Daily Hassles, Mental Health Outcomes, and Dispositional Mindfulness in Student Registered Nurse Anesthetists

By

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Abstract

Introduction: Stress negatively affects student registered nurse anesthetists (SRNAs)' well-being. At present, there is no effective method to identify individual vulnerability to stress to better prepare SRNAs for adaptive stress coping. The underlying assumption of this study was that outcomes of stress were determined by individuals' appraisal of the situation and available coping resources based on the Transactional Model of Stress and Coping. The purposes of the present study were to assess subgroup differences in mental health outcomes of everyday stressors or daily hassles and to evaluate if dispositional mindfulness buffered the negative impact of daily hassles on mental health outcomes. The three specific aims of this research were: (1) Examine the relationships between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs; (2) Characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness, and SRNA characteristics (demographic and nurse anesthesia curricular information); and (3) Determine whether dispositional mindfulness moderates the relationship between daily hassles and three negative mental health outcomes (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and nurse anesthesia curricular information.

Methods: The invitation to this anonymous cross-sectional descriptive online survey was sent to randomly selected 5,000 SRNAs. The survey questionnaire included four validated self-report measures to assess daily hassles, perceived stress, depression, anxiety, dispositional mindfulness, as well as demographic and anesthesia curricular information. Missing data was handled by multiple imputations. There were 881 valid responses. Complete case (n = 728) and multiply imputed data (n = 881) were

simultaneously analyzed using the Stata 14 and the PROCESS macro for the SPSS version 24. Significant outliers were managed by winsorizing. Data analyses were conducted to examine the correlations among the study variables, the group mean score differences based on the SRNA characteristics, and the moderation effect of dispositional mindfulness on the relationship between daily hassles and three mental health outcomes. The type of data analysis was matched to the observed data distribution. Familywise Type I error was controlled using the Holm-Bonferroni's sequential alpha correction at $\alpha = .05$.

Results: The mean perceived stress score (18.1 ± 6.3) was slightly higher than the normative data (17.5 ± 7.3) in the age-matched group, yet the difference was not statistically significant ($p = 0.12$). The mean depression score (7.9 ± 7.3) was higher than normative data (5.44 ± 7.13) in the same age group but was in the normal level range. Notably, 8.4% of the sample had severe depression level, while the 11% had moderate level of depression. The mean anxiety score (8.4 ± 7.1) was more than twice as high as the normative data (3.72 ± 5.02) of the same age group. Almost 20% of the sample had severe or extremely severe levels of anxiety. The mean daily hassles score (92.3 ± 22.7) was comparative to undergraduate student samples reported in the literature.

Dispositional mindfulness had significantly negative correlation with daily hassles, perceived stress, depression and anxiety ($r_s = –.12$ to $–.53$, $p < .05$). Female SRNAs had significantly higher daily hassles ($p < 0.003$), perceived stress ($p < .001$) and anxiety ($p < 0.001$) than their male peers. Nonjudging facet of dispositional mindfulness significantly moderated the impact of daily hassles on depression after controlling for SRNA characteristics and meditation experience ($\beta = .001 \pm .0002$; $z = 4.36$; $p < .001$).

Simple slope analysis revealed that the relationship between daily hassles and depression was also significant at high-, average-, and low-dispositional mindfulness nonjudging facet levels ($\alpha < .05$).

Conclusion: The present study had three novel findings that are relevant to SRNA wellness. First, this research provided reliable estimates of perceived stress, depression, anxiety, daily hassles, and dispositional mindfulness in SRNAs using widely used measures, enabling comparison across age-matched groups in the literature. Nearly a fifth of the SRNAs in the present study reported moderate or severe levels of depression and severe or extremely severe levels of anxiety. The SRNA sample reported a comparable amount of perceived stress and daily hassles with the age-matched normative data. Dispositional mindfulness (specifically nonjudging) significantly buffered the negative impact of daily hassles on depression in the SRNA sample. Second, this investigation found female SRNAs being at risk for more severe psychological effects of poorly-managed stress than their male peers. Finally, this study added further support for the growing body of the literature that dispositional mindfulness might be a key inner resource for psychological adjustment to stress among healthcare student populations.

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Chapter 1: Introduction

Certified Registered Nurse Anesthetists (CRNAs) administer over 34 million anesthetics yearly in all anesthesia settings, including traditional hospital operating rooms, military healthcare facilities, outpatient surgical centers, and medical and dental offices (American Association of Nurse Anesthetists [AANA], 2015). CRNAs work in a team with surgeons, podiatrists, dentists, anesthesiologists, nurses, and other healthcare providers. CRNAs are the predominant anesthesia providers with a high degree of autonomy in the rural parts of the United States (AANA, 2015).

Student Registered Nurse Anesthetists (SRNAs) are registered nurses with the minimum of one year clinical experiences in caring for critically-ill patients, and are enrolled in one of 114 graduate-level nurse anesthesia educational programs. The nurse anesthesia educational programs are accredited by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA), which sets the standard for required didactic instructional contents and clinical experiences. Following the recommendation by the 2005 American Association of Colleges of Nursing which called for all advanced practice nursing education, including nurse anesthesia, to be the doctoral level, the COA has mandated that all SRNAs will graduate with a practice doctorate degree as of January 1, 2022.

Stress in Nurse Anesthesia

SRNAs training to become a CRNA are faced with significant stressors (Perez & Caroll-Perez, 1999; Phillips; 2010; Wildgust, 1986). Stress is a common, costly and potentially deadly problem to both healthcare providers and patients (Cohen & Janicki-Deverts, 2012; Wallace, Lemaire & Ghali, 2009). This phenomenon is especially true for

nurse anesthesia practice and education (Chipas & Mckenna, 2011). The literature documents inadequate stress coping and resultant negative mental health outcomes among SRNAs (Chipas et al., 2012; Kendrick, 2000). In fact, the critical deficit in adaptive stress coping in SRNAs prompted the COA in 2014 to mandate that instruction in wellness and substance abuse be included in nurse anesthesia educational programs. Nurse anesthesia program educational materials are recommended to include evidence-based content on adaptive and maladaptive stress coping as well as the techniques that promote adaptive stress coping. However, there are major knowledge deficits related to modifiable factors that influence stress perception and vulnerability to the negative effects of common stressors among SRNAs.

Identifying such dynamic personal stress risk factors among SRNAs could be of great diagnostic and therapeutic value to nurse anesthesia educators and other concerned parties. Determining key person-level variables that drive individual responses to common stressors among SRNAs might provide deeper understanding of individual differences that result in variable stress vulnerability (Goh & Agius, 2010). Furthermore, the new knowledge of dynamic personal stress vulnerability among SRNAs may facilitate efforts to develop innovative stress management and preventive strategies for the entire nurse anesthesia community, and may also provide insight into stress vulnerability in other high-stress healthcare professions.

Mindfulness and Stress

The literature supports the efficacy of cognitive behavioral interventions for stress among health care providers and trainees (Ruotsalainen, Verbeek, Marine & Serra, 2015).

One such intervention focuses on cultivating mindfulness through various meditation practices, which has its roots in Eastern traditions (Kabat-Zinn, 1982). One common operationalization of mindfulness in Western psychology research is a state of consciousness that is characterized by the moment-by-moment attention and open awareness of external and internal stimuli (Brown & Ryan, 2003). Formal or informal meditation or structured mindfulness-based interventions, such as the Mindfulness-Based Stress Reduction (MBSR) program can cultivate mindfulness (Kabat-Zinn, 1990).

A recent meta-analysis suggests that mindfulness-based interventions may reduce stress-related negative mental health and increase well-being through the reduction in cognitive and emotional reactivity and rumination (Gu, Strauss, Bond & Cavanagh, 2015). Despite the cumulative evidence that supports mindfulness-based interventions for stress in health care providers and trainees (Geary & Rosenthal, 2011; Goldhagen, Kingsolver, Stinnett, & Rosdahl, 2015; Irving, Fitzpatrick, Dobkin, Chen, & Hutchinson, 2012; Warnecke, Quinn, Ogden, Towle & Nelson, 2011), there are no known published reports of mindfulness-based stress interventions involving CRNAs or SRNAs.

Mindfulness-based interventions could be informed by the understanding that mindfulness is an inherent human capacity (Kabat-Zinn, 2003). Naturally occurring mindfulness – termed dispositional mindfulness – is inherent in each person. An individual's dispositional mindfulness is relatively stable over time and across situations, and it can be measured (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Brown and Ryan, 2003). A higher level of dispositional mindfulness has been shown to buffer the impacts of everyday minor stressors or – daily hassles on high school students' mental health (Marks & Sobanski, 2010). Laboratory studies have also shown that people with

higher dispositional mindfulness may handle stress better physically and psychologically (Arch & Craske, 2010; Bullis, Bøe, Asnaani & Hofmann, 2014). Taken together, these empirical studies suggest dispositional mindfulness plays a crucial role in determining how individuals react to stressors and what health consequences these reactions may produce.

In conclusion, people with low levels of dispositional mindfulness may become more susceptible to negative mental health from stress, thus adversely affecting their use of adaptive coping techniques (Hanley & Garland, 2014). However, to our knowledge, this key role of dispositional mindfulness on mental health among SRNAs has never been investigated. This critical gap in the literature needs to be explored now. Demonstrating that dispositional mindfulness is a key determinant of SRNAs' mental health could aid the nurse anesthesia community with designing and implementing evidence-based wellness interventions using mindfulness training.

Purpose of the Study

The overall purpose of this cross-sectional descriptive study was to investigate differences of daily hassles, mental health outcomes, namely perceived stress, depression, and anxiety, and dispositional mindfulness in SRNAs. More specifically, the current study examined the role of dispositional mindfulness in the relation between daily hassles and perceived stress, depression, and anxiety. The investigation of these variables among SRNAs may facilitate designing evidence-based stress education curriculum to help students better manage their stress. To achieve this purpose, this study examined the following three specific aims.

Specific Aim 1. Examine the relationships between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs.

Hypothesis 1.1: Daily hassles, perceived stress, depression, and anxiety will be positively correlated.

Hypothesis 1.2: Perceived stress, depression, and anxiety will be negatively correlated with dispositional mindfulness.

Specific Aim 2. Characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness, and SRNA characteristics (demographic and curricular information).

Hypothesis 2.1: Comparing within the respected categories, female, minority, divorced, and 2nd-year SRNAs, and those who are in the programs with integrated curriculum will report higher perceived stress, depression and anxiety.

Hypothesis 2.2: Daily hassles and dispositional mindfulness will be different across SRNAs based on demographic and curricular information.

