseline. A second survey of 1.1 million participants confirmed these results, conducted between 1982 and

1988 (Shepard et al., 2005). Therefore, the available studies demonstrated a human biological requirement for sleep and raise awareness of the potential detrimental physiological effects of sleep loss.

Sleep Quantity

Epidemiological and community-based studies have shown that the prevalence of decreased nightly sleep duration (< 8 hours) has increased for adults from 1960 to 2000 and has currently been maintained at 6 to 6.5 hours per night (Adenekan et al., 2013). A consensus from a 12-month research study conducted by a panel of the topmost sleep experts recommended that 7 or more hours of sleep per night is required for adults to maintain optimal health (American Academy of Sleep Medicine & Sleep Research Society, 2015). Further, a minimum of 7 hours of sleep per night will avoid adverse health effects of chronic sleep loss in adults. The committee did make recommendations regarding the maximum amount of sleep for adults. The research team used a modified Rand Appropriateness Method to acquire the recommendation (American Academy of Sleep Medicine & Sleep Research Society, 2015). Other organizations, including the National Heart, Lung and Blood Institute, recommended adults get 7 to 8 hours of sleep per night (Chang et al., 2015; Schoenborn & Heyman, 2009).

Sleep inadequacy is prevalent in the United States (CDC, 2011). Students enrolled in college programs are particularly vulnerable to chronic sleep deprivation due to academic, social, and work demands (Gaultney, 2010). Students enrolled in college programs are chronically sleep deprived, averaging 1–1.5 hours less than the ideal recommendations of nightly sleep (Kloss, Nash, Horsey, & Taylor, 2011). Sleep inadequacy is a term used to signify shorter sleep duration across the research literature.

Approximately one in three U.S. adults sleep less than 7 hours per night (CDC, 2011). The percentage of men and women reporting sleeping less than 6 hours per night has increased significantly over the last 2 decades (Luyster et al., 2012). Societal changes such as erratic schedules, longer work and commute times, increases in shift work, and an increased dependence on technology may have contributed to this change (Luyster et al., 2012).

Cognitive Performance and Excessive Daytime Sleepiness

Fatigue, irritability, diminished concentration abilities, loss of vigor, changes in mood, behavioral changes, and decreased cognitive performance have all been associated with excessive daytime sleepiness (Goel et al., 2014; Wells & Vaughn, 2012). Inadequate sleep interferes with the functions of the brain structures responsible for cognitive processes (Zeek et al., 2015). Cognition refers to activities involved in thinking, knowing, remembering, judging, and problem solving (Sachdeva, Kumar, & Anand, 2015). Sleep loss, either voluntary or due to an underlying medical condition, adversely impacts cognitive abilities because sleep is an important function needed to process information encountered during the day and for the consolidation of memory (Brown et al., 2012). Cognitive performance activities include stimulus detection, information encoding, working memory, and motor action (Jackson et al., 2013).

Excessive daytime sleepiness is an unfavorable and undesirable sleepiness during major waking hours or difficulty maintaining a desirable level of wakefulness (Chellappa, Schröder, & Cajochen, 2009; Knie, Mitra, Logishetty, & Chaudhuri, 2011; Stroe et al., 2010). On average, after being awake for more than 1 day, impairment on a simple reaction-time test is equivalent to the impairment observed at a blood alcohol

concentration of 0.10g.dL (Czeisler, 2009).

One of the first groups of researchers to report that daytime sleepiness as a result of sleep debt has a significant relationship on memory was Morris, Williams, and Lubin (1960). Harris and Harris (2000) reexamined the Morris et al. results and confirmed significant memory impairments in sleep-deprived participant groups (as cited in Walker & Struckgold, 2006). Results of a meta-analysis of chronically sleep-deprived participants revealed significant deficits in sustained-attention tasks and working-memory tasks that required working mental flexibility and attention shifts (McCoy & Strecker, 2013). In a meta-analysis of 70 experiments and 147 cognitive tests, researchers demonstrated that, across six categories, sleep loss had the largest impact on attention and memory functions (Lim & Dinges, 2010). Of importance, the research presented suggested an association between sleep deprivation and cognition.

The development of neuroimaging using magnetic-resonance imaging has been used in modern research to explore the impact of sleep loss on the brain. A study using magnetic-resonance imaging to explore brain activity on 13 sleep-deprived participants evaluated the impact of sleep deprivation on learning in three distinct areas: verbal learning, arithmetic, and divided attention (Drummond & Brown, 2001). The researchers looked for heightened activity in the parietal and the prefrontal cortex of the brain. Difficulty concentrating on tasks, lapses in attention, difficulty remembering tasks, failing to anticipate events or actions, compromised reaction times, and the inability to communicate information have all been associated with cognitive symptoms of excessive sleep deprivation (Goel et al., 2014).

Sleep and Gender

To better identify, understand, prevent, diagnose, and treat excessive daytime sleepiness as a result of sleep disturbance, it is important to understand gender differences regarding sleep. Biological and physiological differences cause men and women to sleep differently (Astbury, Bruck, & Loxton, 2011; Röösli, Mohler, Frei, & Vienneau, 2014). Sex chromosomes and gonadal hormones are the prime contributing factors of sleep at the cellular, organ, and system levels, along with a combination of environmental, social, and cultural influences (Mallampalli & Carter, 2014; Mong et al., 2011; Paul, Turek, & Kryger, 2008). The NSF (2007) reported that women are more likely to experience sleep problems than men. A survey conducted by the NSF (2007) evaluated sleep patterns in woman aged 18–64. Study results showed that 60% of U.S. women self-reported they get sufficient sleep few nights during the week and 67% of the woman self-reported they experience sleep problems regularly. The 2007 poll also established that 43% of the women self-reported that their daily activities were impacted by excessive daytime sleepiness (NSF, 2007; B. A. Phillips et al., 2008).

A meta-analysis found that women are 41% more likely to have insomnia than men, and this ratio increases with age (Paul et al., 2008). The likelihood of adolescent girls reporting excessive sleeplessness triples, whereas for boys the likelihood increases modestly, thereby suggesting that female hormonal changes contribute to sleep loss. S. Y. Lee, Wuertz, Rogers, and Chen (2013) studied female college students. Biological reactions to stress, referenced as the interaction between an individual and their environment, can also impact sleep for women. Researchers studied 103 female college students because college is a known time for stress, which can be detrimental to sleep due

to the sympathetic portions of the autonomic nervous system that directly impact sleep quality (S. Y. Lee et al., 2013).

Several other research studies of gender differences explored sleep quantity and quality in the college-aged population. Regestein et al. (2010) performed a study to evaluate the relationship between sleep habits and depressive symptoms in female college students. A stepwise logistic regression was used to interpret the results, demonstrating that students who reported less sleep along with excessive daytime sleepiness had a higher risk of reporting depression (Regestein et al., 2010). The study demonstrated that women who self-reported at least 2 hours or more of sleep deficit or significant daytime sleepiness had a higher incidence of self-reported depression and anxiety. Another study by S. Y. Lee et al. (2013) further supported sleep and gender difference among college-aged women. S. Y. Lee et al. (2013) reported that the majority of female college students slept less than 6 hours and the reported poor sleepers reported an increase in perceived stress and increased excessive daytime sleepiness. The researchers concluded that female college students require interventions to reduce stress, minimize depression, and improve sleep. Psychosocial circumstances adversely impact sleep in women more than in men: 66% of midlife women self-report stress, depression, and sleep disturbances (Mallampalli & Carter, 2014, p. 557). Notably, Regestein et al. (2010) and S. Y. Lee et al. (2013) demonstrated that stress levels in women impact their sleep.

Excessive Daytime Sleepiness and Academic Performance

Sleep, as a health behavior, aligns with academic performance (Flueckiger, Lieb, Meyer, & Mata, 2014). Optimal school performance aligns with more time in bed, better sleep quality, fewer nighttime arousals, less napping, and less difference between

weekday and weekend sleep times (Pagel & Kwiatkowski, 2010). Four fundamental sleep characteristics influence academic performance: sleep quantity, sleep quality, sleep regularity, and sleep-phase scheduling (Azad et al., 2015). Suboptimal sleep duration impacts academic performance, defined for adults as fewer than 7 hours per night (Zeek et al., 2015). Inadequate sleep duration decreases cognitive, psychomotor, and emotional functioning and can have a deleterious impact on students' ability to focus, possibly adversely interfering with daytime routines (Lund, Reider, Whiting, & Prichard, 2010; Orzech, Salafsky, & Hamilton, 2011).

Academic performance is a component of education used to assess and identify students who display the appropriate levels of competence, to enable students to ascertain their own progress and to predict future academic progress (Gedefaw, Tilahun, & Asefa, 2015). Throughout educational institutions and sleep literature, educators and researchers used examination scores and grades to measure academic performance. Students who obtained more sleep (long sleepers, more than or equal to 9 hours) had higher GPAs than short sleepers (less than or equal to 6 hours): GPAs were 3.24 versus 2.74 on average (Hershner & Chervin, 2014). Students at risk for academic failure with a GPA less than 2.0 were at higher risk for sleep disorders. Gaultney (2010) examined 1,845-college students' prevalence of sleep disorders by gender, age, and academic performance. Results demonstrated that 27% of students were at risk for a sleep disorder and students at risk were overrepresented among students with poor academic performances. Sleep disorders were prevalent among the college population and those students may also be at risk for poor academic achievement (Gaultney, 2010).

Baert, Omey, Verhaest, and Vermeir (2015) tested the relationship between sleep

and quality academic performance. The researchers measured the relationship between 804 college students' sleep quality using the Pittsburgh Sleep Quality Index. Results showed that improving sleep quality with one standard deviation leads to a 4.85 percentage point higher course grade (Baert et al., 2015). Pagel and Kwiatkowski (2010) investigated the association between self-reported sleep disturbance and academic performance. Participants in the study included 98 middle school students, 67 high school students, and 64 college students. The researchers concluded that college students reported sleep onset and insomnia as the most significant reported sleep variables associated with poor academic performance. Consistent with the college group, sleep disorders also significantly aligned with poorer school performance for the other groups; therefore, the study indicated that poor sleep negatively affects academic performance at different ages and across educational levels (Pagel & Kwiatkowski, 2010).

Y. J. Lee, Park, Kim, Cho, and Kim (2015) investigated 51 adolescent students who experienced sleepiness and sleep debt due to partial or chronic sleep deprivation and investigated independent predictors of academic performance. Participants self-reported sleep durations, levels of sleepiness, levels of depression and levels of impulsiveness along with their academic performance. The results of the study demonstrated that excessive sleepiness aligns with poor academic performance and that sleep debt predicts poor academic performance independent of depression, impulsiveness, and weekday sleep durations (Lee et al., 2015). Educating college students on the adverse effects of sleep deprivation has been shown to demonstrate improvements in sleep quality for a general population of college students (Kloss et al., 2011).

Sleep Deprivation in College Students

Sleep deprivation in university students is a global issue (Tsui & Wing, 2009). Of college students, 50%, in comparison to 36% of adolescents and adults, reported excessive daytime sleepiness (Hershner & Chervin, 2014). At least 3 days a week, 60% of students reported they were dragging, tired, or sleepy. The consequences of sleep deprivation and daytime sleepiness are especially problematic for college students and may result in lower GPAs, increased risk of academic failure, compromised learning, impaired mood, and increased risk of motor vehicle accidents (Ahrberg et al., 2012; Hershner & Chervin, 2014, p. 73). Sleep deprivation among college students can be physically harmful and a significant relationship exists between sleep deprivation and substandard academic performances (Abdulghani et al., 2012).

Up to 30% of college students reported chronic severe sleep difficulties including daytime sleepiness and insomnia (Pagel & Kwiatkowski, 2010). Habitual sleep loss is common; however, many students are unaware of the potential adverse health risks precipitated by accumulated sleep deprivation. Consequences of sleep deprivation for students who tend to sleep less than an average of 7 hours per night are profound, including decreased cognitive performance, decreased life satisfaction, increased mood disorders, increased somatic complaints, and increased interpersonal impairment (Kloss et al., 2011, p. 553).