Specific Aim 3. Determine whether dispositional mindfulness moderates the relationship between daily hassles and three negative mental health outcomes (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and curricular information.

Hypothesis 3: Dispositional mindfulness will moderate the relationship between daily hassles, perceived stress, depression, and anxiety such that daily hassles will be more strongly correlated with perceived stress, depression and anxiety when dispositional mindfulness is low than when dispositional mindfulness is high.

Significance of Problem

Stressful Nurse Anesthesia Training and Practice Environment, and Patient Safety

CRNAs and SRNAs train and practice in a complex multidisciplinary operating room environment that is inherently stressful with high degrees of uncertainty and constant demands (Chipas et al., 2012; Kendrick, 2000; Reason, 2005). One common source of stress in anesthesia training and practice is production pressure—overt or covert pressure to work faster and harder to get scheduled surgical cases completed on time (Gaba, Howard & Jump, 1994). One of negative consequences of chronic production pressure and work overload, coupled with increasing patient acuity in recent years, is disruptive behaviors among surgical teams and other patient care providers (Rosenstein & O'Daniel, 2006). Interpersonal conflicts among surgical teams and support personnel are often cited as particularly stressful by CRNAs and SRNAs (Cavagnaro, 1983; Elisha & Rutledge, 2011; Perry, 2005; Sakellaropoulos, Pires, Estes & Janinski, 2011). Additionally, SRNAs may have difficulty with adjusting to the new role of a graduate student (Phillips, 2010). This role ambiguity may contribute to suboptimum communication and interpersonal conflicts between SRNAs and clinical instructors and other personnel at clinical training sites (Elisha & Rutledge, 2011).

Studies on healthcare teamwork and patient safety suggest that interpersonal conflicts and the resulting hostile working environment are positively associated with inefficacious learning and compromised patient safety (Cochran & Elder, 2014; Rawson, Thompson & Sostre, 2013; Rosenstein & O'Daniel, 2008). In fact, the Joint Commission in 2008 issued a sentinel report alert on disruptive behaviors among healthcare teams related to patient safety (The Joint Commission, 2008). Situational stressors, such as

complications during patient care and working with unfamiliar team members, seem to foster intimidating, disruptive, or uncivil behaviors particularly among those who routinely exhibit such behaviors (Cochran & Elder, 2014). The persons most vulnerable to disruptive behaviors or incivility in the workplace are those with the least amount of education and training, such as SRNAs. In turn, such abuse against students is likely to contribute to their poor mental health and increasing chances for making mistakes (Dolansky, Druschel, Helba & Courtney, 2013; Elisha & Rutledge, 2010; Laschinger, Wong, Regan, Young-Ritchie & Bushell, 2013). Nursing, in particular, is associated with workplace incivility, which is implicated in staff burnout and increased intention to leave among staff nurses (Oyeleye, Hanson, O'Connor & Dunn, 2013; Lanschinger, Leiter, Day & Gilin, 2009). Despite the negative consequences that incivility may have on nursing education and patient care, the full impact of workplace incivility is relatively unknown.

Stress Education and Patient Safety

The World Health Organization (WHO) has recognized stress education and stress management training among healthcare team members as an important priority for patient safety (WHO, 2009). Similarly, training safe and competent future nurse anesthesia providers who take responsibility and accountability for personal well-being is one of the major goals of nurse anesthesia education (AANA, 2015). Yet the literature on effective stress education and stress management methods in nurse anesthesia practice and education is still scarce.

Another important anesthesia patient care issue related to stress is substance abuse among anesthesia providers and trainees (Merlo, Singhkant, Cummings & Cottler, 2013;

Wright, McGuinness, Schumacher, Zwerling, & Moneyham, 2012; Warner et al., 2013). Impaired anesthesia providers and trainees who are addicted to controlled substances often gain the access to drugs by diverting the medication from patients (Wright et al., 2012). Drug diversion supports substance abuse, but it also results in suboptimal patient care, especially in case of the diversion of most common drug of choice, opioids. Substance abuse among CRNAs in the U.S. is estimated at 10% from voluntary self-report data (Bell, McDonough, Ellison & Fitzhugh, 1999; Wright et al, 2012), which is similar to the national prevalence rate of 9.4% of any illicit drug use among people age 12 and older (Center for Disease Control and Prevention [CDC], 2015). However, the *true* prevalence of substance abuse among health care providers and trainees is often difficult to assess due to practitioner's reporting to regulatory bodies and other career ramifications (Wright et al., 2012). Therefore, reducing stress among CRNAs and SRNAs to decrease the likelihood of substance abuse through early risk identification and stress and wellness education for high-risk individuals is an important priority for the entire nurse anesthesia community.

Implications for Nursing

Understanding what drives effective or ineffective adaptive stress coping in SRNAs is important for effective nurse anesthesia education. Poorly managed stress in SRNAs can adversely affect mental and physical health of the students as well as the well-being of the public that is cared for by the future nurse anesthesia providers (Chipas, et al., 2012; Perez & Carroll-Perez, 1999; Phillps, 2010). To date, the literature suggests SRNAs experience a variety of personal and curricular stressors as they progress through their training, sometimes in an environment that is not conducive to effective clinical

learning (Chipas, et al., 2012; Perez & Carroll-Perez, 1999; Phillps, 2010; Elisha & Rudledge, 2011; Kendrick, 2000; Wildgust, 1986). However, there has been little research on dynamic personal stress vulnerability factors, that is, the personal characteristics that change over time and are modifiable among SRNAs. To fill this gap, the current study addressed what might be a key component in effective adaptive stress education for SRNAs by elucidating the differences in mental health outcomes of daily hassles between SRNAs based upon the level of dispositional mindfulness. The findings of this study may inform the next step in a program of research in designing and testing adaptive stress coping interventions, such as formal mindfulness training among SRNAs.

Lastly, the insidious and potentially career-ending nature of poor stress coping, such as substance abuse among CRNAs and SRNAs, calls for systematic approaches to uncover and address stress vulnerability *early* in the nurse anesthesia career trajectory. Examining dispositional mindfulness as a critical dimension of personal well-being has important implications not only for SRNAs' success in anesthesia training and life-long anesthesia practice, but also for the safety of patients whose lives are dependent on diligent anesthesia care (de Oliveira et al., 2013). Building on previous research findings, the current study investigated the relationship between daily hassles, mental health outcomes measured as perceived stress, depression, and anxiety, and dispositional mindfulness in the national sample of SRNAs.

Chapter 2: The Review of Literature

This chapter presents a succinct review of the critical research supporting the rationale and a conceptual model that guided the current study. The chapter begins with a review of the literature examining three key concepts of the current study, stress, stress in nurse anesthesia, and dispositional mindfulness. A brief summary of key findings and gaps identified in the review of the literature as well as the explanation of the conceptual model concludes the chapter.

Stress

> ***Stress protects under acute conditions, but when activated chronically, it can cause damage and accelerate disease.***
>
> ***—Bruce McEwen, The End of Stress As We Know It***

Stress can have significant effects on human health (Paradies, 2011). Substantial disagreements exist among biological, environmental, and psychological perspectives in stress research, each offering a unique perspective in defining stress.

Biological Perspective of Stress—Stress as Response

The biological perspective, or the response approach, is primarily concerned with the body's physiological responses or patterns to psychological and physiological demands (Cohen, Kessler, & Underwood Gordon, 1995; Hobfoll, Schwarzer, & Chon, 1998). The biological perspective postulates that stress is a body's "dynamic state" (Wolff, 1953) that results from the body's interactions with noxious stimuli. Since the last century, three leading stress researchers, Cannon, Selye, and McEwen, proposed

three interrelated biological mechanisms of stress reactions: sympathetic adrenal medullary system; generalized adaptation syndrome; and allostasis and allostatic load.

Sympathetic adrenal medullary system (SAM). Harvard physiologist Walter Cannon (1932) defined the term *homeostasis* as the systematic mechanism for dealing with fluctuating metabolic needs of the body. His conceptualization of homeostasis was inspired by 19th century French physiologist Claude Bernard who first suggested the term "*milieu intérieur*" or "*homeostasis*" to explain body's need to maintain the stable condition for healthy life independent of the environment. To deal with the stressor and restore homeostasis, Cannon explained, a human body activates sympathetic-adrenal medullary system (SAM) to increase the secretion of catecholamines, namely norepinephrine and epinephrine, from adrenal medulla and sympathetic nerve endings. The increased secretion of norepinephrine and epinephrine, known as "fight or flight" response, is the body's survival mechanism against a threat (functional disturbance against homeostasis) that alters short-term hemodynamics, leading to increases in heart rate, cardiac contractile force, and blood pressure (Seaward, 2014). These reactions occur immediately after the onset of stress reaction and return to baseline in about 10 minutes after the cessation of stressor exposure (Starcke & Brand, 2012).

General adaptation syndrome (GAS). Following Cannon's early work on acute stress reactions, Hungarian-Canadian endocrinologist Hans Selye (1936) expanded the concept of stress response to the body's adaptation to chronic exposure to stressors. Selye is widely recognized as "*the father of stress research*" for his discovery of neuroendocrine responses to stressors, which laid the foundation for the understanding of

a complex but well-coordinated body functioning (Institute of Medicine, 1982; Seaward, 2014).

Selye (1974) defined stress as "*the nonspecific response of the body to any demand made upon it*" (p. 14) and described the three stages of general adaptation syndrome (GAS) that characterize the nonspecific endocrine responses of Hypothalamic-Pituitary-Adrenocortical Axis (HPA-axis) activation to noxious stimuli (Selye, 1950). These three stages are (1) alarm reaction (acute reactions to restore functional physiological state in which the release of catecholamines precedes corticosteroids from the adrenal cortex); (2) stage of resistance (adaptation to stressors to restore functionality); and (3) stage of exhaustion (prolonged stressor exposure depletes the body's adaptive capacity, leading to irreversible organ dysfunction). The GAS is the result of the HPA-axis activation leading to heightened output of a set of corticosteroids, cortisol and aldosterone, from the adrenal cortex. These two hormones initiate a series of metabolic changes, such as increased blood sugar and fluid retention, to mobilize energy resources. Persistent stress that overwhelms the body's adaptive mechanism can lead to illness and ultimately death.

Allostasis and allostatic load. Neuroendocrinologist Bruce McEwen focused on the remarkable ability of the body to adjust swiftly to changes in the environment to remain within normal physiological parameters called *allostasis* (McEwen & Lasley, 2002). McEwen equated allostasis with acute "fight or flight" response that ensures sufficient energy for the key body systems to remain stable, allowing us to cope with the demands. When a short-term "fight or flight" response does not resolve the body's

demand, prolonged allostasis begins to malfunction, resulting in damages to the mind and the body called *allostatic load*. The transition from allostasis to allostatic load varies among people, perhaps due to genetics, lifestyles, and individual psychosocial factors. Allostatic load transition provides a practical biological explanation for why some people thrive on while others succumb to challenges.

McEwen's stress model advanced the current understanding of stress by integrating physiological adaptive stress responses with corresponding changes in the brain anatomy to explain the complex processes of stress-induced pathophysiology (McEwen, 1998). McEwen's conceptualization of the brain as the "central mediator and target of stress, resiliency, and vulnerability processes" (McEwen & Gianaros, 2011, p. 2) has contributed significantly to elucidating the nature of stress-related vulnerable regions in the brain, namely prefrontal cortex, hippocampus, and amygdala. These three brain areas are the current popular targets of stress research (Hölzel et al., 2010; Taylor et al., 2011).

Environmental Perspective of Stress—Stress as Cause

Socially focused environmental perspective looks at the nature of stress stimuli in the environment and provides a useful framework for learning *how* people succumb to stress-related diseases and cope with various environmental stressors (Pearlin, 1993), particularly stressful life events and minor everyday stressors or daily hassles (Paradies, 2011).

Stressful life events. Life events are discrete observable triggers with self-liming time course, leading to significant life changes (Wheaton, 1999). Research studies have used life event scales, such as the Social Readjustment Rating Scale (SRRS), to examine

whether a cumulative amount of undesirable change brought about by life events in one's life within a year or longer had significant health implications (Holmes & Rahe, 1967). Some studies have found that high scores on life event scales were associated with psychological and physiological morbidity, particularly psychiatric illness and decreased immune functions (Cohen, Tyrrell, & Smith, 1993; Cohen et al., 1998; Paykel, 1978). However, the findings in these studies warrant some cautions. For instance, life event scales, such as the SRRS, have several major limitations, including (1) the poor control of some study biases, suc h as retrospective recall, which has been implicated in general poor test-retest reliability in life event scales, and social role; (2) unstandardized level of stressfulness in each item; and (3) item contamination with disease symptoms, which might bias adverse health outcome predictions. Despite these known issues, life event survey has been one of most popular methodology in stress research in the past 40 years due in part to its simple and heuristic conceptualization of social stress-health link (Thoits, 2010; Turner &Wheaton, 1995).

Daily hassles as everyday stressors. Everyday minor stressors or daily hassles are "irritating, frustrating, distressing demands" that ordinary people experience as a part of their daily life (Kanner, Coyne, Shaefer, & Lazarus, 1981). Daily hassles may include annoying, upsetting happenings, such as losing an item, getting caught in a heavy traffic, and having arguments with family or work supervisors. Daily hassles involve "on-going strain" of everyday living, which has a greater effect on day-to-day interactions with the living environment (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). Daily hassles appear to be better predictors of adverse health outcomes, particularly psychological symptoms, than are stressful life events due in part to reduced retrospective recall bias

that may emerge when using stressful life event scales (Burks & Martin, 1985; DeLongis et al., 1982; Kanner et al., 1981). While unexpected stressful life events, such as the death of a spouse, are largely out of one's control, daily hassles are more likely to be modifiable day-to-day activities (Mechanic, 1974). Therefore, the results regarding the effects of daily hassles on health outcomes may inform potential preventive or therapeutic stress-reduction interventions.

The self-assessments of daily hassles have two major psychometric issues. The first major issue concerns the nature of the relationship between hassle items and outcome variables. Critics have argued that the Daily Hassles Scale (DHS; DeLongis et al., 1982; Kanner et al., 1981) was so severely contaminated with psychological symptoms that one third of the scale items measured potential reactions to stressors (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984; Monroe, 1983). Therefore, the DHS seems to better predict adverse health outcomes compared to stressful life event checklists.

Second, there are varied opinions on the relationship between daily hassles and stress appraisal (Monroe & Simmons, 1991; Monroe & Kelly, 1995), or on the way in which the appraisal of daily hassles should be operationalized. The appraisal of hassles or "stressfulness" has been operationalized as aversiveness (Lewsinsohn & Talkington, 1979), frequency (Burks & Martin, 1985), degree of exposure (Kohn, Lafreniere, & Gurevich, 1990), the combination of frequency and persistence (Blankstein, Flett, Koledin, 1991; Kanner et al., 1981), and the combination of frequency, severity, and rumination (Pett & Johnson, 2005; Sarafino & Ewing, 1999). Such diverse operationalization of hassle appraisal renders cross-comparison of study results difficult.

Psychological Perspective of Stress—Stress as Cognitive Appraisal

Psychological perspective of stress holds that stress is *a dynamic process* that changes over time and across situation depending upon on-going interactions between the person and the situation or environment (Lazarus & Folkman, 1984). Lazarus (1966) expanded the concept of stress to include cognitive appraisals of situations or the appraisal in the complex environment-person interplay, which led to the development of the influential transactional model of stress and coping (Lazarus & Folkman, 1984).

When the situational demand or a stressor has a potential stake in the person's life and well-being *and* exceeds the person's coping ability, he or she experiences stress (distress). However, when the situation does not threaten his or her goals or well-being, the individual is less likely to experience stress. Likewise, when the situation has a high stake, but the person appraised it as a manageable challenge with potential desirable outcomes, it is considered a good stress or eustress. Appraised or perceived stress is, therefore, both the result of the person-environment interplay and the appraised adequacy of own coping resources.

Moreover, subjective appraisal of stressful demands and objective environmental stressors appear to play a role in different underlying mechanisms of stress process (Cohen, Tyrrell & Smith, 1993). The appraisal of stressful situations and coping resources appear to moderate the relation between situational demands and human health (Monroe, 2008). Personal beliefs about the self and the situation, personal values and commitment about the situation, personality disposition, perceived adequacy of available coping resources, and available new information about the situation influence stress appraisal (Lazarus & Folkman, 1984). Thus, examining these personal stress factors may

provide invaluable insights into individual differences in health-related outcomes, including emotional well-being.

Psychological perspective of stress has several limitations. The most important issue concerns the operationalization of stress appraisal. It is unclear how stress appraisal, (i.e., the evaluation of the meaning of environmental events and situations), differs from other cognitive processes, such as worrying about and not tolerating psychological distress (Monroe & Kelley, 1995). Similarly, antecedent conditions, such as co-morbidity with depression, which distorts the perception of the world, might influence stress appraisal as a cognitive process. In such a case, is appraisal still a key component of stress process or simply a product of other processes? Despite these fundamental conceptualization issues, viewing stress as the product of person-environment interaction provides a valuable insight into within- and between-subject differences in stress responses.

Symptoms of Stress

Physiological Symptoms. Elevated level of stress is associated with both physical and psychological morbidity. For instance, chronically elevated cortisol level via the HPA-axis activation as well as repeated surge of catecholamine release via "fight or flight response" are detrimental to the body's key protective mechanisms against stress, namely cardiovascular, metabolic, and immune systems (McEwan, 1998).

Cardiovascular system. Cardiovascular diseases account for approximately one in three deaths in the U.S. (American Heart Association, 2015). Research has shown that acute physical stress, such as intense physical exertion and sexual activity, is linked with the increase in acute cardiovascular events, such as acute myocardial infarction and acute

coronary syndrome (Mittleman, Maclure, & Tofier, 1993; Strike & Steptoe, 2005). Acute and chronic psychological distress and related negative emotions have been associated with the development of cardiovascular diseases and the worsening of existing cardiovascular diseases (Dimsdale, 2008; Lee, Colditz, Berkman, & Kawachi, 2003; Schwartz et al., 2012). Most dramatic presentation of psychological stress-induced cardiovascular malfunction is Takotsubo cardiomyopathy, also known as stunned heart or broken-heart syndrome. Takotsubo cardiomyopathy is a transient left ventricular apical ballooning without angiographically significant coronary artery stenosis; its clinical symptom onset is often precipitated by acute intense emotional stress, and it is primarily seen among peri-postmenopausal women (Virani, Khan, & Mendoza, 2007). However, the exact cause and the pathophysiology of Takotsubo cardiomyopathy have not been identified.

Metabolic system. Chronic stress can cause metabolic changes that have detrimental effects on cardiovascular functions collectively called metabolic syndrome. Systematic inflammation due to dysregulated cortisol secretion seen in chronic stress can cause oxidative stress to endothelial cells of white fat tissues, resulting in impaired blood flow and impaired glucose uptake in energy-consuming major organs, such as the liver and the skeletal muscles (Otani, 2011). Chronically elevated blood glucose level due to restricted glucose uptake in skeletal muscles and increased glucose output by the liver contribute to insulin resistance, which may lead to diabetes.

Furthermore, dysregulation of cortisol actions can cause pro-inflammatory state that underlies the acceleration of endothelial dysfunction. Endothelial dysfunction is the systematic imbalance between relaxation and constriction of the blood vessels, which is

strongly implicated in the development of atherosclerosis, a chronic inflammatory state of the arterial wall structure (Brotman, Golden, & Wittstein, 2007; Deanfield, Halcox, & Rabelink, 2007). Atherosclerosis involves the buildup or plaque made of macrophages, white blood cells, low-density lipoprotein particles, and an increased level of pro-inflammatory proteins and cytokines (Woollard, 2013). A sudden rupture of hardened plaque and resultant blood clot formation reduce or block arterial circulation in the heart and the brain, causing acute coronary syndrome, acute myocardial infarction, or stroke (Brotman et al., 2007). Adverse health effects of metabolic syndrome are largely amenable to lifestyle modifications, such as weight loss, healthy diet, and physical exercise (Sharma & Majumdar, 2009).

Immune system. Stress increases various neuroendocrine hormones, primarily adrenal glucocorticoids, and cathecholamine, and to a lesser extent prolactin, human growth hormone, and nerve growth factors. These hormones bind to their unique receptors on lymphocytes to exert diverse regulatory effects on immune reaction, including dysregulation of immune function, delayed wound healing, impaired vaccine response, development of cancer, and reactivation of latent virus infection (Segerstrom & Miller, 2004; Webster Marketon & Glaser, 2008).