Tsui and Wing (2009) performed a study associating sleep patterns and health risks of college students in Hong Kong. Their study comprised 620 full-time college students enrolled in a business program. Results demonstrated an increase in sleep deprivation, an increase in reported excessive daytime sleepiness, and an increase in

irregular sleep patterns. Additionally, they found an increase in reported psychiatric disturbances and perceived poor health in business students with sleep deprivation (Tsui & Wing, 2009). Regestein et al. (2010) researched the correlation between sleep debt and depression in 339 female college students. Researchers used stepwise logistic regression to interpret the results, demonstrating that students who reported less sleep along with excessive daytime sleepiness had a higher risk of reporting depression (Regestein et al., 2010). In a study by Pallos, Yamada, Doi, and Okawa (2004), a strong relationship emerged between Japanese graduate students enrolled in classes and an increased report of excessive daytime sleepiness. Furthermore, students had an increase in accidents reported as a result of sleep deprivation (Pallos et al., 2004).

Wong et al. (2013) performed a longitudinal study of 930 college students from Hong Kong, investigating the relationship among sleep, mood, academic functioning, physical health, and psychological health. Sleep directly related to mood, academic functioning, and physical health. Additionally, Wong et al. concluded that sleep disturbances and excessive daytime sleepiness were the strongest predictors of poor academic performance. Sleep deprivation has been shown to have a negative impact on a student's ability to focus, can lead to fatigue, and can interfere with daytime routines (Lund et al., 2010, p. 125). A study by Roberts, Roberts, and Duong (2008) collected data from 4,175 youths aged 11–17 and found that chronic sleep loss is a comparable burden to other psychiatric disorders due to its impact on mood, motivation, and social, physical, and psychological health. Lund et al. (2010) found that lack of sleep and disturbed wake patterns are noticeable in college students. Furthermore, poor sleep linked to poor physical health and poor academic performance. These studies supported the notion that

academic programs could benefit from implementing intervention programs for sleep enhancement in the college population.

Excessive Daytime Sleepiness and Medical Students

Due to significant levels of pressure, impressive workloads, and large amounts of stress, medical students worldwide often report sleepiness and the prevalence of sleep complaints higher than that of the general population (Abdulghani et al., 2012; Ahrberg et al., 2012; Azad et al., 2015, p. 70). Medical students are at potentially increased risk for cumulative sleep deprivation that has been associated with attention, memory, and learning deficits (Perez-Olmos & Ibanez-Pinilla, 2014). In a study of 413 medical students aged 19–33, researchers aimed to characterize nighttime and daytime sleep habits of medical students and to estimate how academic progress and workload aligned with reported sleep quality (Veldi, Aluoja, & Vasar, 2005). Participants completed a self-reported sleep and habits questionnaire and provided demographics and sleep and daytime habits. Veldi et al. (2005) concluded that complaints about sleep problems are common in young medical students.

A systematic random sample of healthy medical students at King Saud University of Saudi Arabia showed that the students with "average" performance reported they were sleepier during class and reported higher ESS scores compared to "excellent" students (Azad et al., 2015). "Excellent" performers reported earlier bedtimes and higher sleep duration during weekdays. Decreased nocturnal sleep time, late bedtimes during weekdays, and increased daytime sleepiness negatively aligned with academic performance in medical students (Azad et al., 2015).

The IOM compiled a report of research studies on the relationship between sleep

deprivation with clinical-performance deficits and medical error of medical students (as cited in Blum et al., 2011). The IOM (2009) released a report, entitled, "Resident Duty Hours: Enhancing Sleep, Supervision and Safety," which recommended new limits on resident physician work hours and workload and focused on quality improvements for residency training. A 35.9% reduction in errors resulted for medical interns by introducing an intervention schedule that eliminated extended work shifts and reduced the number of hours worked per week (Landrigan et al., 2004). In additional efforts to promote high-quality learning, foster a humanistic environment for graduate medical education, and support safety, the Accreditation Council for Graduate Medical Education (2003) established norms that set 80 as the maximum number of weekly work hours, with no more than 24 hours of continuous work activity, and shifts no more often than every 3 days (as cited in Blum et al., 2011).

Sleepiness and Nursing

To provide continuous care for patients and meet the demands of the healthcare system, the International Council of Nurses affirmed that the practice of shift work is necessary for nursing (Lin, Liao, Chen, & Fan, 2014). The impact of shift work on nurses and levels of sleepiness aligns with poor sleep quality and links to medical error, reduced alertness, and poor health (Hasson & Gustavsson, 2010; Ramadan & Al-Saleh, 2014; Smart & Wilson, 2013). Nurses have increased risk in their ability to maintain adequate levels of performance as a result of disrupted sleep and waking and disrupted circadian regulation resulting from shift-work schedules (Lin et al., 2014). Shift-work related sleep disturbances were comparable to those diagnosed with clinical insomnia (Elder, Wetherell, Barcay, & Ellis, 2014). Safety and prevention of medical errors has become a

public concern since the IOM (1999) released a report indicating that 44,000 Americans die each year from medical errors (as cited in Ramadan & Al-Saleh, 2014).

Kang, Miao, Tseng, Sithole, and Chung (2015) studied 40 nurses and the effects of shift work on circadian-activity rhythms. Nurses wore wrist actigraphs to monitor their activity and self-reported their total sleep time, sleep-onset latency, waking episodes, and total time spent in bed throughout the course of 7 days. Nurses also completed the Pittsburgh Sleep Quality Index, which is a tool that assesses sleep quality. Results indicated that nurses working night shifts had disturbed circadian rhythms on and off duty and may be subject to higher amounts of stress than nurses working the day shift. As a result of the findings, the researchers recommended that nurses improve their sleep hygiene to minimize stressful factors that interfere with their sleep when they are not working (Kang et al., 2015).

Smart and Wilson (2013) studied the differences and relationships among sleep and self-reported viral illnesses among 131 hospital nurses. A descriptive, cross-sectional study used a 10-item sleep questionnaire to measure nurses' sleep quality. Findings exhibited that night-shift nurses used more techniques to stay awake while at work than day-shift nurses; however, no differences emerged in reported viral illnesses from the two groups. Sleep disturbances are present among shift nurses working during the day and night; however, depending on the nurse's age, sleep disturbance was worse for night-shift nurses (Smart & Wilson, 2013). This study suggested that despite the inability to support an increase in viral illness for sleep-deprived nurses, nurses play a critical role in the healthcare-delivery system and nurses working the nightshift must be vigilant and cognitively available for the patients they serve.

Domen, Connelly, and Spence (2015) performed a study on 325 certified nurse anesthetists, discerning their frequency of self-reported fatigue, call-shift fatigue, and medical errors. Participants completed anonymous surveys providing information about their fatigue experience, call-shift length and frequency, errors in patient care, and use of measures to counteract fatigue. Study results demonstrated that 82% of the certified nurse anesthetists reported call-shift fatigue, 87% used a fatigue countermeasure, 77% used a fatigue-avoidance approach, and 28% reported a medical error as a result of tiredness (Domen et al., 2015, p. 129). The researchers advocated that the reported sleep experiences of participants were suboptimal and may have had adverse physical and psychological effects on practitioners, yielding a have detrimental impact on patients (Domen et al., 2015).

Employment Status and Academic Performance

It is not uncommon for college students to participate in paid work while enrolled in graduate programs, despite the impact employment may have on their academic performance. Of college students in the United States, 72% are employed part time and 20% work full time (Kavarana, 2015). Motives to obtain employment for students may include costs associated with studying, the desire to support current lifestyles, and the desire to enhance their curriculum vitae (Salamonson et al., 2012). Working less than 20 hours per week while enrolled in college courses can increase students' engagement, increase self-confidence, develop time-management skills, and improve academic performance (Miller, Danner, & Staten, 2008; Salamonson et al., 2012; Sander, 2012).

Rochford, Connolly, and Drennan (2012) conducted a cross-sectional study of undergraduate nursing students to develop a better understanding of the relationship of

employment to students' academic and clinical achievement and their educational experience. The researchers found that the majority of the students work part time for an average of 16 hours per week in healthcare. Study findings supported the concept that longer work hours (> 16) lowers academic performance and lessens the overall college experience, compared to students who either did not work or worked less than 16 hours. A direct relationship emerged between fewer hours worked and better academic performance (Rochford et al., 2012; Salamonson & Andrew, 2006). In comparison to Rochford et al., Teixeira et al. (2012) studied the sleep–wake cycle and perceived level of sleepiness of working male college students. The researchers collected a self-reported activity log from participants and participants wore actigraphs throughout the study. The researchers found no significant differences in sleep–wake cycles, but participants' perceived levels of sleepiness increased over evening school hours. As the trend in the literature shows, sleepiness tends to negatively impact cognition and academic performance.

Miller et al. (2008) studied the association between college students' work hours and binge drinking, sleep habits, and academic performance. A random sample of 903 participants responded to a questionnaire of self-reported health behaviors and hours worked per week. Students who worked more than 20 hours per week significantly aligned with those more likely to binge drink, sleep fewer hours, and report lower academic performance. Students that reported working less than 20 hours per week did not demonstrate a significant relationship between work, academic progress, and binge drinking.

Sleep and Well-being

Sleepiness can deleteriously impact an individual's state of physical and emotional health, supporting a strong link between poor psychological health and compromised sleep (Chasens & Olshansky, 2008; Ohayon & Vecchierini, 2005; Phelan, Love, Ryff, Brown, & Heidrich, 2010; Wells & Vaughn, 2012). Sleepiness can also impact an individual's ability to perform tasks related to basic needs and role obligations. Individuals who report fewer sleep disturbances report a better overall quality of life compared to those who report sleep problems (Hanson & Ruthig, 2012). Excessive daytime sleepiness negatively impacts activity levels, vigilance, general productivity, and social interactions (Chasens & Olshansky, 2008). Increasing evidence supports that measures such as quality sleep promote and maintain psychological well-being and can serve as protective measures to promote optimal well-being (Ryff, 2013).

Sleep is an essential component in maintaining positive psychological functioning, which, for this study, is conceptualized as psychological well-being (Phelan et al., 2010). Phelan et al. (2010) investigated changes in sleep quality in senior woman to determine if their psychological well-being was impacted by their sleep quality. Participants self-reported physical illnesses and psychological distress, defined as depression or anxiety. Sleep patterns did not decline for all women. Two groups of sleep quality emerged: good but declining and disrupted. Participants with higher levels of reported sleep quality also had higher levels of psychological well-being on the Ryff (2013) Scales of Psychological Well-Being, with fewer illnesses and lower depression scores (Phelan et al., 2010).

To further support the relationship between sleep quality and psychological well-being in adults, Hanson and Ruthig (2012) studied 489 adults and examined the

association between sleep quality and psychological well-being. Hanson and Ruthig defined psychological well-being as pertaining to positive emotions, negative emotions, and depression. Studies by Phelan et al. (2010) and Hanson and Ruthig (2012) positively supported the concept that better sleep quality results in higher levels of psychological well-being.

Sleep Research and the Epworth Sleepiness Scale

Sleep disturbances can be measured electrophysiologically, using polysomnography or through self-report survey questionnaires (World Health Organization, 2011). Epidemiological studies' "self-reported sleep disturbance" is the most easily measurable outcome indicator, because physiological measurements are costly, difficult to carry out on large samples, and may themselves influence sleep (Chellappa et al., 2009). The ESS is the most widely used self-administered questionnaire that offers a valid method to assess overall levels of sleepiness. It has been used on patients with various sleep disorders and has been translated and validated in several languages. The scale reports on sleepiness over a 1-month period, including active and passive situations of possible behavioral sleepiness.

Johns (1991) developed the ESS to provide a simple method to measure the general level of daytime sleepiness or sleep propensity in the adult population. The ESS instrument measures excessive sleepiness or excessive daytime sleepiness, differentiating between average sleep and significant issues with sleepiness that may require medical interventions. Measuring daytime sleepiness over various degrees of sleepiness, the ESS provides a simple, standardized method commonly used for clinical research and in clinical settings.

The ESS questionnaire identifies excessive sleepiness associated with accumulated sleep debt or clinical sleep disorders (Johns, 1991). This eight-item scale assesses how sleepy one has felt in the past 6 months; participants indicate the likelihood that they would fall asleep while doing certain activities (e.g., watching TV, sitting and talking to someone, or stopped at a traffic light), with responses from (0 = would never doze to 3 = high chance of dozing; Johns, 1992). Scores range from 0 to 24, with scores over 10 indicative of significant levels of daytime sleepiness. Internal consistency for the ESS, estimated by Cronbach's alpha, is .88 (Johns, 1992). To date, no other reliability testing of the tool is available.