A meta-analysis of the relationship between psychological stress and the parameters of human immune system from 293 independent studies conducted over 40-year period found differential effects based on the chronicity of stress (Segerstrom & Miller, 2004). Acute and time-limited stressors were associated with most adaptive up-regulation and some down regulation of natural immune functions (enhancing immune response); however, chronic stress shifts the pattern of various cytokine secretion,

causing diminished immune response against infection and cancer and increased risk for autoimmune diseases and allergies. Thus, more focus should be placed on effective stress coping to deal with chronic than acute stress to reduce allostatic load on the immune system.

Psychological stress symptoms in young adults

Various stressors that young adults experience are known to precipitate or exacerbate serious problems related to their well-being, such as poor academic performance (Elias, Ping & Abdullah, 2011; Lin & Huang, 2013), alcohol and substance abuse (Knight et al., 2002; Harrison & McKee, 2011), and suicidal experiences (Brownson, Drum, Smith & Denmark, 2011; Garcia-Williams, Moffitt, & Kaslow, 2014). Moreover, psychological stress symptoms often appear early in life, with about 75% of people who have lifetime mental disorders that meet the diagnostic criteria set by the American Psychological Association (APA) typically experiencing their first onset by age 24 (Kessler et al., 2005). Those with an early onset of mental disorders are more likely to experience the disorder later in life with more severe symptoms (Pettit, Lewinsohn, Roberts, Seeley, & Monteith, 2008). The following sections review some of the major psychological stress symptoms, perceived stress, depression, anxiety, and burnout.

Perceived stress. Perceived or appraised stress refers to the degree to which situations in one's life are appraised as stressful (Cohen, Kamarck, & Mermeistein, 1983). Perceived stress has been assessed in numerous research studies to predict various health conditions and behaviors among young adults within educational contexts. For instance, one study tracked the trajectory of perceived stress change over the academic

year and examined its relation to multiple psychosocial indices in order to differentiate groups of students based on their ability to adapt to their academic stress (Vitaliano, Majuro, Mitchell, & Russo, 1989). In another study, a team of German researchers assessed the relation of ill-managed perceived medical school stress manifested as heightened risk for burnout with adaptive or maladaptive study habits among three cohorts of students (Voltmer, Kötter, & Spahn, 2012). The study findings from these studies collectively suggest that in general, perceived stress correlates positively with unhealthy or maladaptive stress coping behaviors and negatively with healthy, adaptive stress coping.

One issue regarding perceived stress is that the literature is not clear whether perceived stress is a subset of psychological distress that encompasses a wide range of psychological symptoms, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Lazarus, Delongis, Folkman, and Gruen (1985) argued that perceived stress had a recursive relationship with psychological distress because stress appraisal was fundamentally a relational construct between environmental and person variables. In response, Cohen and Williamson (1988) suggested that perceived stress and psychological distress conceptually overlapped but not necessarily merged, because empirically perceived stress scores could predict health-related outcomes after statistically controlling for the overlapping effects of perceived stress and psychological distress. Despite this issue, many studies have utilized the Perceived Stress Scale (PSS; Cohen et al., 1983) to uncover the relation between perceived stress and many diseases in people's lives (Cohen, Janicki-Deverts, & Miller, 2007).

Depression and anxiety. In general, depression is common among American adults. In 2012, major depression, based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnostic criteria, affected 8.9% of the American adults between 18 and 25 years of age and 7.6% of adults between 26 and 49 years of age (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013). Depressive symptoms, such as feelings of hopelessness, pessimism, guilt, worthlessness, or difficulty concentrating, remembering, or making decisions, were also reported by nearly one third of college students (Buchanan, 2011; Ibrahim, Kelly, Adams, & Glazebrook, 2012). A high rate of depression is consistently found among medical students, particularly female students (Chang, Eddins-Folensbee, & Coverdale, 2012; Compton, Carrera, & Frank, 2008; Dyrbye, Thomas, & Shanafelt, 2006; Goebert et al., 2009).

Both depression and anxiety are considered a part of common downstream consequences of dysregulated biological stress processes, namely the HPA-axis and the SAM (Young, Abelson, & Liberzon, 2008). Furthermore, both depression and anxiety share unique clinical features. For example, research studies have reported that relatively stable negative emotions are common to both depression and anxiety, while the low levels of positive emotions are unique to depression and hyperarousal is unique to anxiety (Watson, Clark & Carey, 1988).

The etiology of depression appears to be intimately related to the person's developmental history. According to the Cognitive/Developmental Model of Depression (Beck, 1967, 2008), stressful events are thought to foster *and* activate negative attitudes and biases about self, called schemas. Adverse events early in life promote the integration

of schemas into the person's routine cognitive patterns (cognitive vulnerability for depression); for those people with a cognitive vulnerability, the encounter with negative events later in life and dysfunctional stress appraisal are suspected to contribute to depression. Furthermore, studies also suggest that adolescents and young adults with a cognitive vulnerability to depression are more likely to show increases in depressive symptoms upon experiencing negative events compared to their peers without such vulnerability (Abela & D'Alessandro, 2002; Seeds & Dozois, 2010).

On the other hand, anxiety in itself is a normal emotional reaction to danger or threat (Öhman, 1993). However, abnormal or pathological anxiety, which is characterized by high level of negative affect associated with a sense of uncontrollability, hypervigilance, and inability to focus on normal daily activities, is typically chronic and severe enough to disrupt the person's routine daily functioning (Rosen & Schulkin, 1998). It can lead to anxiety disorders, such as post-traumatic stress disorder (PTSD), obsessive-compulsive disorder (OCD), and specific phobias, which are the most prevalent lifetime mental disorders in the U.S, affecting 28.8% of the adult population (Kessler et al., 2005).

Adaptational correlates of depression and anxiety. Research studies have examined the prevalence of concurrent depression and anxiety related to various adaptational correlates. For example, depression and anxiety increased significantly in both female and male medical students while preparing for examination, which positively correlated with the increase in salivary cortisol level, confirming the heightened HPA-axis activation (Singh et al., 2012). Other studies assessed behaviors that were strongly

suggestive of maladaptive stress coping, such as poor sleep quality, alcohol misuse and suicidal behaviors, and burnout.

Poor sleep quality. Poor sleep quality is strongly associated with clinically significant anxiety disorders due to heightened arousal state in pathological anxiety (Staner, 2003). Reports on poor sleep quality among college students (Lund, Reider, Whiting, & Prichard, 2010) indicate that as many as 70% of young adults suffer from sleep problems (Gaultney, 2010; Peltzer & Pengpid, 2014). Poor sleep quality is known to contribute to allostatic load, which negatively affects cognitive functions and further exacerbates stress-induced neuronal restructuring in the brain (McEwen 2006). Chronic poor sleep-induced cognitive impairment is particularly problematic among college students, because cognitive impairment, which directly affects learning and memory, has been shown to adversely affect objective academic achievements (Curcio, Ferrara, & De Gennaro, 2006). College students at risk for academic failure (GPA less than 2.0) were also more likely to be at risk for sleep disorders in one study conducted at a single public university in the Southeast U.S. (Gaultney, 2010).

Alcohol misuse and suicidal behaviors. Alcohol misuse is a serious problem among young adults. The most recent government figure indicated that in 2013, nearly 60% of full-time college students age 18-22 admitted using alcohol in the previous month compared to age-matched peers who were not attending college, and 39% engaged in binge drinking (SAMHSA, 2013). Stress and depression are risk factors for alcohol misuse among young adults. For example, young adults typically start drinking alcohol during college years and often use alcohol to cope with stress. Especially male students were more likely to use alcohol compared to their female peers due to their limited use of

active coping styles, such as social support (Hussong, 2003). Depression also has a significant association with alcohol use in this population, particularly among females. Of a concern, depressed female young adults are more likely to engage in heavy episodic drinking, often starting in their final year in high school, and to meet all clinical criteria for alcohol abuse compared to male peers (Weitzman, 2004).

The literature also suggests a strong link between undertreated depression, particularly with concurrent alcohol misuse, and suicidal behaviors (Pompili et al., 2010). In 2009, suicide was the 3rd leading cause of death among young adults ages 15-24. Suicide accounted for 14.4% of all deaths in this population (NIMH, 2015). Depressive symptoms, such as hopelessness, loneliness, and helplessness are the most commonly reported contributing factors to suicidal ideation or behaviors among college students (Furr, Westefeld, McConnell, & Jenkins, 2001).

Burnout. Burnout is a prolonged response to chronic emotional and interpersonal stressors characterized by emotional exhaustion, depersonalization, and low personal accomplishment specific to work context (Maslach, Schaufeli, & Leiter, 2001). Burnout may be associated with depression. Burnout is often a serious problem specific to work-related context, while depression is pervasive in all aspects of people's life (Maslach et al., 2001).

Maslach and colleagues. (2001) offered a comprehensive review of burnout to identify individuals at the risk for burnout. Burnout seems to precipitate psychological distress, such as depression and anxiety, among workers who receive little support from their supervisors and coworkers as well as those with little decision-making opportunities and job feedback. Additionally, young age, which correlates with less job experience and

professional knowledge as well as a single marriage status, i.e., less social support, predicts higher burnout. Burnout-prone personal characteristics include low levels of hardiness, external locus of control, avoidance, passive or defensive coping styles, which are known to correlate with low self-esteem and neurotic and Type-A personality. Collectively, burnout seems to be a serious problem especially among young adults with inadequate coping skills who are at the initial stage of their professional career.

Stress in Nurse Anesthesia

The literature positively supports stressful nature of anesthesia training and practice (Chipas & McKenna, 2011; Chipas et al., 2012; Larsson & Sanner, 2010; Nyssen & Hansez, 2008). Many previous studies on stress in anesthesia viewed stress as the result of the interplay between the environmental demand unique to the anesthesia specialty (stressors) and the characteristics of the anesthetists. The common approaches to studying stress in anesthesia have been: (1) to identify significant stressors in anesthesia; (2) to describe the outcomes of ill-managed stress among anesthesia providers and trainees; and (3) to identify the moderating factors of stress that might provide insight into the individual differences on stress manifestation (Nyssen & Hansez, 2008). Anesthesia providers and trainees experience similar stressors in clinical practice; however, anesthesia trainees such as SRNAs experience *additional* training-related stressors, such as socializing into the new professional role, maintaining academic excellence and studying for the national certification examination, as well as relationship with instructors and peers.

Training-Related Stressors Among SRNAs

Studies investigating the source of stress among SRNAs have generally reported either school or training-related demands and interpersonal relation that affected their subjective level of stress. The vast majority of studies used survey design using validated or instructor-designed instruments. A few studies used a qualitative approach to analyze the personal meanings of stressful experiences among SRNAs.