Researchers who studied students' levels of sleepiness and academic performance have used the ESS. Abdulghani et al. (2012) performed a cross-sectional study of medical students seeking a relationship between daytime sleepiness and academic performance. The researchers based academic performance on students' cumulative GPA and determined daytime sleepiness using the ESS. Abdulghani et al. concluded that a significant relationship exists between daytime sleepiness, total sleep hours, and academic performance; additionally, medical students with higher GPAs had less daytime sleepiness. Johns (1992) and Menon, Karishma, and Mamatha (2015) used the ESS for their studies. Johns (1992) studied a group of medical students using the ESS, asking them to complete the ESS on two separate occasions over a 5-month period. Because the correlation between the two measurements was high, Johns (1992) concluded that ESS was a reliable test to measure daytime sleepiness. The Johns (1992) study was limited to healthy subjects (Nguyen et al., 2006).

Comparably, Menon et al. (2015) performed a cross-sectional study on 750

nursing students from two nursing colleges. Participants took a self-administered questionnaire of demographics along with the two sleep surveys: the ESS and the Pittsburgh Sleep Quality Index. Researchers looked at students' levels of sleepiness and sleep quality. Students with poor sleep quality had lower grades than their peers. Additionally, sleep quality and daytime sleepiness positivity correlated in that students with poor sleep quality had increased levels of daytime sleepiness and poor academic grades. Last, significant numbers of nursing students suffered from sleep loss (Menon et al., 2015). Notably, Johns (1992), Abdulghani et al. (2012) and Menon et al. (2015) used the ESS as a subjective tool for their studies since sleep is difficult to quantify and the ESS enables researchers to identify the prevalence of excessive daytime sleepiness.

Chapter Summary

Sleep is a vital function. The consequences of poor sleep quality such as sleep debt among university students may be detrimental for students' academic performance and psychological and overall health (Tsui & Wing, 2009, p. 167). Physiological changes that occur during sleep contribute to the conservation of homeostasis (Makic, Rauen, Watson, & Poteet, 2014). Circadian rhythms are the 24-hour-per-day night cycle that influences the quantity and quality of one's sleep; therefore, the more steady and consistent the circadian rhythm, the better a person sleeps (Forquer, Camden, Gabriau, & Johnson, 2008). Additional studies can assess if daytime sleepiness can impact academic performance and overall well-being in nursing students.

Researchers have shown a growing interest in sleep and the relationship it shares with overall health for night-shift workers, the effects of sleep debt in specific populations, and the adverse effects deficient sleep has on cognition. Excessive daytime

sleepiness may cause decreases in motivation, cognition, and function. These declines may result in poor productivity, increased risk factors for the occurrence of errors, and increased risk of injury (Ferreira & De Martino, 2012).

Upon completion of the review, a gap emerged in the published literature that described sleep practices of APN students. A broad literature review could not uncover any study that evaluated the relationship between sleep and academic performance for APN graduate students. APN students may be at high-risk for poor sleep quality due to the nature of their work and the rigorous clinical and academic demands placed on them through APN programs. Researchers have yet to determine if APN students' excessive daytime-sleepiness scores correlate with their academic performance. Information from this study discerned sleep problems and aimed to improve APN students' academic performance. Findings from this review will make APN educators and planners aware of the necessary steps to improve APN programs.

Chapter Three

Methods

The purpose of this study was to determine APN students' level of sleepiness and to correlate their level of daytime sleepiness with GPA, gender, and employment status. The following research question guided the study: Are levels of daytime sleepiness predicted by APN students' GPA, gender, and employment status?

GPA, gender, and employment were the predictor variables. The ESS (Johns, 1991) was the criterion variable used to measure general levels of sleepiness. The ESS differentiates between average sleep and significant issues with sleepiness that may require medical interventions.

Research Design

A quantitative nonexperimental, observational, correlational design was used (Bland, 2015; McCuster & Gunaydin, 2015). Correlational research is an objective, formal, systematic process that tests relationships between the predictors and the criterion (Carr, 1994; Creswell, 2014; Ingham-Broomfield, 2014; McCuster & Gunaydin, 2015; Polit & Beck, 2012). The ESS sleepiness scale was the instrument used to measure daytime sleepiness and to analyze if daytime sleepiness was predicted by an APN student's GPA, gender, and employment status (see Appendix B).

Specifically, a basic correlation design is limited to two variables where there is one predictor variable and one criterion variable. When there are multiple predictors, as was the case here, the basic design is extended to multiple correlation, which indicates

the combined relationship of the predictors with the criterion. When prediction is of primary interest, the design is further extended and called multiple regression. The results of a multiple regression design provides descriptive statistics, bivariate correlations among all the variables, the combined multiple correlation coefficient, and the regression weights used in the regression equation (Tabachnick & Fidell, 2007).

Research Assumptions

Participants voluntarily completed the ESS and provided demographic information. It was assumed that the ESS measured levels of sleepiness because it was shown to be valid and reliable in previous research (Johns, 1992; Kendzerska et al., 2014; Smyth, 2007). Therefore, it was assumed that participants would view the questions on the scale in similar ways. Demographic information was also collected and it was assumed that the self-reporting of gender, GPA, and employment status was reported accurately and participants were truthful in their responses.

Setting

A large public university in Miami, Florida, that has been designated a top-tier research institution, provided the setting. The university has undergraduate and graduate programs and is an urban, multicampus university committed to research, excellence in teaching, and collaborative engagement with local and global populations. The university offers students more than 80 graduate programs. This study focused on participants in APN graduate programs. APN programs have four specializations and post-Master of Science in Nursing certificate tracks (adult-gerontology, pediatric, family, and psychiatric/mental health), nursing-education graduate certificates, and foreign-education physicians registered nurse/master of science degrees in the nursing track. Students in the

family, adult-gerontology, pediatric, and psychiatric/mental health tracks in the students' 2nd year of the program were recruited.

Sampling Plan

A nonprobability sampling approach was used (Bland, 2015; Creswell, 2014; Ingham-Broomfield, 2014; Waltz, Strickland, & Lenz, 2010). Specifically, a convenience sample was used to recruit participants. The strength of using this sampling method is that it allowed recruitment of APN participants and ensured every variable was likely to be included in the sample (Ingham-Broomfield, 2014). A weakness inherent to using a nonprobability-sampling design is diminished external validity in that results may not represent all graduate nursing APN programs. Thus, these results may not be used to generalize to the entire APN graduate nursing program population (Creswell, 2014; Ingham-Broomfield, 2014).

Eligibility Criteria

Participants were 2nd-year actively enrolled APN students in the adult-gerontology, pediatric, family, and psychiatric/mental health tracks.

Exclusion Criteria

Exclusion criteria included that students were not actively enrolled in the 2nd year of the APN program, students with a diagnosed sleep disorder, and students who did not believe they could provide honest answers or commit the time to answer the questionnaire.

Determination of Sample Size: Power Analysis

Power analysis in statistics indicates the probability of finding statistical significance and avoiding Type 11 error (Creswell, 2014; Tabachnick & Fidell, 2007;

Trochim, 2006). Statistical significance is almost completely dependent on the number of participants in the study. Multiple regression was the primary statistical analysis used to predict levels of sleepiness and the primary statistic employed where daytime sleepiness was the criterion and GPA, gender, and employment were the predictors. A power analysis (G*Power) for multiple regression based on the three predictors resulted is an estimated sample size of approximately 77 participants needed, based on a medium effect size ($f^2 = .15$), at the .05 level of probability ($\alpha = .05$), and power of .80. The symbol f^2 for multiple regression/correlation effect size is analogous to .30, often used to indicate a medium effect size for bivariate correlation when estimating sample size. Thus, the estimated sample size was met ($N = 123$). The odds were at least 80 to 20 that an f^2 of .15 or greater would be statistically significant.

To ensure adequate power, more than 100 participants were recruited. This not only increased the power of the statistic but also considered the possibility of unusable or incomplete participant data. Oversampling ensures that enough eligible participants perform the study and aids in minimizing the margin of sampling error.

Protection of Human Subjects

Every effort to maintain participants' anonymity and confidentiality was undertaken. All participants were treated equally and fairly. Approval was granted from the Institutional Review Boards at Nova Southeastern University and the participating institution prior to beginning the study. Minimal risk to participants was expected; therefore, an Adult Verbal Consent to Participate in a Study was obtained. Participation for the study was voluntary and participants had the choice to decline to participate or leave the study at any time. The data were aggregated and reported as descriptive

statistics (i.e., means, standard deviations, and frequencies) along with the bivariate correlations among GPA, gender, employment status, and the sleepiness scale. The multiple correlation and predictor beta weights were reported as results from the regression analysis.

Risks and benefits of participation. No health or safety-related risks accrued to participants. No participants expressed any concerns about their levels of sleepiness. Risks such as loss of privacy or breach of confidentiality were minimized because no identifying information was collected. Benefits of participation included expanded knowledge about APN students' levels of sleepiness.

Data storage. All printed data was saved in a locked file cabinet that only the principal investigator could access in the principal investigator's personal office. Electronic data are stored and managed in a secure manner. All data will be securely maintained for 3 years, after which data will be shredded and computer files erased. All computers that contain any data are password protected. The primary investigator is the only person with access to hard copy or electronic data.

Procedures

Institutional Review Board approvals were granted and 2nd-year APN students were recruited to participate in the study. The survey administrator obtained study materials from the principal researcher prior to the start of the class. The survey administrator completed Collaborative Institutional Training Initiative training prior to participation. Participants were recruited during one of their face-to-face on-campus class periods during the semester. The survey administrator distributed packets to all students during the first 15 minutes of class, which allotted enough time for students to complete

the survey.

The principal investigator prepared the study packets for the instructor to distribute. Each packet consisted of a sealable envelope, an Adult Verbal Consent to Participate in a Study with clearly stated procedures, and a survey tool including the demographic questionnaire and the ESS (see Appendices A, C, and D). Interested participants were first presented with information about the study that was also enclosed in the packet, the risks and benefits of the study, and that by proceeding to answer questions, they were giving consent to participate in the study. It was clearly stated in their study packet and stated by the instructors that participation was voluntary and no consequences would accrue, either positive or negative, if they opted not to participate. All procedures were clearly explained to participants, including the type of scale that was administered and the amount of time required for completion (see Appendices E and F).

Once all participants completed their packets and placed them in the container, the survey administrator sealed the container. The survey administrator gave the principal investigator the container with the sealed packets. The participants had the option to return the survey without completion because packets were distributed to the entire class.

Instrumentation

Epworth Sleepiness Scale

Permission was sought and granted to use the ESS (see Appendix F) The ESS was first published in 1991 by Johns (see Appendix B). The ESS measures sleepiness and is commonly used in sleep research and clinical settings (Kendzerska et al., 2014). The respondents self-reported on a 4-point Likert scale how likely they would be to doze in eight different situations. The eight situations involved various activity and participation

levels, body positions, and eye closure (Johns, 1991) with responses as follows:

0 = would never doze

1 = slight chance of dozing

2 = moderate chance of dozing

3 = high chance of dozing

Total scores were the sum of all the item responses and ranged between 0 and 24; the higher the score, the higher the person's level of daytime sleepiness.

The demographic questionnaire was a set of four questions used as predictor variables (see Appendix C). Participants were asked to identify their gender, GPA, and employment status. They also indicated how many hours they currently worked per week.

Reliability. To ensure rigor, it was important that measurement scales were psychometrically sound. Reliability refers to the extent to which an instrument measures an attribute consistently (DeVon et al., 2007). Johns (1992) reported that the ESS has a high level of internal consistency, measured by Cronbach's alpha (.88). According to Smyth (2007), the internal consistency between the eight items in the ESS, as measured by Cronbach's alpha**,** ranged from .74 to .88 in a sample of adults with various sleep disorders. Kendzerska et al. (2014) reported a test–retest reliability of 0.82 between two administrations of the ESS over a 5-month time period (Kendzerska et al., 2014). The ESS was reliable; part of the analysis determined and confirmed reliability, based on the sample.

Validity. Evidence supporting the construct validity of the ESS was shown by Miletin and Hanly (2003) in a study on treating patients for sleeping disorders where the ESS was administered before and after treatment. ESS scores decreased from the pretest

(M = 15, SD = 6) to the posttest (M = 7, SD = 5). The difference was statistically significant ($p < .001$) indicating support for the ESS as a measures of sleep propensity. Further evidence, according to Johns (1994), for construct validity emerged where the ESS showed a moderate correlation with the Multiple Sleep Latency Test (r = -.37), which is another measure of sleep deprivation. In studies where the ESS correlated with other measures of health-related attributes, correlations ranged from -.51 to -.43 (Miletin & Hanly, 2003). These correlations were in the expected direction and tend to support the construct validity of the ESS.