School-related demands. The literature suggests that most school-related stressors in SRNAs are due to high level of academic and clinical demands (Chipas et al., 2012). One of earliest reports of stress in SRNAs in the 1980s suggested that school-related stressors varied depending on the stage of nurse anesthesia training (Wildgust, 1986). The first-year students who just started their clinical training perceived clinical training very stressful because they were learning new clinical skills. Information overload was another top stressor among the first-year students. On the other hand, the second-year students reported the assignments with progressively more complex and challenging clinical cases were the major source of stress.

Finally, studying for the national certification exam, maintaining academic excellence and clinical competency became the top-rated stressors among those who were nearing the end of nurse anesthesia training. Another notable stressors common to both cohorts of students were test anxiety and fear of making mistakes. Many stressors identified in Wildgust's study were also endorsed by the subsequent SRNA stress studies (Perez & Caroll-Perez, 1999; Phillips, 2010; Chipas et al., 2012), indicating that school-related stressors described in Wildgust's study were inherently a part of nurse anesthesia education.

While the majority of SRNA stress studies used cross-sectional survey method, Phillips (2010) conducted a qualitative study to illustrate individual stress processes experienced by SRNAs, including 3-stage coping process. The author analyzed the interview data from 12 CRNAs within two years from their graduation using grounded theory technique. Commonly reported personal stressors while in school included role strain, lack of personal time, relationship with family, friends, and peers, poor sleep habits, and finance. Common curriculum stressors were information overload, high expectation, fear of reprimand, fear of making clinical mistakes, fear of academic dismissal from the nurse anesthesia educational program, conflict with clinical preceptors, ineffective time management, clinical assignments and performance evaluation, adjusting with different teaching styles among multiple clinical preceptors, and taking national certification exam.

Phillip's findings also provided insight into the nature of maladaptive stress coping among SRNAs who tend to ignore the needs of self. The apparent school-life imbalance among SRNAs provided an important educational opportunity for effective adaptive stress coping interventions, such as self-care and social support. Small in number in publication, however, qualitative studies such as Phillips (2010) and Perry (2005) can provide invaluable insight for the process of adaptation experienced by SRNAs, and are needed.

Interpersonal relation. Hierarchical nature of clinical preceptor-student relationship, as well as the perceived lack of control in the operating room among anesthesia personnel may contribute to constrained, stressful interpersonal relationship among operating room personnel, sometimes presenting as abusive treatment of students

by clinical preceptor or staff (Kinzl, Traweger, Trefalt, Riccabona & Lederer, 2007). For instance, verbal abuse was reported by 60% of SRNAs ($N = 696$) who responded to an online survey conducted by Elisha & Rutledge (2011). Predominant perpetrators of the abuse were CRNA and anesthesiologist preceptors. Moreover, sexual harassment was reported by 10% of SRNAs, and the majority of the victims were female students. However, the perpetrators of sexual harassment and other types of abuse, such as physical abuse and racial discrimination, were more likely the unspecified persons who were working outside the operating room. The authors also have found the clinical preceptors overestimated their teaching effectiveness in communication and creating an environment for learning. These findings by Elisha & Rutledge suggest the urgent needs for additional training specific to effective clinical teaching among CRNA and/or anesthesiologist clinical preceptors.

Practice-Related Stressors

Six most common stressors in clinical anesthesia practice in the literature were (1) time pressure; (2) excessive workload; (3) task complexity; (4) ethical decision-making and the fear of harming patients; (5) interpersonal relations; (6) lack of control; and (7) work-life imbalance (Nyssen & Hansez, 2008). These six stressors are also similar to the findings of Phillips (2010). In addition to these common issues, CRNAs also face unique stress related to workforce issues, such as medical supervision or direction by physicians, and the scope of practice, which were also the source of morale distress among CRNAs.

Operating room environment. Perry (2005) reported working in the window-less operating rooms (OR) was stressful among experienced CRNA participants because it was depressing particularly during the dark months. Rosenstein & O'Daniel (2006) also

described small physical confines of OR as a unique environmental factor that breeds disruptive behaviors:

Interpersonal relation and workplace incivility. Cavagnaro (1983) investigated stressors among intensive care unit (ICU) registered nurses (RN) and CRNAs. ICU RNs ranked staffing issues the highest, while CRNAs listed interpersonal job-related conflicts and attitudes of physicians/surgeons as the top cause of stress. In the study by Rosenstein & O'Daniel (2006), most frequent types of disruptive behaviors reported in the literature were yelling, raising voice, disrespectful interactions and using abusive language. Attending surgeons and anesthesiologists were ranked at top as the perpetrator, while CRNAs and SRNAs were least likely to exhibit disruptive behaviors among perioperative team, suggesting nurse anesthetists as the victim of abusive conducts by others.

Also, abusive behaviors in nurse anesthesia practice were reported in a national study by Sakellaropoulos, Pires, Estes & Jasinski (2011), who found that over 90% of female CRNAs have experienced abuse which was mostly directly targeted verbal abuse. Male CRNAs also reported similar experiences but at lesser prevalence than female CRNAs. The largest portion of active aggression was directed against younger female CRNAs less than 40 years of age. The victims of verbal abuse also reported psychological stress from abuse, such as "feeling tense and stressed".

Chronic stress from interpersonal relations has been also associated with negative psychological states, such as burnout. Incivility from coworkers and burnout was positively correlated among CRNAs practicing in the state of Michigan ($N = 385$), controlling for gender, employment type and professional role, and hours worked (Elmblad, Kodjebacheva & Lebeck, 2014). Similar to SRNA abuse reported by Elisha &

Rutledge (2011), the source of incivility was a general hospital employee, non-employee, and medical doctors. These research studies collectively illustrate pervasive chronic stressor in the form of disruptive behaviors in the CRNAs' working environment. However, how CRNAs and cope with difficult interpersonal relations, or the characteristics of CRNAs and SRNAs who "thrive" or "sink" under such circumstance are not well understood.

Workforce and scope of practice. CRNA-anesthesiologist work relationship is a well-known cause of stress in nurse anesthesia due to restricted scope of practice, role ambiguity, and hierarchical working relationship. Alves (2005) conducted a mailed survey among AANA members in six New England states (N = 347; 30% response rate) to examine the relation between the scope of practice under anesthesia care team model, CRNA-anesthesiologist collaboration and role-related occupational stress. CRNA employed by anesthesiologist group had the most restricted scope of practice, and few CRNA felt their practice was collaborative and many used compromise to deal with problems. On the other hand, CRNA with broader scope of practice reported higher collaboration and also higher level of stress, perhaps due to independent practice providing anesthesia care without close medical supervision or direction.

Restricted scope of practice, in turn, can cause job-related morale distress. Dumouchel, Boytim, Gorman & Weismuller (2015) found the majority of CRNA study participants in California (n = 1,190) have experienced moderate level of morale distress. Medically supervised CRNA, especially working in the hospital setting, reported higher morale distress than independent CRNAs who mainly worked at outpatient surgery setting. However, the authors speculated this group difference might be also related to the

difference in patient acuity between hospital and outpatient surgery centers. Also, research studies using qualitative methodology to explore the nature of distressful working environment as well as how CRNAs cope with their moral distress are needed.

Production pressure. Production pressure is defined as "overt or covert pressures and incentives on personnel to place production as their primary priority instead of safety (Gaba et al., 1994). Gaba and his colleagues at the Stanford University conducted a mail survey study among the members of the American Society of Anesthesiologists (ASA) in California ($N = 279$). The respondents identified "avoiding case cancel" and "eliminating case delays and providing quick turn over of the room in all situations" as common objectives of production pressure in their anesthesia practice that caused their psychological distress. The pressure to achieve these objectives caused unsafe actions in their views as anesthesiologists. Perry (2005) also identified workload, staffing, work schedule as attributes of production pressure. Another survey study among perioperative team also found that disruptive behaviors were more witnessed when the caseload was heavy (Rosenstein & O'Daniel, 2006). While production pressure has been often cited as a contributing factor of staff burnout among anesthesiologists (Lederer, Kinzl, Trefalt, Traweger & Benzer, 2006; Nyssen & Hansez, 2008), this relation is yet to be explored in nurse anesthetists.

Sleep deprivation - fatigue. Sleep deprivation and fatigue are closely related to production pressure, which has an implication for depression and suicidal thoughts as well as patient safety (Howard, Rosekind, Katz, & Berry, 2002). Recent national survey of call-shift fatigue and use of countermeasures among CRNAs found over 80% ($N =$ 325) of survey respondents reported experiencing call-shift fatigue (Domen, Connell, &

Spence, 2015). Many CRNAs are often sleep-deprived and self-medicate using both prescription and over-the-counter sleep aids (Biddle & Aker 2011). The use of sleep aids casts a concern over their mental and physiological readiness to take care of patients. However, unlike high-risk industry like commercial aviation, currently there is no regulatory requirement concerning the use of chemicals before and during the duty hours in the American clinical nursing practice. Still, more research is needed to assess the nationwide prevalence of sleep aid use among clinical nurse anesthesia providers and students to fully assess its relation with mental health among nurse anesthesia professionals and patient safety.

Morale distress. Unexpected patient injury or death is a very difficult topic for many healthcare providers and is a major stressor, particularly for anesthesia provider and students, because anesthesia training philosophy is avoiding, not managing the aftermath of disasters (Gazoni, Durieux, & Wells, 2008). Booth (1998) described unexpected incidents that CRNAs may experience sometime in their anesthesia career, such as intraoperative death, organ harvest, anesthetizing a patient on "do not resuscitate" order, directly contributing to patient demise due to error in clinical judgment, or substandard of care by others. Booth strongly advocated for developing personal coping mechanism for some of the most unexpected difficult clinical scenario, such as sudden patient death in the operating room.

Due to its extreme rarity, there is no empirical study describing the effects of intraoperative catastrophes among CRNAs. However, there is one mail survey study conducted among anesthesiologists ($N = 659$) about their personal experience in perioperative catastrophe and their emotional impact (Gazoni et al., 2008). Over two

thirds of the survey respondents got involved in at least one unexpected perioperative patient death or serious injury over their career, and a half of them as the primary anesthesiologist for the case. Among those with the catastrophe experience, 40% were anesthesia-related event, and 56% of the catastrophe was believed as preventable. Most common emotional experiences were re-living the event, anxiety, guilt, fear of litigation, and depression. Notably, 5% of the respondents admitted using drug or alcohol to cope with their emotional distress.