Face validity refers to the appearance of the instrument to the respondent (Bland, 2015; Creswell, 2014; DeVon et al., 2007). Face validity is vital because when participants attempt to fill out the ESS, it is important that the test appears to measure what it claims to measure, so participants will be more apt to respond. It is important that measuring tools such as the ESS have face value to increase subject-response rates. Face validity does not necessarily indicate that a scale is valid or measures what it is intended to measure; it must appear to laypersons as a reasonable test to measure levels of sleepiness.

In summary, the reliability and validity of the ESS has enabled the tool to gain acceptance worldwide to measure levels of sleepiness in adults. In a study by Johns (1998), the ESS showed the greatest ability to discriminate narcoleptics and those without daytime sleepiness. Using the standard cutoff score of greater than 10, the ESS had a sensitivity of 93.5% and specificity of 100% (Johns, 1998). The sensitivity of the ESS refers to its ability to correctly identify individuals with excessive daytime sleepiness. The specificity of the ESS refers to its capacity to correctly identify individuals without

excessive daytime sleepiness.

General Statistical Strategy

Data Management and ESS Scoring

At the completion of data collection, the packets were coded numerically from one through the number of participants (*N*). The code number and the item-by-item responses to the ESS, GPA, gender, and employment for each participant were entered into a software package (IBM SPSS version V22, 2013). The code number made it possible to refer back to a specific raw data packet in the event it was necessary during the data-entry procedure. This was important so in the event a data-entry error was made, the primary investigator could correct it in the SPSS file. The participants' GPA was entered as given. Gender was coded as 0 = female and 1 = male. Employment was coded as 0 = not employed and 1 = employed, and the hours-per-week data were entered. For those who indicated they were employed, a follow-up question asked for the number of hours per week, which was entered into the form. If a participant did not provide an answer to a particular item, a "99" was entered for that item, which indicated it was a missing response. During the subsequent data-screening process, the missing responses were addressed by replacing a missing response with the mean for those participants who did respond to the item (Tabachnick & Fidell, 2007).

Summing responses to the eight items provided the ESS score (see Appendix G). Based on the scale of 0 to 3 the lowest score possible was 0 and the highest score possible was 24. At the completion of ESS scoring, the dataset contained the packet code number, the item-by-item responses to the GPA, gender, employment, the eight ESS items, and the ESS total score for each participant. The reliability (Cronbach's alpha) of the eight-

item ESS was obtained as part of the scoring procedure.

The data were cleaned according to the assumptions underlying multiple regression: normality, linearity, and homoscedasticity (Tabachnick & Fidell, 2007). The data-cleaning procedure first consisted of the researcher performing a visual inspection of a printed data file and inspecting and editing the data for coding problems prior to analysis (Polit & Beck, 2012). Frequency distributions and histograms of the data were used to detect outliers (Polit & Beck, 2012). If violations were found that could have unduly affected the statistical results, they were to be corrected using common recommendations (Tabachnick & Fidell, 2007) or considered in the interpretation of the results.

Data Cleaning

Once the data were entered and were complete for each participant, following the above procedures, the GPA and ESS scores were cleaned for extreme values (outliers) that might excessively influence the overall statistical results. Cleaning was done by converting the GPAs and ESS scores to standardized *z*-scores where the mean was 0 and the standard deviation was 1. An outlier was defined as a *z*-score of 3.29 standard deviations above or below the mean 0, which would place it in the extreme upper or lower portion of the distribution. In the event outliers were found, they would have been adjusted according to one of the procedures recommended by Tabachnick and Fidell (2007).

Descriptive Statistics

Descriptive statistics were reported for GPA, gender, employment, and ESS. GPA and ESS were continuous variables. Thus, the statistics reported were the mean, median,

and standard deviation. Gender and employment were dichotomous variables, with statistics reported as frequencies and percentages. The mean, median, and standard deviation was reported based on the number of hours per week for those who indicated they were employed.

Reliability Testing

The reliability for ESS was obtained using Cronbach's alpha procedure, which is an indicator of the internal consistency of the responses to the items that make up an instrument. A reliability of .70 or greater is generally considered adequate (Nunnally & Bernstein, 1994). To obtain reliability for a measure, it must have two or more items. GPA, gender, and employment are single-item measures. Thus, reliability could not be obtained.

Research Question and Hypotheses

The overall guiding research question is repeated below. Because the study had three predictors, hypotheses are provided for each predictor.

RQ: Are levels of daytime sleepiness predicted by APN students' GPA, gender, and employment status?

H_{01}: GPA is not a significant predictor of daytime sleepiness.

A Pearson product moment correlation was used to test the null hypothesis (H_0). The .05 level of probability was used as the benchmark to interpret statistical significance.

H_{a1}: GPA is a significant predictor of daytime sleepiness.

H_{02}: Gender is not a significant predictor of daytime sleepiness.

A Pearson product moment correlation was used to test the null hypothesis (H_0). The .05 level of probability was used as the benchmark to interpret statistical significance.

H_{a2}: Gender is a significant predictor of daytime sleepiness.

H_{03}: Employment status is not a significant predictor of daytime sleepiness.

A Pearson product moment correlation was used to test the null hypothesis (H_0). The .05 level of probability was used as the benchmark to interpret statistical significance.

H_{a3}: Employment status is a significant predictor of daytime sleepiness.

A Pearson product moment correlation was used to test each null hypothesis (H_0). The .05 level of probability was used as the benchmark to interpret statistical significance.

Statistical Analysis

To examine the research question and hypotheses, a multiple regression analysis was performed. Multiple regression is a statistical method used to analyze the strength of the relationship between a set of predictor variables and a dependent outcome variable defined as the criterion (Tabachnick & Fidell, 2007). The overall relationship is represented by the multiple correlation coefficient (R). R is the combined correlation of the individual bivariate correlations (r) with the criterion. The squared multiple correlation coefficient (R^2) is of most interest and is the indicator of the strength of the relationship. R^2 can range from .00 to 1.00. An R^2 of .00 would show that the predictors and criterion share zero of their variance whereas an R^2 of 1.00 would indicate that 100% of their variance is shared. The $f^2 = .15$ used in the section above on estimating sample size is closely related to R^2 and is referenced as a medium effect size. Thus, if an R^2 of approximately .15 or greater was obtained, it would indicate that GPA, gender, and employment share about 15% or more of their variance and will be considered medium in strength.

Although the multiple correlation and squared multiple correlation provide

indicators of how the predictors relate to the criterion when combined, for prediction purposes, each individual predictor is assigned a regression weight associated with its contribution to the overall combined correlation. The resulting regression-prediction equation is based on the weights of each predictor. In addition to the multiple and squared correlation coefficients and the regression weights, the statistical analysis also provided the bivariate correlations between each predictor and daytime sleepiness, measured by the ESS scale. As described above, the descriptive statistics were obtained as part of the overall analysis and reported in conjunction with the correlation/regression results.

Threats to Internal Validity

Internal validity refers to experimental threats, treatments, or experiences of participants that may threaten the ability to draw inferences from the data set of a study (Bland, 2015; Creswell, 2014). It is important to control possible confounding variables in a study because of the risk of potential inaccurate explanations that account for cause and effect relationships (Halperin, Pyne, & Martin, 2015). Because this study attempted to investigate the relationship between APN students' levels of sleepiness and academic performance and sought to discover the cause and effect relationship between the variables, internal validity was relevant (Creswell, 2014). Self-selection is a threat to internal validity. Because levels of sleepiness may change over time, temporal ambiguity is also a threat to interval validity.

Threats to External Validity

Potential threats to external validity or generalizability refer to how researchers make inferences based on a study's results and generalize the outcomes to a larger population (Creswell, 2014). Generalizability entails a larger picture of understanding of

whether the research results can be placed into the context of larger or similar populations, geographic locations, settings, and time (Pearce, Christian, Smith, & Vance, 2014). Generalizations from this study could extend to APN students with similar demographics. A threat to external validity inherent to this study is the requirement for study participants to meet the eligibility requirements that include current enrollment as 2nd-year APN students. Given the requirement that participants must be enrolled in one APN program may limit generalizability. Due to the scarcity of research examining levels of sleepiness and academic performance of APN students, future research will be necessary to examine the outcomes for different populations.

Chapter Summary

The chapter described the methodology that was used for this study. This study attempted to discover predictors of APN students' levels of sleepiness and academic performance, gender, and employment status. Results from this study assessed and investigated any significant correlations between the independent variables and the dependent variables presented in this study. This chapter included the problem statement, the hypotheses, a description of the ESS, the participant-recruitment plan, assumptions, limitations, and ethical assurances for this study. Additionally, procedures to determine descriptive statistics, reliability testing, and statistical analysis were included in the chapter.

Chapter Four

Results

The purpose of the study was to examine the relationship between daytime sleepiness as it relates to GPA, gender, and employment status. Daytime sleepiness was measured by the ESS. Bivariate correlation and multiple regression were used as the primary statistical analyses. In addition, effect sizes are provided in conjunction with the statistical significance results. This chapter provides a description of the sample, the procedures used to obtain and prepare the data for analysis, and the results of the statistical and effect-size analyses.

The overall guiding research question for this study was: are levels of daytime sleepiness predicted by APN students' GPA, gender, and employment status? The specific research question and hypotheses are provided as part of the regression results.

Data Management, Screening, and Scoring

The data were collected as described in Chapter 3 and packets were collected from 125 APN participants. The eight ESS item-by-item responses, GPAs, gender, and employment status were entered into an Excel spreadsheet. The spreadsheet was converted to SPSS for subsequent data-management procedures and the statistical analysis.

Screening showed that one participant did not respond to any of the items and was removed from the dataset. Another participant did not respond to the question on gender and was also removed from the spreadsheet. This left the number on which the analysis

was conducted at 123. The sample size was considerably larger than the 77 estimated by the power analysis for power of .80 and increased the power to .96.

The data were then screened for missing responses on individual items. Overall, for the 123 participants, only two missing responses emerged on the ESS. These responses were replaced by the means based on those that that did respond to the items. One participant did not provide a GPA, which was replaced by the mean of the other participants (Tabachnick & Fidell, 2007). The ESS was then scored by summing the responses to the eight items. The lowest score possible could be 0 and the highest score 24 where the higher the score the greater the tendency for daytime sleepiness.

Statistical Assumptions

Outliers

The ESS and GPA were screened for univariate outliers (high or low extreme values) that could unduly influence the statistical results. This was done by converting the GPAs and ESS values to standardized *z*-scores where the mean is 0 and the standard deviation is 1. An outlier was defined as a *z*-score of 3.29 standard deviations above or below the mean of 0, which would place it in the extreme upper or lower 1% of the distribution (Tabachnick & Fidell, 2007). No univariate outliers were found, based on observation of Mahalanobis distances, Cook's distances, and leverage values (Tabachnick & Fidell, 2007).

Screening for multiple regression assumptions included the identification of multivariate outliers and multicollinearity as well as independence of errors, multivariate normality, linearity, and homoscedasticity of residuals. No multivariate outliers were found, based on observation of Mahalanobis distances, Cook's distances, and leverage

values (Tabachnick & Fidell, 2007).

Multicollinearity and Singularity

In regression multicollinearity happens when two or more predictor variables are too highly correlated (i.e. > .80). Similarly, singularity occurs when two predictor variables are highly correlated because they each measure the same construct making one or more of the variables redundant. Multicollinearity or singularity was not an issue since the intercorrelations among the predictors were well below .80 (Tabachnick & Fidell, 2007). Tolerance is another statistic that can be used to assess collinearity. If tolerance is less than .20 a problem is indicated (Tabachnick & Fidell, 2007). For this data the tolerance levels for the three predictors were not above .90; therefore, providing further evidence that multicollinearity or singularity was not an issue.

Multivariate Normality, Linearity, and Homoscedasticity

These three assumptions were evaluated simultaneously through the analysis of a standardized residual scatterplot depicted in Figure 3. The residuals are the differences between the actual and predicted values showing errors in prediction. The X-axis shows the standardized residuals. The assumptions are met if the residuals have a straight line relationship with the predicted values, are normally distributed around the predicted values, the shape of the scatterplot is rectangular, and the correlation between the residuals and predicted values is zero (Tabachnick & Fidell, 2007). Examination of the scatterplots indicates that the assumption of normality was met in that the plots are scattered approximately equally above and below the line (see figure 3). The plots are rectangular which indicates that the assumption of linearity was met. Had linearity not been met the plots would show a curvilinear trend rather than rectangular. If the

assumption of homoscedasticity was not met the plots would spread out in a fan-like shape (Tabachnick & Fidell, 2007).