In addition to rare unexpected incidents, chronic on-going minor stressors that many CRNAs and SRNAs experience, such as workplace interpersonal issues, can cause serious psychological distress. For example, Radzvin (2011) reported that Pennsylvania CRNAs ($N = 300$) generally experienced moderate level of morale distress primarily from working closely with physicians and surgeons, and younger CRNAs reported higher distress. Psychological manifestations of their moral distress were frustration, anger, feeling powerlessness, and guilt. Physical manifestations were headaches, stomachaches, and muscle tensions. The similar results were also reported from the active duty nurse anesthetists in the U.S. Army who found incompetent coworkers, staffing issue, mandatory overtime, providing care to patients with possible health risk to staff, protecting patient rights and human dignity caused their moral distress (Jenkins, Elliott & Harris, 2006).

Collectively, these studies suggest that anesthesia practice can cause moral distress in both nurse and physician anesthesia providers. Unexpected intraoperative incidents as well as chronic on-going workplace minor hassles, particularly interpersonal relation issues, are potential source of moral and psychological distress. In some cases

with inadequate coping resources, anesthesia providers might opt to cope with their distress using drug and alcohol. Therefore, qualitative research study to investigate the narrative account of how CRNAs who have had moral distress, especially unexpected catastrophes cope with their difficult experiences is needed.

Correlates of Stress in Nurse Anesthesia Practice and Training

The literature suggests that unique stressors inherent in nurse anesthesia practice and training might contribute to variety of correlates of stress, such as burnout, perceived stress, anxiety and depression, chemical dependency, and nurse anesthesia program attrition.

Burnout. Burnout is a significant long-term problem among anesthesia professionals affecting a large portion of CRNAs and SRNAs (Chipas & McKenna, 2011). Empirical studies on burnout among anesthesia personnel have been mostly conducted among physician anesthesiologists, including residents. There are only one data-based article about burnout in nurse anesthesia in the U.S. Chipas and McKenna (2011) conducted a survey study among the entire AANA membership (N = 7,537; 26.9% response rate) and found that non-specific symptoms of stress, such as agitation, craving, insomnia, obsessive compulsiveness, and headaches were common in nurse anesthesia professionals. However, contrary to the study title, the authors did not actually examine burnout itself in their study.

There was only one empirical study on burnout in nurse anesthesia practice, which was conducted in the Netherland, one of 40 countries worldwide where nurse anesthetists provide anesthesia care. Meeusen, van Dam, Brown-Mahoney, van Zundert & Knape (2011) examined burnout among 882 Dutch nurse anesthetists using the

Maslach's MBI scale. The authors found burnout and psychosomatic symptoms, such as anxiety, fatigue, and headache, were negatively associated with job satisfaction. In addition, burnout, particularly emotional exhaustion and depersonalization, was more prevalent among older nurse anesthetist. The positive relation between older age and emotional exhaustion was contrary to the findings on burnout among medical doctors, which have consistently reported higher burnout among young residents under 30 years of age (Nyssen, Hansez, Baele, Lamy, & De Keyser, 2003; Shanafelt et al., 2009). The unique work environment and the nature of nurse anesthesia practice in Netherland might have contributed to this difference. Also, the authors did not report the actual MBI scores or the percentile of the participants who had met the criteria for burnout. This was also contrasting to the majority of burnout studies among medical doctors, which often provided such data for cross-comparison among studies. This is a significant gap in knowledge regarding the prevalence and the severity of burnout in nurse anesthesia.

Perceived stress and moderators of stress. The literature on nurse anesthesia stress has consistently illustrated high stress nature of nurse anesthesia practice and education. As described in the previous stressors in nurse anesthesia section, many studies of stress in nurse anesthesia assessed school or personal situations that were known stressors, rather than appraised or perceived stress. On the other hand, there are only two studies that quantified perceived stress level among SRNAs and CRNAs (Chipas & McKenna, 2011; Chipas et al., 2012). These two studies reported differential stress perception among SRNAs and CRNAs depending on the professional role, anesthesia training level, curricular and personal characteristics.

Professional role and training level. Nurse anesthetists at all professional roles were asked to rate their level of stress on an average day on a single 10-point Likert scale item, 10 being the highest level of stress, one the lowest, instead of validated multi-item measure, such as Cohen and colleagues' Perceived Stress Scale (PSS). The average score for the whole sample was 4.7. SRNAs were the most stressed group at 7.2, followed by educators at 6.2, program administrators at 5.1, military members at 4.9, and staff civilian CRNAs was the least stressed group at 4.3 (Chipas & McKenna, 2011). Within SRNAs, the stress level was highest during the 5th-semester (second year) and remained relatively stable, only to rise slightly at the end of their training. Second-year students in the study by Kendrick (2000) were also most stressed; however, their stress level was calculated using a scale that measured occupational stressors. The increase in the stress level among the graduating students was attributed to preparing for the national certification examination, and seeking for employment as a newly graduated CRNA.

Program curriculum design. Nurse anesthesia educational programs are roughly divided between two types of curriculum designs based on the timing in which students engage in clinical training. Front-loaded didactic programs are the most common type and students complete all or most of their didactic learning in classroom before entering clinical training. The other type is integrated program, in which students study didactic lecture in classroom and clinical training simultaneously, often starting their clinical training during their very first semester in the program. In a 2012 survey study by Chipas and colleagues, SRNAs in the integrated programs reported approximately 10% higher perceived stress level than their peers in front-loaded programs. The authors explained

that higher stress level among SRNAs in integrated programs might be due in part that they began clinical training while still receiving the academic basis for anesthesia care.

Demographic characteristics. Several studies reported that female SRNAs experienced higher stress level than their male peers (Chipas et al 2012). This is not surprising; female gender is a well-known moderator of perceived stress in higher education (Kanner, et al., 1981, Kohn et al., 1990), undergraduate nursing education (Campbell, Svenson, & Jarvis, 1992), as well as in general public (Bolger et al., 1989; Cohen & Jankcki-Deverts, 2012). In addition to gender difference, Chipas and colleagues (2012) also identified several other demographic characteristics that were associated with higher levels of perceived stress among SRNAs. These at-risk groups included divorced SRNAs, compared to single, married, or separated peers, Black and Hispanic SRNAs, compared to non-Hispanic White and Asian peers. Higher psychological distress, burnout in particular, among minority healthcare students has been reported among medical students in Minnesota (Dyrbye et al., 2006); however, studies on the burnout risk among minority medical students have been equivocal (Dyrbye et al. 2008).

There is a paucity of research on perceived stress and its correlates in nurse anesthesia, however. Only two studies by Chipas and colleagues measured the level of perceived stress among nurse anesthesia professionals. Their method of measuring perceived stress using a single item question was problematic for two reasons. First, they asked the participants to rate their stress level on an average day. The way the authors asked the question did not adequately control for the context in which the participants rated their stress level. Similar to the issue of item standardization in life event checklist measures, different people might interpret “on an average day” in different ways. Second,

the perceived stress data in Chipas and colleagues' studies cannot be used for across-the-study comparison. This problem could have been easily mitigated if the study authors used a validated published measure, such as the PSS, which is the most widely used in stress research across disciplines.

Anxiety and depression. The only published study that described depression and suicidal ideation among SRNAs was conducted by Chipas and colleagues (2012). The authors asked the participants (N = 1,374) whether they had felt depressed or had a thought about killing themselves at least one point during training in dichotomous YES-NO questions. Nearly a half of SRNAs (47.3%) reported depression and 21.2 % of SRNAs had suicide ideation. The authors did not assess anxiety among SRNAs.

Two studies on anxiety among SRNAs were both related to clinical learning. The earlier study was Garcia-Otero & Teddlie (1992), which conducted a quasi-experimental study (n = 43) to test whether receiving instructional sessions based on students' preferred learning style would decrease the level of anxiety among SRNAs. The data suggested knowing *and* learning based on one's preferred learning style decreased anxiety and also improved performance.

More recently, a quasi-experimental study on SRNA's stress and anxiety during simulated clinical training (N = 18) assessed multiple objective markers of stress reaction, subjective level of anxiety, and their relation with clinical performance (Mckay, Buen, Bohan & Maye, 2010). The outcome variables included salivary α-amylase level, heart rate, blood pressure, and the presence of sweat on the subjects' forehead as well as the objective performance using checklist during a 15-minute general anesthesia induction scenario using a high-fidelity manikin. There was no significant difference among three

levels of performers (classified based on the student performance in the simulation)—low, moderate, and strong—in objective markers of stress and anxiety. The authors attributed the lack of statistical power for non-significant finding. These two experimental studies on SRNAs' anxiety had quite different research purposes: the former studied anxiety as a marker for improved clinical instruction, whilst the latter investigated the effect of stress reaction including anxiety on clinical performance. Despite their differences, both studies emphasized that anxiety was a common hindrance of effective clinical learning among SRNAs.

Similar to perceived stress, there are only few research studies on depression and anxiety in nurse anesthesia in the literature. This is surprising, given many published research studies describing stressful nurse anesthesia education and practice environment. Most nurse anesthesia stress literature has focused primarily on identifying the "cause" of stress, and offering the suggestions for remedy for the identified problems, but not about the "symptoms" of stress. Furthermore, the only study that quantified depression in SRNAs used a single dichotomous YES-NO question, which has unknown reliability and validity to assess depressive symptomatology. This gap in the literature is significant, because without knowing the nature of outcomes of the stressors, it is difficult to design a theory-based stress intervention that can account for potential moderators that influence the effectiveness of the intervention.

Chemical dependency. In 2009, national prevalence of illicit drug or alcohol abuse among the American public age 12 and older was estimated at 9.3%, or 23.5 million people (SAMHSA, 2011). Chemical dependency among CRNAs has been estimated about the same as the national average around 10% (Bell et al., 1999; Wright et

al., 2012). Bell et al.' study portrayed the average impaired CRNA as a male with 6-10 years of clinical practice and was currently abusing midazolam, nitrous oxide, or opioids. A systematic review of substance abuse among anesthesia residents between 1975 and 2009 also reported overwhelming representation by male residents among abusers (95.5%), as well as relatively high rates of relapse that was estimated as above 40% over 30-year career, and higher sudden death (Warner et al., 2013). Intravenous fentanyl was the most common drug of choice, followed by alcohol and marijuana/cocaine. Subsequently, Wright et al. (2012) reported the result of 2006 unpublished follow-study by Bell, which found little difference from his1999 study, except for higher opioid and propofol abuse and longer clinical practice experience (10 – 20 years) among the abusers.

Known risk factors of opioid dependency in anesthesia are; (1) comorbid affective disorders; (2) family history of substance abuse; (3) excitement and sensation-seeking personality; (4) easy access to intravenous drug of choice; (5) poorly managed stress; (6) inclination for self-medication; and (7) professional training in pharmacology.