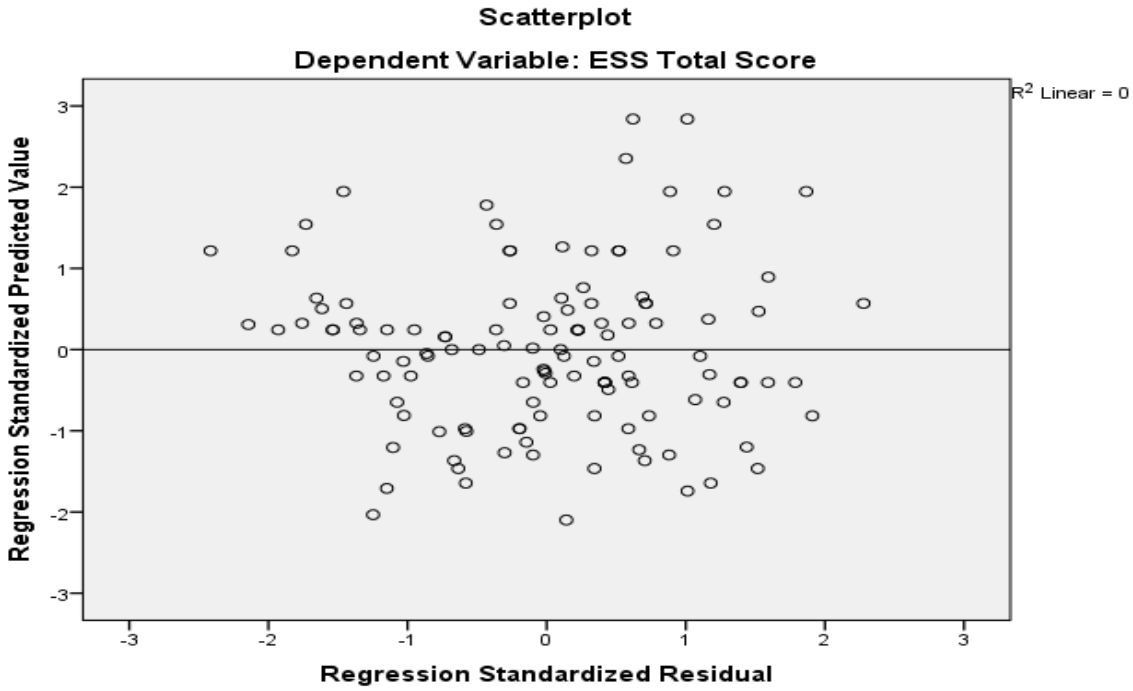

Figure 3. Scatterplot for regression assumptions for multivariate normality, linearity, and homoscedasticity.

Independence of Residuals

This assumption is that the participants' errors in prediction are not related or correlated with one another and are independent and was tested using the Durbin-Watson statistic. The assumption is met if the statistic is near 2.0 (Tabachnick & Fidell, 2007). For this data the value was 2.12; therefore, indicating that the assumption was met.

Results

Descriptive Statistics

The purpose of this survey study was to investigate APN students' level of sleepiness and to correlate their level of daytime sleepiness with grade-point average (GPA), gender and employment status. Table 1 provides the descriptive statistics and the

correlations among the variables. For the ESS, the mean of 10.49 indicates that, as a group, participants expressed a slight to moderate tendency for daytime sleepiness given the eight situations to which they responded on the ESS (see Appendix G). While the mean shows the overall group average, the standard deviation shows how the individual participants tended to vary. The standard deviation of 5.28 indicates that there was considerable variation among participants on an individual basis. The class in which the study was conducted was limited to students with GPAs of 3.0 or greater. As a group their mean GPA (M = 3.71, SD = .26) was toward the higher side where 4.0 could be the highest value.

The reliability for ESS was obtained using Cronbach's alpha procedure, which is an indicator of the internal consistency of the responses to the items that make up an instrument. A reliability of .70 or greater is generally considered adequate (Tabachnick & Fidell, 2007). ESS reliability was obtained (Cronbach's alpha = .82) and considered adequate. This is consistent with reliability coefficients calculated in other studies (Kendzerska et al., 2014).

Table 1

Means, Standard Deviations, and Intercorrelations for Daytime Sleepiness and Predictor Variables (N = 123)

Variable	*M*	*SD*	1	2	3
ESS	10.49	5.28	-.24*	-.07	.14
Predictor variables					
1. GPA	3.71	.26	—	-.18*	-.11
2. Gender	.34	.48		—	.07
3.Employment	.80	.40			—

Note. ESS = Epworth Sleepiness Scale, GPA = grade-point average, *p < .05, ESS reliability = .82 (Cronbach's alpha).

Data Management

Regression assumes that the predictor and criterion variables are continuous. When categorical variables are used as predictors they can be can be treated as continuous in order to meet the regression assumption by scoring them as either 0 or 1. This scoring indicates either the presence or absence of a characteristic or trait and referred to as "dummy" coding (Tabachnick & Fidell, 2007). The assumption was met for gender by coding female = 0 and male =1. For employment, those who were not employed were coded as 0 and those that were employed were coded as 1. Of the 123 participants 42 (34%) were men and 81 were women. While all students are enrolled full time at the university, for employment, 98 (80%) participants were employed and 25 not employed.

Statistical significance alone provides no information about the importance of a correlation between variables regardless of whether the correlation is statistically significant. In contrast, effect size indicates the importance of a correlation, disregarding whether the correlation is statistically significant and recommended to be reported in conjunction with statistical significance (American Psychological Association, 2010). For correlation, the correlation coefficient itself can be interpreted as an effect size (Cohen, 1992). A correlation coefficient is often also squared as an indicator of the shared variance between two variables. The resulting value is referred to as the coefficient of determination. An r^2 equal to 1.00 would indicate that two variables share 100% of their variance and by knowing the performance on one variable the second variable could be perfectly predicted. On the other hand a correlation of 0.00 would indicate that the two variables shared 0% of their variance and by knowing performance on one would provide

no information about performance on the other. The squared coefficient is considered as an indicator of the strength or magnitude of a relationship and the shared variance is labeled as an effect size. Commonly used guidelines for interpreting the correlation coefficient as effect size were suggested by Cohen (1992). The guidelines use the actual correlation coefficients and not the squared coefficients. For this study Cohen's guidelines were modified by squaring the suggested actual correlations. The results are reported using both shared variance and effect size as follows: r^2 = .01 (small effect), r^2 = .09 (medium effect) and r^2 = .25 (large effect) (Cohen, 1992).

The overall guiding research question is repeated below. Because there were three predictors, hypotheses are provided for each predictor. Pearson product moment correlation was used to test each null hypothesis (H_0) with the .05 level of probability used as the benchmark to interpret statistical significance.

RQ: Are levels of daytime sleepiness predicted by APN students' GPA, gender, and employment status?

H_{01}: GPA is not a significant predictor of daytime sleepiness.

H_{a1}: GPA is a significant predictor of daytime sleepiness.

H_{02}: Gender is not a significant predictor of daytime sleepiness.

H_{a2}: Gender is a significant predictor of daytime sleepiness.

H_{03}: Employment status is not a significant predictor of daytime sleepiness.

H_{a3}: Employment status is a significant predictor of daytime sleepiness.

Hypothesis 1

The three correlations shown in the first row in Table 1 were used to statistically test the three null hypotheses as well as show the effect sizes as represented by the

correlation coefficients. The ESS and GPA were negatively correlated and statistically significant (r = -.24, p < .05). This indicates that as the tendency for sleepiness increased GPA decreased. Thereby the null hypothesis (H_{01}) that GPA was not a predictor of sleepiness was rejected supporting the alternative hypothesis (H_{a1}) for GPA being a predictor of sleepiness. The correlation of .24 when squared indicates that the GPA and ESS measures shared approximately 6% of their variance. Using the guidelines this can be can be interpreted to mean that the relationship was small with respect to magnitude of importance or strength. As noted above, enrollment in the class was limited to students with GPAs of 3.0 or higher. This restricted the range of GPAs from 3.0 to 4.0. When correlation is computed from values with restricted range, the coefficient is lower than if it were computed from values with unrestricted range; therefore, had the class been open to students with GPAs less than 3.0, the correlation and effect size would likely have been higher.

Hypothesis 2

The null hypothesis (H_{02}) that gender is not a predictor of sleepiness was supported statistically (r = -.07, p > .05). That is, the null hypothesis was not rejected statistically showing no statistical support for the alternative hypothesis (H_{a2}) that gender would be a predictor of sleepiness. The shared variance was near zero (r^2 = .004) indicating that the effect size was nil.

Hypothesis 3

For employment the null hypothesis (H_{03}) was not rejected (r = .14, p > .05) indicating no statistical support for the alternative hypothesis (H_{a3}) that employment is a predictor of sleepiness. Conversely, those who were employed did tend to show greater

daytime sleepiness. The correlation of .14 squared shows that the shared variance was approximately 2% and from an effect size perspective can be considered small.

Although not the focus of this study, the correlation between gender and GPA indicated that women tended to have higher GPAs (r = -.18, p < .05). With respect to the relationship between employment and GPA, participants who were not employed tended to have higher GPAs (r = -.11, p > .05).

Table 2 shows the results of the multiple regression analysis. Whereas the correlations shown in Table 1 are bivariate correlations between each of the variables and ESS, the multiple-regression procedure produces the multiple correlation (R), which is the combined correlation between the predictors with ESS. For these data, sequential multiple regression was employed (Tabachnick & Fidell, 2007). In sequential regression, the predictors are entered in steps. This allows observation of how each predictor contributes to their overall combined correlation with the criterion.

Table 2

Sequential Regression Analysis Summary for GPA, Gender, and Employment for Predicting Daytime Sleepiness (N = 123)

Step	Predictor variable	R	R^2	Incremental R^2	β
1	GPA	.24*	.06*		-.24*
2	Gender	.26*	.07*	.01	-.12
3	Employment	.29*	.08*	.01	.12

Note. GPA = grade-point average, *p < .05.

Because there were three predictors (GPA, gender, and employment) three steps are shown in the table. GPA was entered as the first step. Being the first step, its correlation with ESS was .24, the same as the bivariate correlation. The squared multiple correlation coefficient (R^2) is of most interest and is the indicator of the strength of the

relationship and represents the effect size of the relationship. Step 2 added gender and when combined with GPA, *R* increased from .24 to .26 and R^2 increased by .01 from .06 to .07. When employment was entered as the last step, *R* increased from .26 to .29 and R^2 from .07 to .08. The asterisk indicates that *R* and R^2 were statistically significant, mostly due to the correlation between GPA and ESS.

The squared multiple correlation (R^2) indicates the shared variance between the ESS and the predictor variables. Cohen (1992) suggested rules of thumb for interpreting shared variance for multiple correlation where R^2 = .02 (small effect), R^2 = .15 (medium effect), and R^2 = .35 (large effect). For this analysis the R^2 of .08 indicates that the shared variance can be considered between small and medium with respect to magnitude or importance. The column labeled Incremental R^2 shows how much R^2 increases as predictors are added after the first step. It may be seen in Step 1 that R^2 for GPA was .06. When gender was added (Step 2) the R^2 increment was .01. Likewise, the addition of employment increased R^2 by .01. As shown in the last column, (β) neither of the increments was statistically significant. Therefore, because the increments for gender and employment increased only slightly when combined with GPA, most shared variance was due to the relationship between GPA and ESS.

Although the multiple correlation and squared multiple correlation provide indicators of how the predictors relate to the criterion when combined, for prediction purposes, each individual predictor was assigned a regression weight (β) associated with its contribution to the overall prediction equation. Although the prediction equation was not the objective of this study per se, the standardized weights are shown in the last column. Because the weights shown are standardized, they can be compared directly with

respect to their contributions. GPA would have twice the weight of gender or employment (i.e., .24/.12 = 2), whereas gender and employment would have equal weights. From the perspective of statistical significance, only GPA was significant. However, disregarding statistical significance, gender and employment would contribute slightly to the prediction equation.