There is only one published study on chemical dependency in SRNAs. A 5-year prevalence of documented student chemical dependency cases between 2008 and 2012 as reported by 23 nurse anesthesia program administrators was 0.65% or 16 cases (Bozimowski, Groh, Rouen, Dosch, 2014). Among the 16 reported cases, slightly over a half of the abusers were in their 20s of age and in their 2nd year of study. Staff at clinical training sites discovered the majority of cases. Common drugs of choice were opioid, alcohol, marijuana, and benzodiazepines. Following the discovery of their drug abuse, 10 students voluntary entered to treatment, seven were dismissed, two lost their RN license, four out of six students with follow-up data were allowed to return to their original nurse

anesthesia program, and three students graduated. One of 16 abusers sadly died of his drug abuse. Moreover, less than the optimum readiness for student chemical dependency among the nurse anesthesia program apparent in Bozimowski and colleagues' study. First, not all nurse anesthesia programs had implemented wellness education for their students, and only five programs had chemical dependency risk assessment policy for screening potential candidates. Furthermore, less than a half of the programs in the study conducted a drug test even after students' drug abuse became surfaced.

These study findings collectively highlighted the difficult challenges with confronting chemical dependency in anesthesia. The foremost challenge is that it is very difficult to identify and treat chemical dependency in healthcare providers in general, because impaired providers are adept at hiding their addiction (Baldisseri, 2007). Unfortunately, the ultimate discovery of chemical dependency with intravenous drugs among anesthesia providers is due to sudden death by overdose. Second, there is no national database that collects chemical dependency among students, unless their abuse has been reported to their state nursing licensure authority. Therefore, it is possible that abusers could return to clinical nursing after their dismissal from nurse anesthesia training program without receiving necessary treatment and putting patient safety at jeopardy. In fact, only 10 out of 16 students were known to voluntarily enter the drug treatment program in Bozimowski and colleagues' study. However, the reporting of impaired anesthesia providers and students to regulatory body needs to be carefully balanced with the respect for the person's wish to seek treatment for their addiction with the goal of reentry to clinical practice. Successful reentry into clinical anesthesia is possible with costly inpatient treatment, long drug monitoring periods and strong social

support (Wilson & Compton, 2009); however, the provision of diversion program, or alternative-to-discipline program differs among 50 state board of nursing in handling of impaired nurses (Monroe, Kenaga, Dietrich, Carter & Cowan, 2013), and successful reentry to clinical anesthesia practice among recovering CRNAs is not well understood (Wilson & Compton, 2009). Better study methodology to investigate chemical dependency among SRNAs and CRNAs is needed to improve data collection and reporting to ensure student well-being as well as patient safety.

Attrition. The national attrition rate in nurse anesthesia education remains stable around 9%, and was highest during 12-18th semesters (Dosch, Jarvis, & Schlosser, 2008). The majority of nurse anesthesia program administrators also endorsed that attrition has not changed over the recent years. Most common mechanism of attrition was self-resignation (35.5%) and academic dismissal (30.4%). The relationship between SRNA stress and contributing factors for resignation was not investigated, but was suggested. The reasons cited for attrition were: personal or health reasons, poor academic and clinical performance, time commitment, CRNA job role (not congruent with own professional goal), and substance abuse. The relationship between SRNA stress and attrition and the potential remedy through stress education deserves further attention, because attrition is costly to nurse anesthesia education.

Mindfulness

Introduction

Mindfulness has its roots in ancient spiritual traditions. Mindfulness was expounded in the teachings of Buddha roughly 2,600 years ago, as a principal concept as well as the core contemplative practice to achieve freedom from human suffering (Gunaratana, 2011). Western interest in Buddhism has grown steadily since large numbers of Europeans and Americans began to travel to Asia, beginning in the late 19th century. It achieved even greater growth after World War II (Gethin, 1998). In the West, mindfulness can refer to either a secular meditative practice, or one grounded in Buddhist teachings.

Mindfulness-based interventions (MBI) for various psychopathologies have been rapidly expanding in the past 30 years (Williams & Kabat-Zinn, 2011). The groundbreaking MBI was Mindfulness-Based Stress Reduction (MBSR), introduced in 1979 by John Kabat-Zinn of the Stress Reduction Clinic at the University of Massachusetts, which initially treated chronic pain patients who were refractory to traditional medical treatments (Kabat-Zinn, 1982). Subsequently, the success of MBSR to treat a variety of chronic conditions has inspired many MBIs within cognitive behavior therapy, such as Dialectical Behavior Therapy (DBL; Linehan, 1993) for borderline personality disorder; Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 1999) for anxiety disorders; Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams & Teasdale, 2002) for recurrent major depression; Mindfulness-Based Relapse Prevention (MBRP; Bowen et al., 2009) for substance abuse disorders; and

Emotion Regulation Therapy (ERT; Mennin, Fresco, Ritter & Heimberg, 2015) for concurrent generalized anxiety disorder and depression.

Currently, MBIs are also widely tested outside health care settings among non-clinical contexts, including K-12 education, higher education, military, veterans, law enforcement, a variety of business settings, business leadership training, and prison rehabilitation (Kabat-Zinn, 2011). Despite the apparent diversity of purposes, target populations, and applications, the alleviation of psychopathologies by cultivating mindfulness remains the unifying theme among the various MBIs.

Cultivating Mindfulness in the West

MBIs play a significant role in alleviating physical and psychological symptoms in both clinical and general populations through intensive attention training based on Buddhist teachings of mindfulness (Carmody, 2015). The majority of MBIs taught in secular Western settings are devoid of the original Buddhist religious context and without other integral mental aspects of Buddhist practice, such as compassion, loving-kindness, equanimity, sympathetic joy, and non-self (Grossman, 2011). This deliberate omission is seen as a necessary strategy to make MBIs accessible to a larger Western audience, who may otherwise not be willing to learn mindfulness skills (Baer, 2011; Kabat-Zinn, 2011).

Traditionally, long-term steady mindfulness training, through various forms of meditation, is believed to cultivate mindfulness over time—often taking years of regular practice (Grossman, 2011; Kabat-Zinn, 2011). There are many ways to cultivate mindfulness, including: (1) informal self-directed everyday activities (everyday mindfulness) that remind the person throughout the day to pay attention to what is happening in the moment without radically changing routines; (2) formal sitting

meditation, alone or in a group setting; (3) retreat practices, which are single- or multi-day programs dedicated entirely to cultivating mindfulness; and (4) structured therapeutic mindfulness training programs. Structured therapeutic mindfulness training programs, such as MBSR and MBCT, can offer appreciable health benefits to participants. Recent multiple systematic reviews and meta-analyses suggest that MBIs can effectively relieve symptoms related to many psychological issues among healthy adults as well as clinical populations (Chiesa, Anselmi & Serretti, 2014; Gu et al., 2015; Irving, Farb & Segal, 2015; Shapiro & Jazaieri, 2015).

The literature also supports the benefits of MBIs for stress reduction among healthcare students. The seminal work by Shapiro, Schwartz & Bonner (1998) demonstrated that meditation-based stress reduction intervention effectively decreased anxiety and depression while increasing empathy among premedical and medical students. In addition, a number of meditation-based stress intervention studies have been conducted among undergraduate nursing students (Beddoe & Murphy, 2004; Chen, Yang, Wang & Zhang, 2013; Kang, Choi & Ryu, 2009; Snowden et al., 2015; Song & Lindquist, 2015; van der Riet, Rossiter, Kirby, Dluzewska & Harmon, 2015); and medical students (Bughi, Sumcad & Bughi, 2006; de Vibe et al., 2013; Greeson, Toohey & Pearce, 2015; Rosenzweig, Reibel, Greeson, Brainard & Hojat, 2003; van Dijik, Lucassen & Speckens, 2015; Warnecke et al., 2011). These studies collectively support the connection between MBI and various health benefits among healthcare student populations, including decreased perceived stress, anxiety, depression, and negative emotions, as well as increases in empathy, subjective well-being, and the overall satisfaction with the intervention. Furthermore, a recent meta-analysis of MBSR among

healthy individuals reported that those who benefited the most from MBSR were healthcare professionals, including students (Khoury, Sharma, Rush, & Fournier, 2015).

However, these studies also indicated several challenges with implementing structured meditation-based stress intervention among healthcare students. Only a few school-wide medical education curriculums integrated with mindfulness have been described in the literature (Dobkin & Hutchinson, 2013). The majority of MBIs involving healthcare students were offered as extra-curricular voluntary training. As a result, most MBIs for healthcare students reported either attrition or a low response rate (Shapiro, Astin, Bishop & Cordova, 2005). The students' lack of time and increased responsibility, rather than the loss of interest in the intervention, has been cited as the most common reason for attrition. Also, a small sample size, characteristic of many single-institution studies, as well as a lack of control groups are methodological weaknesses in studying the benefits of MBIs for healthcare students.

Also, ensuring a minimum amount of treatment to detect the study effect while minimizing participant burden and attrition seems a challenge in any research setting, whether educational or occupational. A shorter MBI protocol was said to better accommodate the busy schedules of people with multiple demanding social roles, such as healthcare professionals and students (Irving, Dobkin & Park, 200; Shapiro, Carlson, Astin & Freedman, 2006). However, the treatment dosage appears to influence the long-term maintenance of treatment effects. While most MBSR studies reported only short-term follow-up on sustained treatment effects (Shapiro & Jazaieri, 2015), one small MBI study (n = 30) has reported sustained treatment effects lasting for at least 12 months (Shapiro, Brown, Thoresen & Plante, 2011). Moreover, a recent systematic review by Gu

and his colleagues (2015) found that there was a significant dosage effect, that is, the participants in a full eight-week MBSR had better mental health outcomes than those who participated in shorter versions of the program.

Another important MBI consideration is intervention delivery mode. MBI studies involving healthcare students varied widely in terms of intervention protocol, to include: an abbreviated MBSR (Fortney, Luchterhand, Zakletskaia, Zgierska & Rakel, 2013); entirely online eight-week MBRS (Morledge et al., 2013); a single two-hour group session with home practice using an instructional DVD (Prasad, Wahner-Roedler, Cha & Sood, 2011); seven consecutive days of face-to-face mindfulness meditation (Chen et al., 2012); to a four-week virtual mindfulness coach (Hudilicka, 2013). Determining both the minimum effective dosage and delivery mode is a critical aspect of designing effective and attractive MBIs with minimum attrition and lasting treatment effects. However, the participant population and local context largely influence the choice of the most appropriate intervention protocol. Therefore, it may be challenging to assess the fit of a published MBI protocol to a particular research study setting and purpose, particularly when the study details are not well described in the published article.