Whereas the results provided in Tables 1 and 2 are based on the total ESS score, Table 3 summarizes how the participants responded to each of the eight ESS items. Although reporting the item-by-item descriptives provided in the table is not essential in respect to the understanding the overall results using the ESS total score they are informative and their rankings probably of interest and will make sense to most readers. The participants responded to the ESS using the following directions:

How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired? Even if you haven't done some of these things recently, try to figure out how they would have affected you.

0 = no chance of dozing

1 = slight chance of dozing

2 = moderate chance of dozing

3 = high chance of dozing

Table 3 shows the mean, mode, and range of responses to each item ranked according to most likely to least likely to doze. Lying down to rest in the afternoon was responded to as the most likely situation indicating that on the 4-point scale that the likelihood of dozing was moderate to high (*M* = 2.3). The mode (*Mo*) shows which of the four options was chosen most often and it can be seen that a high chance of dozing (3)

was selected most often for that situation. Reading down through the situations it can be seen that dozing was least likely in the sitting and talking to someone situation (M = .4) with no chance of dozing selected most often (Mo = 0). While the means and modes show the group averages and most often selected options the ranges indicate that there was variability in that each of the options 0 through 3 were selected by some participants for each situation.

Table 3

ESS Item Summaries Ranked by Most Likely to Least Likely to Doze (N = 123)

Situation	*M*	*Mo*	Range
Lying down to rest in the afternoon when circumstances permit	2.3	3	0–3
Sitting and reading	1.7	2	0–3
Watching TV	1.6	2	0–3
As a passenger in a car for an hour without a break	1.3	1	0–3
Sitting quietly after a lunch without alcohol	0.9	0	0–3
Sitting inactive in a public place (e.g., a theater or a meeting)	0.7	0	0–3
In a car, while stopped for a few minutes in traffic	0.4	0	0–3
Sitting and talking to someone	0.4	0	0–3

Summary

Bivariate and multiple regression were employed to examine the relationship between GPA, gender, and employment status with daytime sleepiness on a sample of APN students (N = 123). Results showed a statistically significant negative correlation between daytime sleepiness and GPA indicating that lower GPAs tended to align with greater daytime sleepiness. Although not statistically significant, those participants who were employed reported greater daytime sleepiness, as did women. Viewed as effect sizes, the correlation between GPA and daytime sleepiness can be considered medium in importance, whereas the correlation between employment and daytime sleepiness can be

viewed as small to medium in magnitude. Although women tended to report greater daytime sleepiness, the correlation was small in magnitude. When GPA, gender, and employment were combined, the multiple correlation showed a statistically significant shared variance of 8% with daytime sleepiness, due primarily to the correlation between GPA and daytime sleepiness. From the perspective of effect size, the shared variance can be considered between small to medium with respect to importance or magnitude. The next chapter discusses these results further.

Chapter Five

Discussion and Summary

Summary of the Findings

This study aimed to determine APN students' level of sleepiness and to investigate the relationship of daytime sleepiness to GPA, gender, and employment status. This concluding chapter presents a discussion of the study findings, a comparison of findings to those of other researchers, implications for nursing education, practice, research, and policy, and the limitations of the study.

This research built on the theoretical framework of the PWB model. The PWB model proposes (Ryff, 1989; Ryff & Keyes, 1995) six components of positive functioning and eudemonic well-being: (a) autonomy, (b) environmental mastery, (c) personal growth, (d) purpose in life, (e) self-acceptance, and (f) positive relations with others. According to Ryff (2013), well-being links to life situations and fluctuates across adult development. Increasing evidence supports health-promoting behaviors such as sleep to foster optimal psychological well-being and overall health (Brown et al., 2012; Goel et al., 2014; Ryff, 2013). This study examined sleep as the resource or the vigor needed to manage and work toward important goals.

Integration of the Findings With Previous Literature

Results obtained from this study were compared to previous research findings. Because this is the first research study to explore daytime sleepiness of APN students and its relationships to GPA, gender, and employment status, the results were compared to

other studies in the literature, seeking to predict relationships of daytime sleepiness. The study results produced many similarities that are consistent with the current literature.

Excessive Daytime Sleepiness and Academic Performance

Throughout educational institutions and sleep literature, educators and researchers use examination scores and grades to measure academic performance. Results from this study supported the literature with respect to the relationship between daytime sleepiness and GPA. Results from Hershner and Chervin (2014) reported students who obtained more sleep (long sleepers, more than or equal to 9 hours) had higher GPAs than short sleepers (less than or equal to 6 hours): GPAs of 3.24 versus 2.74 on average were consistent with the present research findings. Similarly, Baert et al. (2015) tested the relationship between sleep and quality academic performance. The researchers measured the relationship between 804 college students' sleep quality. Results showed that improving sleep quality with one standard deviation leads to a 4.85 percentage point higher course grade (Baert et al., 2015). Results from the present study are consistent with a negative correlation between daytime sleepiness and GPA. Similarly Azad et al. (2015) concluded that lower GPAs tended to align with greater daytime sleepiness.

The complex nexus of difficult financial circumstances and being gainfully employed, combined with academic stressors, was shown to impact students' academic performance. Consistent with the findings, excessive daytime sleepiness as a result of working long hours and reduced college attendance has the potential to negatively impact college students' academic performance (Ryan, Barns, & McAuliffe, 2011; Salamonson & Andrew, 2006; Salamonson et al., 2012; Teixeira et al., 2012).

Sleep and Gender

Consistent with the literature, this study found that women tend to report greater daytime sleepiness, even though the correlation was small in magnitude. This finding is consistent with S. Y. Lee et al. (2013) who studied female college students. Their research showed that biological reactions to stress, referenced as the interaction between an individual and their environment, could impact sleep for women. Female students' stress can have a detrimental impact on their ability to sleep. Astbury et al. (2011) reported that a meta analysis of 29 studies showed women have a higher incidence of sleeping difficulty and are at higher risk for insomnia when compared to men.

Also consistent with the findings are deteriorating sleep patterns for women throughout the academic year. It is not uncommon for college students to have erratic sleep schedules and later bedtimes. According to Orzech et al. (2011) women and men reported significant differences in self-reported sleep quality throughout the academic school year. Orzech et al. studied the sleep quality of 4,513 college freshman. Women and men reported significant differences in self-reported sleep quality; results demonstrated that women's sleep quality worsened across the school year. The researchers confirmed that women with less sleep experienced higher levels of depression and anxiety while in school.

Poor sleep quality is common for middle-aged women with a prevalence of 33–51% (Jou, Siao, Chen, Tsao, & Liu, 2016). As changes in overall student demographics evolve, the average graduate-student age is increasing. According to Jou et. al. (2016) an increase in sleep disturbance has been reported in menopausal and postmenopausal women compared to premenopausal women.

Employment Status and Academic Performance

Although not statistically significant, those participants who were employed reported greater daytime sleepiness, which aligned with the literature. Additionally, with respect to employment, 98 study participants were gainfully employed and 25 were not employed. The mean of .80 indicates that 80% were employed (98/123 = .80). This is consistent with Watanabe (2005, p. 39), who reported that 55–80% of students are employed while attending academic programs. Consistent with the literature, an unfavorable relationship emerged between college students working and academic performance. According to Watanabe, 29% of the students working 30–39 hours per week and 39% of those students working full time indicated that work had a negative and frequent impact on their academic progress. Furr and Elling (2000) found that students working between 30 and 39 hours per week and those working more than 40 hours per week reported their employment had a negative effect on their academic progress.

Salamonson et al. (2012) studied the impact of paid employment and nursing students' GPAs over 3 years. The researchers surveyed 566 first-year nursing students and 182 students completed the follow-up survey in 3 years. The study showed a 14% increase in working nursing students from Year 1 to Year 3 and an inverse relationship between mean hours students were paid to work and their GPA. Similar to Miller et al. (2008), results from the present study exhibited an inverse relationship: students who worked more than 20 hours believed their employment adversely impacted their academic performance, reported less nightly sleep duration, and participated in binge drinking. Furr and Elling (2000) also found that upperclassmen worked more hours than freshmen, indicating that older students would be more likely to suffer academically.

Implications of the Findings

Research is necessary to guide academicians to gain a richer understanding of the impact of sleep on learning and well-being. The significance of the findings found in this research aligned with previous research outcomes. Research regarding sleepiness, GPA, gender, and employment status provided understanding of the relationship between program demands and students' level of sleepiness. Additionally, increased knowledge regarding students' levels of sleepiness can impact APN education, APN practice, APN research, and APN policy.

Implications for Nursing Education

Although there has been previous research on sleep and academic performance, this is the first study to provide APN students with tangible evidence about their levels of sleepiness that they can use as evidence to make daily decisions regarding their sleep as it relates to their academic success (Zeek et al., 2015). APN programs need to gain a better understanding on how to best educate students about the importance of sleep and the consequences that increased levels of sleepiness may have on their academic performance. Sleep awareness and sleep education for APN students may heighten awareness of the consequences sleepiness can have on academic performance and their well-being.

APN students and nursing faculty can use the information from this study to inform academicians about changes in APN programs that can be used to promote quality sleep, which may improve motivation and enhance education quality. Prior to this study, APN graduate students and faculty did not have data to inform them about potential consequences of not adhering to sleep recommendations to promote optimal physical and

psychological health while enrolled in APN programs. Faculty development programs on the neurobehavioral effects of daytime sleepiness and its potential safety implications can yield improved APN program outcomes. Providing students with education about sleep and highlighting specific actions to decrease their levels of sleepiness will enable APN students to improve their academic experiences and potentially improve their attitude toward sleep behaviors.

Implications for Nursing Practice

Increased levels of daytime sleepiness have been associated with negative consequences such as decreased nursing performance, poor health, and increased risk for accidents (Uehli et al., 2014). Information from this study provides information on the impact of daytime sleepiness for APN students on their academic performances. The relationship between levels of sleepiness and employment status needs to be assessed to heighten safety for practicing APN students. Deficits such as decreased attention, vigilance, and other measures of cognition, including memory and complex decision making can be impacted by increased daytime sleepiness. Increasing APN students' awareness of the potential impact daytime sleepiness can have on them while in an APN program has the potential to improve success throughout their careers, because increased evidence supports that those who engage in healthier lifestyle habits have increased academic success (Miller et al., 2008). Educators and college authorities need to be mindful of the impact that sleepiness can have on students and ought to take an active role and consider expanding knowledge of sleep disturbance to academic performance, thereby heightening student awareness about good sleep hygiene (BaHammam et al., 2012).

Implications for Nursing Research

The interrelationship between sleepiness and academic performance warrants further investigation. An area of particular interest includes the relationship of daytime sleepiness to learning. This study considered GPA as a measure of academic performance; however, future researchers may seek to include learning or memory recall as a measure. As academicians gain knowledge regarding learning, memory processes, and well-being, they can educate students about the connection between learning and sleep. Future researchers may look at levels of sleepiness and stress on APN students' academic performance. According to Ahrberg et al. (2012), a close relationship between sleep and stress exists and can impact learning for students.

The relationship between daytime sleepiness and GPA may be subtle; however, the relationship of daytime sleepiness to mood may impact APN students. Gaultney (2010) reported that poor sleep has impacted college students' mood, such as increasing risk-taking behaviors, depression, and impaired social relationships. This study demonstrated that APN students have increased levels of sleepiness. Investigating the relationship between sleepiness and mood may increase awareness of the importance of optimal sleep behaviors and enhance learning experiences. Additionally, by increasing knowledge about the importance of sleep, colleges may establish a screening process for students early in their academic experiences to improve their learning experiences, safety, and well-being. Until more evidence emerges regarding sleep and its relationship to gender, GPA, and employment, it is important for nurse researchers to continue to monitor and regulate APN student patterns and educate students on sleep and well-being.

Implications for Public Policy

Of the working population in the United States, 30% receives less than the recommended 7 hours of sleep per day (Luckhaupt, 2012). Healthcare workers such as APN students who are gainfully employed bring concerns regarding increased daytime sleepiness. This population is of particular importance because of personal health risks and patient-safety concerns. Medical residents receive an average of less than 5 hours of sleep per day (Lawrence, Kantrowitz-Gordon, & Landis, 2014). In response to the reported sleep deficiency of medical residents, national organizations such as the Accreditation Council for Graduate Medical Education (ACGME), IOM, the National Academy of Sciences, and the European Working Time Directive, have created regulations limiting shifts for residents (ACGME, 2003; IOM, 2003, 2008; Joint Royal College of Anaesthetists and Royal College of Surgeons of England, 2009). ACGME established Common Program Requirements that outlined medical-resident work restrictions and updated work hours restrictions in 2011. (ACGME, 2003, 2011; Auger et al., 2012).

Nurses, including those at all levels of practice, need to protect their own health and safety as well as the safety of those they serve in the community. The ACGME took a position to prevent potential harm to medical residents, and professional nursing organizations ought to do the same. The mission of the Commission on Collegiate Nursing Education (CCNE) is to safeguard the quality and integrity of nursing programs. The Accreditation Commission for Education in Nursing (ACEN) supports the improvement of patient care and safety in nursing education. These and other organizations such as National Institute of Occupational Safety and U.S. Centers for

Disease Control and Prevention can support sleep research through grant opportunities and research fellowships. Collaborative partnerships with nursing programs can support multi-center studies to investigate sleep deprivation as a potential risk for students. This information can be used in nursing programs to foster optimal learning and student well being while in APN programs. APN organizations need to collaborate with other health and safety associations and serve as their advocates to ensure the safety of APN students. New skills are more likely to be impacted by sleepiness than well-known proficiencies (Lawrence et al., 2014). Additionally, sleep impacts physical function, cognitive function, quality of life, and safety (Mitler et al., 1988). Implementation of guidelines for work hours could lead to APN students who are more well rested while working toward their degree. Adequate rest for APN students can have important health and safety implications.

Although many students work to pay for their education, APN students have an ethical responsibility to arrive for their clinical practicum experiences well rested. Limitations on the hours APN students can work as nurses while being in APN programs has not been addressed in state laws. This includes limitations on required practicum hours while attending an APN program. Any students who are gainfully employed while attending an APN program will work a nursing-shift schedule of 8 to 12 hours before attending class or attending their clinical practicum.

Increasing knowledge through research demonstrating how sleep quality and sleep hours are important for learning, cognition, memory, safety, performance, and well-being will provide professional APN organizations with the education needed to set regulations, limiting shifts for clinical rotations and outside employment. The limitations

set by organizations are made to heighten academic experiences, improve APN students' well-being, and provide practicums that are safe and high in quality. Additional research is needed to determine the ideal number of work hours for an APN student to maximize their academic experience and maintain their well-being. To meet these goals, professional APN organizations and educational institutions ought to develop clinical hour limitations for outside employment while participating in APN education.

Limitations

Limitations for this study include that APN students may not have been honest when they self-reported their responses. Self-reported sleep behavior may be subject to problems of social-desirability bias; participants may provide socially accepted responses or responses that are in line with the impression they want to create (Kimberlin & Winterstein, 2008). Self-reported scales may elicit an estimation of sleep behavior rather than the actual recall of the behavior (Kimberlin & Winterstein, 2008). The sample size may have too little variability and may not capture accurate results. Even though participants hailed from a single academic institution, four APN specialties were used. Other institutions may have provided different results. Additionally, women were overrepresented, and male students showed a different pattern of results. Men should be investigated through further research. Findings from this study may be limited in transferability due to the population and the geographic area being studied; participants collected from one public university may not be generalized to other universities.

APN students are inherently graduate students. A limitation of this study consists of using only APN students as a sample population. A universal requirement for graduate education is for students to maintain a 3.00 GPA or greater. This study used 2nd semester

APN students as participants, thereby requiring them to maintain a GPA of 3.0 or greater. When correlation is computed from values with a restricted range, the coefficient is lower than if it were computed from values with an unrestricted range; therefore, had the class been open to students with GPAs less than 3.0, the correlation and effect size would likely have been higher. Limitations regarding self-reported GPA scores include over- or underestimation of the score. Additionally, GPA can be driven by many different inherent factors such as personal motivation, individual learning experiences, and individual financial positions.

Recommendations for Future Research

This study examined the relationship between levels of sleepiness and GPA, gender, and employment status. Additional research on the relationship between the amounts of sleeps hours or study hours on GPA, gender, and employment status may be necessary for future studies. Researchers could explore the possibility of students shortening their sleep hours to meet academic demands so they can maintain their GPA scores. These results, compared to their levels of sleepiness, may provide a more thorough representation of an APN's educational experience. Future researchers may want to explore sleep quality as a factor that correlates to APN students' GPA scores, gender, and employment status. The results from this study suggest that students are able to maintain having outside employment and maintaining their GPA scores, so to have a deeper understanding of this, researchers should investigate employment status and its influence on GPA, gender, and levels of sleepiness of APN students.

Important factors that may have contributed to the results include self-reporting measures. Students may have incorrectly reported their GPA scores, their work hours,

and their levels of sleepiness. Unfortunately, levels of sleepiness is a subjective measure and will need to be sought from participants, similar to employment status; however, in the future, GPA scores can be provided from the university database, thereby capturing a more accurate measure of GPA scores.

Long-term effects of daytime sleepiness cannot be drawn from this study because this study was cross sectional. Longitudinal research seeking associations between daytime sleepiness and its impact on APN students over time may determine conclusions regarding sleepiness and its long-term influence on APN students as a cohort. Much of the research related to daytime sleepiness in the literature was obtained from quantitative survey data and investigated correlations between sleepiness and specific outcomes. Longitudinal studies could add to the body of knowledge regarding sleepiness and APN students by comparing data over periods of time while comparing results with detailed interventions.

Chapter Summary

These findings alongside other sleep research could lead to future studies to guide APN education and provide schedules and policies for students that improve student well-being, improved patient care, and safety. The present study demonstrated that daytime sleepiness impacts performance. It is imperative that discussions begin in academic environments for APN students to become more informed about their vulnerability toward daytime sleepiness and its potential impact.

Improving the quality of APN education must become an important consideration. Academicians can play an important role in resolving the problems that result from increased levels of daytime sleepiness. APNs are fundamental to the delivery of current

health care and it is essential that APN students and faculty members maintain an appreciation for the importance of APN well-being to maintain a healthcare environment that produces optimal patient-care delivery. It is vital to engage other members of the healthcare team with interdisciplinary activities and academic initiatives that are intended to provide education to help APN students recognize and improve their sleep habits. APN programs need to foster and support environments that encourage APNs to engage in healthy sleep behaviors.

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Appendix A: IRB letters and Annual Approval Letters

To: **Deana Goldin**
College of Nursing
From: **Jo Ann Kleier, Ph.D., Ed.D.,**
Center Representative, Institutional Review Board
Date: **September 27, 2016**
Re: **IRB #: 2016-430; Title, "Factors that Predict Levels of Sleepiness of Advanced Practice Nursing Students"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt Category 1**

Exempt Category 2). You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.
2) ADVERSE EVENTS/UNANTICIPATED PROBLEMS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and Jo Ann Kleier, Ph.D., Ed.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.
3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: **Robin Chard, Ph.D., R.N.**

To:

CC: From:

Date: Protocol Title:

Dr. Ellen Brown

File Maria Melendez-Vargas, MIBA, IRB Coordinator

October 26, 2016 "Factors that Predict Levels of Sleepiness of Advanced Practice Nurses"

Office of Research Integrity Research Compliance, MARC 414

The Health Sciences Institutional Review Board of Florida International University has approved your study for the use of human subjects via the Expedited Review process. Your study was found to be in compliance with this institution's Federal Wide Assurance (00000060).

IRB Protocol Approval #: IRB-16-0404 IRB Approval Date: 10/25/16 TOPAZ Reference #: 105117 IRB Expiration Date: 10/25/17

As a requirement of IRB Approval you are required to:

1) Submit an IRB Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved by the IRB prior to implementation.

2) Promptly submit an IRB Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.

3) Utilize copies of the date stamped consent document(s) for obtaining consent from subjects (unless waived by the IRB). Signed consent documents must be retained for at least three years after the completion of the study.

4) **Receive annual review and re-approval of your study prior to your IRB expiration date**. Submit the IRB Renewal Form at least 30 days in advance of the study's expiration date.

5) Submit an IRB Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A. For further information, you may visit the IRB website at http://research.fiu.edu/irb. MMV/em

Appendix B: Survey Tool

Epworth Sleepiness Scale

Your age (Yrs): _____

How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired?

This refers to your usual way of life recently.

Even if you haven't done some of these things recently, try to figure out how they would have affected you.

Use the following scale to choose the **most appropriate number** for each situation:

0 = **no chance** of dozing

1 = **slight chance** of dozing

2 = **moderate chance** of dozing

3 = **high chance** of dozing

It is important that you answer each item as best as you can.

Situation	Chance of Dozing (0-3)
Sitting and reading	
Watching TV	
Sitting inactive in a public place (e.g., a theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in traffic	

THANK YOU FOR YOUR COOPERATION

Appendix C: Demographic Information Questionnaire

Please note, your information will not be sold or given to outside entities and will be confidential.

1**. Gender** (Please circle your answer)

Male Female

2. **Current GPA** (please answer with a numerical value example 3.15)

_____

3. Are you currently employed? (Please circle your answer)

Yes No

4. If you answered yes to being employed indicate the number of hours you work per week.

_____

Appendix D: Permission to use Figure 1

From: deana[redacted]

Sent: 11 January 2015 10:00:36 (UTC+12:00) Auckland, Wellington

To: Aaron Jarden

Subject: permission for use

Hi Dr. Jarden,

I would like permission to use the figure from Dodge, R., Daly, A. P., Huyton, J., & Sanders, L. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing, 2,* 222-235 in a paper.

Please let me know if I am granted permission.

Thank you.

Deana Goldin

From: Aaron Jarden [redacted]>

To: deana[redacted]; 'Mrs Rachel Dodge' [redacted]>

Sent: Sat, Jan 10, 2015 10:00 pm

Subject: RE: permission for use

Hi Deana, many thanks for your email and asking.

As long as you abide by the IJW creative commons licence (on first page of article) that's fine. For any commercial use you will have to contact Rachel (cc'ed) as the author is the owner beyond the CC licence. Attached is also the version of the image used in publication.

Kind regards, aaron.

Appendix E: Study Participation

FIU IRB Approval:	10/25/2016
FIU IRB Expiration:	10/25/2017
FIU IRB Number:	IRB-16-0404

TO PARTICIPATE IN A RESEARCH STUDY

Factors that Predict Levels of Sleepiness of Advanced Practice Nursing Students

Hello, my name is Dr. Victor Delgado, I am the survey administrator for a research study. You have been chosen at random to be in a research study about the relationship between academic performance and levels of sleepiness. The purpose of this study is to determine APN students' level of sleepiness and to correlate their level of daytime sleepiness with GPA, gender and employment status. If you decide to be in this study, you will be one of 100 people in this research study. Participation in this study will take 15 minutes of your time. If you agree to be in the study, I will ask you to do the following things:

1. Complete a questionnaire that includes these items: demographics, employment status, GPA, and the Epworth Sleepiness Scale.

2. Please after completing the questionnaire place it in the provided sealable envelope. There will be no way to connect you to your responses, please do not add any identifying information to the questionnaire.

3. If you prefer not to complete the questionnaire simply place the blank questionnaire in the envelope.

4. Then place the sealed envelopes into the provided bin.

Risks/Benefits to the Participant: There may be minimal risk involved in participating in this study. Specifically, participating in the study may make you reflect on your own level of sleepiness and the potential impact on your performance and well-being. There are no direct benefits for agreeing to be in this study. Please understand that although you may not benefit directly from participation in this study, it is expected that this study will benefit society by providing information about Advanced Practice Nursing students' levels of sleepiness, which may be essential to improve the overall quality of Advance Practice Nursing students' well-being and academic performance.

There is no cost or payment to you. If you have questions while taking part, please stop me and ask.

You will remain anonymous. In any sort of report we might publish, we will not include any information that will make it possible to identify you as a subject. Research records

will be stored securely and only the researcher team will have access to the records.

FIU IRB Approval:	10/25/2016
FIU IRB Expiration:	10/25/2017
FIU IRB Number:	IRB-16-0404

Every effort to maintain participants' anonymity and confidentiality will be undertaken. All participants will be treated equally and fair. No identifying information will be requested from participants. Additionally, participants may choose to return the survey without completion since the packets will be distributed to the entire class.

If you have questions for one of the researchers conducting this study, you may contact Dr. Ellen Brown at 305-348-1312 or at **ebrown@fiu.edu**.

If you have any concerns about the risks or benefits of participating in this study, you can contact the investigators and/or the university's human research oversight board (the Institutional Review Board or IRB) at the numbers listed below. This study protocol has been reviewed and approved by both the Institutional Review Board of Florida International University and Nova Southeastern University.

Institutional Review Board

Nova Southeastern University Office of Grants and Contracts (954) 262-5369/Toll Free: 866-499-0790 IRB@nsu.nova.edu

Florida International University Office of Research Integrity, MARC 414 (305) 348-2494 http://research.fiu.edu/irb/

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to stop. Do you consent to participate in this project?

If you wish to participate please complete the survey, place the completed survey in the envelope provided, seal the envelope, and place in the box. Please let me know if you have any questions. Thank you

Appendix F: User agreement Special Terms

Mapi Research Trust, a non-for-profit organisation subject to the terms of the French law of 1st July 1901, registered in Carpentras under number 453 979 346, whose business address is 27 rue de la Villette, 69003 Lyon, France, hereafter referred to as "Mapi" and the User, as defined herein, (each referred to singularly as a "Party" and/or collectively as the "Parties"), do hereby agree to the following User Agreement Special and General Terms:

Mapi Research Trust Information Support Unit 27 rue de la Villette 69003
Lyon France Telephone: +33 (0)4 72 13 65 75 Fax: +33 (0)4 72 13 66 82 Email:
PROinformation@mapi-trust.org

Recitals

The User acknowledges that it is subject to these Special Terms and to the General Terms of the Agreement, which are included in Appendix 1 to these Special Terms and fully incorporated herein by reference. Under the Agreement, the Questionnaire referenced herein is licensed, not sold, to the User by Mapi for use only in accordance with the terms and conditions defined herein. Mapi reserves all rights not expressly granted to the User.

The Parties, in these Special Terms, intend to detail the special conditions of their partnership.

The Parties intend that all capitalized terms in the Special Terms have the same definitions as those given in article 1 of the General Terms included in Appendix 1.

In this respect, the Parties have agreed as follows:

Article 1. Conditions Specific to the User

Section 1.01

Country

if different:

Section 1.02

Identification of the User

Deana Goldin Nova Southeastern University
14550 SW 84th CT Palmetto Bay, FL 33158
United States of America
Deana Goldin 305-232-0460
dg1110@nova.edu

Identification of the Questionnaire
Epworth Sleepiness Scale (ESS) Johns Murray W, MB, BS, BSc, PhD Johns Murray W.

User name
Legal Form
Address
Name of the contact in charge of the Agreement
Telephone number
Fax number
Email address
Legal Form
Address
Country
Title
Author(s)
Owner

Epworth Sleepiness Scale_UserAgreement_ January2014_2.0 © Mapi Research Trust, December 1994, 2015. The unauthorized modification and use of any portion of this document is prohibited.
1 / 4

Copyright
Original bibliographic references

ESS © MW Johns 1990-1997. Used under License

Johns MW. The clinical assessment of daytime sleepiness in patients with obstructive sleep apnea. In: Surgery for snoring and obstructive sleep apnea syndrome, ed. Fabiani M. Kugler publications, The Hague, 2003: 283-295

Johns MW. Sensitivity and specificity of the multiple sleep latency test (MSLT), the maintenance of wakefulness test and the Epworth Sleepiness Scale: failure of the MSLT as a gold standard. J Sleep Res. 2000 Mar;9(1):5-11 (PubMed abstract)

Johns MW. Sleepiness in different situations measured by the Epworth Sleepiness Scale. Sleep. 1994 Dec;17(8):703-10 (PubMed abstract)

Johns MW. Daytime sleepiness, snoring, and obstructive sleep apnea. The Epworth

Sleepiness Scale. Chest. 1993 Jan;103(1):30-6 (PubMed abstract)

Johns MW. Reliability and factor analysis of the Epworth Sleepiness Scale. Sleep. 1992 Aug;15(4):376-81 (PubMed abstract)

Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep. 1991 Dec;14(6):540-5 (PubMed abstract)

Article 2. Rights to Use Section 2.01 Context of the Use of the Questionnaire

The User undertakes to only use the Questionnaire in the context of the Study as defined hereafter.

Context of use
Title
Disease or condition
Type of research
Number of patient expected
Number of submission to the Questionnaire for each patient
Term of clinical follow-up for each patient
Mode of administration

Section 2.02

Clinical project or study The Impact of Sleep on the Academic Performance of Advanced Practice Nursing Students Sleep Other 100 1 0

Paper

Conditions for Use

The User undertakes to use the Questionnaire in accordance with the conditions for use defined hereafter.

(a) Rights transferred Acting in the Author's name, Mapi transfers the following limited, non-exclusive rights, to the User (the "Limited Rights")

> (i) to use the Questionnaire, only as part of the Study; this right is made up exclusively of the right to communicate it to the Beneficiaries only, free of charge, by any means of communication and by any means of remote distribution known or unknown to date, subject to respecting the conditions for use described hereafter; and
>
> (ii) to reproduce the Questionnaire, only as part of the Study; this right is made up exclusively of the right to physically establish the Questionnaire or to have it

physically established, on any paper, electronic, analog or digital medium, and in particular documents, articles, studies, observations, medical publications, websites whether or not protected by restricted access, CD, DVD, CD-ROM, hard disk, USB flash drive, for the Beneficiaries only and subject to respecting the conditions for use described hereafter; and

(iii) Should the Questionnaire not already have been translated into the language requested, the User is entitled to translate the Questionnaire or have it translated in this language, subject to informing Mapi of the same beforehand by the signature of a Translation Agreement and to providing a copy of the translation thus obtained as soon as possible to Mapi.

The User acknowledges and accepts that it is not entitled to amend, condense, adapt, reorganise the Questionnaire on any medium whatsoever, in any way whatsoever, even minor, without Mapi's prior specific written consent.

(b) Specific conditions for the Questionnaire Use in Individual clinical practice or Research study / project
The User undertakes never to duplicate, transfer or publish the Questionnaire without indicating the Copyright Notice. Use in a publication or on a website with unrestricted access:

In the case of a publication, article, study or observation on paper or electronic format of the Questionnaire, the User undertakes to respect the following special obligations:

- not to include any full copy of the Questionnaire, but a protected version with the indication "sample copy, do not use without permission" - to indicate the name and copyright notice of the author - to include the reference publications of the Questionnaire - to indicate the details of Mapi Research Trust for any information on the Questionnaire as follows: contact information and permission to

use: Mapi Research Trust, Lyon, France. E-mail: PROinformation@mapi-trust.org – Internet: www.proqolid.org - to provide Mapi, as soon as possible, with a copy of any publication regarding the Questionnaire, for information purposes.

Use for dissemination: - On a website with restricted access:

In the case of publication on a website with restricted access, the User may include a clean version of the Questionnaire, subject to this version being protected by a sufficiently secure access to only allow the Beneficiaries to access it.

The User undertakes to also respect the following special obligations:

- to indicate the name and copyright notice of the author - to include the reference

publications of the Questionnaire - to indicate the details of Mapi Research Trust for any information on the Questionnaire as follows: contact information and permission to

use: Mapi Research Trust, Lyon, France. E-mail: PROinformation@mapi-trust.org – Internet: www.proqolid.org

- On promotional / marketing documents In the case of publication on promotional/marketing documents, the User undertakes to respect the following special obligations:

- to indicate the name and copyright notice of the author - to include the reference publications of the Questionnaire - to indicate the details of Mapi Research Trust for any information on the Questionnaire as follows: contact information and permission to

use: Mapi Research Trust, Lyon, France. E-mail: PROinformation@mapi-trust.org – Internet: www.proqolid.org - to provide Mapi, as soon as possible, with a copy of any publication regarding the Questionnaire, for information purposes

For any other use not defined herein, please contact Mapi for the specific conditions of use and access fees (if applicable).

Article 3. Term

For Clinical Trials and Study Projects:

Mapi transfers the Limited Rights to use the Questionnaire as from the date of delivery of the Questionnaire to the User and for the whole period of the Study.

For Clinical Practice and Dissemination purpose: Mapi transfers the Limited Rights to use the Questionnaire as from the date of delivery of the Questionnaire to the User and for a period of 3 years.

For a publication in a book: Mapi transfers the Limited Rights to use the Questionnaire as from the date of delivery of the Questionnaire to the User and for a period of 10 years.

Article 4. Beneficiaries

The Parties agree that the User may communicate the Questionnaire in accordance with the conditions defined above to the Beneficiaries involved in the Study only, in relation to the Study defined in section 2.01.

Article 5. Territories and Languages

Mapi transfers the Limited Rights to use the Questionnaire on the following territories and in the languages indicated in the table below:

Language
English for the USA
Versions/ Modules
ESS

Article 6. Price and Payment Terms

The User undertakes in relation to Mapi to pay the price owed in return for the availability of the Questionnaire, according to the prices set out below, depending on the languages requested and the costs of using the Questionnaire, in accordance with the terms and conditions described in section 6.02 of the General Terms included in Appendix 1.

ROYALTY FEES *	Commercial users	Cost per study	1 100 €(use in commercial epidemiologic / observational / marketing studies: please consult the User Agreement)
		Cost per language	550 €
	Funded academic research	Cost per study	300 €
		Cost per language	50 €
	Not funded academic users	Cost per study	Free
		Cost per language	Free
DISTRIBUTION FEES *	Commercial users	Cost per study	1 000 €
		Cost per language	500 €
	Funded academic research	Cost per study	300 €
		Cost per language	50 €
	Not funded academic users	Cost per study	Free
		Cost per language	Free

* Excluding VAT

Commercial users: Industry, CRO, any for-profit companies Funded Academic research: Projects receiving funding from commerce, government, EU or registered charity. Funded academic research– sponsored by industry fits the "commercial users" category. Not funded academic users, individual medical practice: Projects are not explicitly funded, but funding comes from overall departmental funds or from the University or individual funds

Agreed and acknowledged by

User's name: Deana Goldin

Date: 02/11/2015

Appendix G: ESS Epworth Sleepiness Scale

Version 2.0
Scaling and Scoring Version 1: December 2011

Written by:
MAPI Research Trust 27 rue de la villette 69003 Lyon France
Phone: +33 (0) 4 72 13 65 75 Fax: +33 (0) 4 72 13 66 82 E-mail: contact@mapi-trust.org
Author's address:
Dr Murray W Johns P.O. Box 232 Flinders, VIC 3929, Australia
E-mail: mjohns@optalert.com

The Epworth Sleepiness Scale is composed of 8 items investigating 1 domain.

Domains and Clusters

Domain 1 8 1-8 No

Scoring of Domains

Direction of Domains

Higher score = higher sleepiness

MAPI RESEARCH TRUST
Education Information Dissemination

Number of
Cluster of
Item

Domains

Items

Items reversion

Item scaling	4-point Likert type scale ranging from 0 (would never doze) to 3 (high chance of dozing)
Weighting of items	No
Range of scores	0-24
Scoring Procedure	Global score = sum of all item scores
Interpretation and Analysis of missing data	For score like 1⁄2 or 11⁄2: It is recommended that these scores be taken at face value, adding up all 8 item-scores, including halves. If the total ESS score includes a half score it should be rounded up the next whole number.
Interpretation of multiple answers for one item	If there is more than one score made (inappropriately) for an item, the mean score could be used, or alternatively, the whole questionnaire could be considered invalid

REFERENCE(S):

Dr Johns' personal website about the ESS. Available at: http://epworthsleepinessscale.com/about-epworth-sleepiness/. Accessed November 21, 2011

And information provided by the author

Epworth Sleepiness Scale

Name: _____ Today's date: _____ Your age (Yrs): _____ Your sex (Male = M, Female = F): _____

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you haven't done some of these things recently try to work out how they would have affected you. Use the following scale to choose the **most appropriate number** for each situation:

0 = would **never** doze 1 = **slight chance** of dozing 2 = **moderate chance** of dozing 3 = **high chance** of dozing
It is important that you answer each question as best you can.

Situation
Sitting and reading Watching TV Sitting, inactive in a public place (e.g. a theatre or a meeting) _____ As a passenger in a car for an hour without a break _____ Lying down to rest in the afternoon when circumstances permit _____ Sitting and talking to someone _____ Sitting quietly after a lunch without alcohol _____ In a car, while stopped for a few minutes in the traffic _____
THANK YOU FOR YOUR COOPERATION

M.W. Johns 1990-1997

Chance of Dozing (0-3)