Despite these challenges in conducting MBIs for healthcare students, further research is needed to design and test the best MBI model for busy healthcare students that maximizes study participation and minimizes attrition and the burden to fully participate in MBIs. Research could also examine the health benefits experienced by students who already possess a higher level of mindfulness than their peers, thus avoiding time-consuming and potentially costly clinical mindfulness intervention.

Definition of Mindfulness

Within the Buddhist tradition, the term "mindfulness" is the English translation of *sati*, a word from the ancient Asian language, Pali. The concept of "mindfulness" in the English language came from a translation of *sati* by influential British scholar of the Pali language, T.W. Rhys Davids, around the turn of the last century (Gethin, 2011). Pali was the language used in the earliest written transmission of the discourse of Buddha's teachings and its commentaries, within the Theravada tradition of Buddhism. *Sati* literally means "memory." There are multiple opinions on the precise meaning of *sati* among Buddhist scholars and teachers. Among many commentaries on *sati* by contemporary Buddhist teachers, one of the earliest and most influential interpretations was "bare attention" given by a German Theravada monk, Nyanaponika Thera (1969). "Bare attention" was a particularly necessary skill for beginners in mindfulness training. Thera explained that *sati* meant attending just to the bare facts of a perception, all while stressing the importance of non-elaborative awareness. Thera used "bare" to highlight purely receptive, clear, single-minded awareness of what happens to the human mind. His student, an American Theravada monk and scholar Bhikkhu Bodhi, later argued that his teacher had mistakenly conflated two distinct concepts, *sati* (mindfulness) and *manasikara*, which means turning the mind to an object spontaneously, whenever an object enters one's perceptual world (Bodhi, 2011). Instead, Bodhi defined *sati* not so much as "memory" or "remembering," but as "lucid awareness" which works with clear comprehension to cultivate insight and wisdom to eradicate human suffering.

Meanwhile, academic Buddhist scholars discussed *sati* mostly in line with the original translation, "memory," by Rhys Davids. British Buddhism scholar Rupert Gethin

(2011) explained *sati* as "to remember, or not to forget what one is supposed to be doing." He also emphasized remembering as a "working memory," in contrast to long-term memory. Wallace (2008) also provided a similar interpretation of sati as "recollection or non-forgetfulness" across the temporal sequence, retrospectively, present and prospectively.

Operational Definition of Mindfulness

There are multiple operational definitions of mindfulness in Western academic literature. Still, mindfulness is widely understood as a temporal state of mind during a period of formal meditation; this temporal state of mind fades away when the meditator stops meditation (Lau et al., 2006). A common notion underlying the operationalization of mindfulness is that all human beings have an inherent or innate capacity to be mindful, to a greater or lesser degree (Kabat-Zinn, 2003); mindfulness is thus seen as a skill that can be taught for specific purposes, such as reducing stress (Kabat-Zinn, 1990) or treating recurrent major depressive disorder (Segal, Williams & Teasdale, 2012).

Kabat-Zinn (1994) also provided one of the earliest and the most popular operational definitions of mindfulness, stating that mindfulness is "the awareness that arises from paying attention on purpose, in the present moment, non-judgmentally" (Paulson, Davidson, Jha, & Kabat-Zinn, 2013). Recently, Kabat-Zinn (2015) also described the purpose of mindfulness practices as striving to cultivate pure awareness. Kabat-Zinn's operational definition of mindfulness is frequently cited in clinical/applied mindfulness research studies, owing to Kabat-Zinn's widely popular MBSR program.

Another popular operational definition of mindfulness used in clinical mindfulness studies is the one developed by Bishop et al. (2004, p. 232) "a kind of

nonelaborative, nonjudgmental, present-centered awareness in which each thought, feeling, or sensation that arises in the attentional field is acknowledged and accepted as it is." Mindfulness has been described by other scholars as "intention, attention, and attitude" (Shapiro et al., 2006); "observing thoughts, emotions, and sensations" as they appear and disappear in one's mental field while keeping "an attitude of curiosity and acceptance" (Baer & Krietemeyer, 2006); a "momentary state of awareness that can be prolonged by using proper techniques" (Gunaratana, 2011, p. 132) and "an increased phenomenal consciousness of subtle, fleeting stimuli, and decreased affective biases of attention and memory" (Davis &Thompson, 2015, p. 56).

The conceptualization of mindfulness as a natural human capacity, as well as a skill, has given rise to a new Western scientific concept: trait or dispositional (used interchangeably in psychology research) mindfulness, which was coined in a seminal paper by University of Rochester researchers Brown & Ryan (2003). They introduced the first validated self-report dispositional mindfulness questionnaire, the Mindfulness Awareness and Attention Scale (MAAS). The MAAS has further been popularized in research studies on dispositional mindfulness using multiple self-report questionnaires with a variety of operational definitions, depending on the study's purpose. Self-report dispositional mindfulness questionnaires have proven a useful tool for Western researchers to study whether the intended clinical outcomes were indeed attributable to a change in the level of mindful awareness or mindfulness skill. Measuring changing levels of mindfulness is also considered essential to study the causal mechanism of MBIs among the mostly non-meditating Western population (Baer, 2011).

State - disposition concept in Western psychology. Some personal qualities, such as personality, are studied as either a state or disposition. Personal dispositions provide important information to investigators who study stress and diseases within the context of a specific life event (IOM, 1982). For example, outcome variables at a personal state level are useful to monitor an individual's response to therapeutic intervention, thus helping the provider to make appropriate clinical judgments. On the other hand, studying personal dispositions that exist at the time of disease manifestation can help identify risk factors for a particular disorder or vulnerability. Such research can identify individuals at high risk, as well as provide insight into the etiology of the disorder (Kraemer, Gullion, Rush, Frank & Kupfer, 1994). Also, when dispositions are studied after the disease manifestation, this can aid in understanding the disease process and its course, as well as serving as a marker of the disease's status. Accordingly, studying mindfulness in both state and dispositional forms has proven valuable in advancing the knowledge of mindfulness.

Dispositional Mindfulness

The most popular definition of dispositional mindfulness is "the general level of mindfulness that is relatively constant from day to day," which can be cultivated by mindfulness training (Brown & Ryan, 2003). Individual differences in dispositional mindfulness are thought to arise through a complex interaction of genetic predisposition, environmental circumstances and explicit training (Davidson, 2010). It has been widely understood that improvements in mindfulness skills facilitate the health benefits of MBIs (Baer, Carmody, & Hunsinger, 2012). MBIs are designed to achieve health benefits by increasing the individual's level of dispositional mindfulness over time, based on the

assumption that mindfulness training can increase the participants' capacity to remain in the state of mindfulness (Baer, 2003; Carmody, Baer, Lykins & Olendzki, 2009; Shapiro et al., 2006). In other words, increase in state or momentary mindfulness during and immediately after the MBI may lead to a subsequent increase in relatively stable dispositional mindfulness, which can account for measured treatment effects (Carmody, Reed, Kristeller & Merriam, 2008). People with higher dispositional mindfulness—those who frequently reside in a mindful state throughout everyday life—exhibit a variety of beneficial outcomes in cognitive, affective, and physical health (Quaglia, Brown, Lindsay, Creswell, & Goodman, 2015).

State and dispositional mindfulness. The literature is not clear about the relationship between state and dispositional mindfulness; there are differing opinions on whether dispositional mindfulness is a distinct construct independent of state mindfulness. For example, Brown and Ryan (2003) argued that state mindfulness could be seen as a "within-person" variable, while dispositional mindfulness as a "between-person" variable, and the two variables are conceptually independent; that is, a dispositional level of mindfulness is a stable individual difference on an average level across multiple days, while the level of state mindfulness involves systematic fluctuations above and below the mean within the same person.

Others, such as Arch and Landy (2015), provided a different view on the relationship between state and dispositional mindfulness. They argue that all forms of mindfulness, including dispositional mindfulness, may simply represent variations in state mindfulness, based on the level of mindfulness training. Untrained dispositional mindfulness represents the tendency for a person to reside in the mindful state over time,

whereas “trained” dispositional mindfulness represents the trained capacity to cultivate and to remain in the mindful state more often.

Arch and Landy (2015) also argued that the state of mindfulness may not be the same among people with varying mindfulness practice experience; it is a wide spectrum, ranging from a brief calm moment to years of formal meditation training. Most studies of the mindfulness state employed a brief, 5- to 10-minute induction of mindfulness to explore the effects of mindfulness on mental health-related behaviors in the laboratory setting, using mostly meditation-naïve undergraduate student volunteers (Brown & Gordon, 2009). Therefore, it is unknown whether the data of state mindfulness from such experimental studies accurately represent the state of mindfulness experienced in everyday life. This is an important methodological point, because empirical studies investigating the relationship between state and dispositional mindfulness have been inconclusive, which might be related to the method by which state mindfulness was induced in experiments.

For instance, research studies have investigated whether a positive correlation between the increase in both state mindfulness and dispositional mindfulness after mindfulness practice would suggest an insight into the relationship between state and dispositional mindfulness. Thompson and Waltz (2007) conducted the first cross-sectional study to examine the relationship between state and dispositional mindfulness among undergraduate students (n = 356) using one state mindfulness measure, the Toronto Mindfulness Scale (TMS)-state (Davis, Lau, & Cairns, 2009), and three dispositional mindfulness measures, the MAAS, the Cognitive and Affective Mindfulness scale-revised (CAMS-R), and the Five Facet Mindfulness Questionnaire (FFMQ). The

authors found no significant relationship between state and dispositional mindfulness except for the "observe" facet of the FFMQ among meditation-naïve students. Carmody et al. (2008) reported a similar study to examine the association between state and dispositional mindfulness and eight-week MBSR outcomes among a community of adult participants (*n*=44). The data from this longitudinal study suggested significant improvements in the MAAS, the TMS-state, spirituality, psychological distress and medical symptoms after the MBSR. However, there was no significant correlation between pre- and post-intervention scores of the MAAS and the TMS-state. Moreover, the increase in the TMS-state was not correlated with the decrease in physical or psychological symptoms.

Recently, evidence has begun to emerge to support the hypothesis that the increase in state mindfulness over time leads to improvements in dispositional mindfulness. Kiken, Garland, Bluth & Palsson (2015) examined the trajectory of change in state and dispositional mindfulness during an eight-week MBSR. The community of adult participants (*n*=235) took the TMS-state 10 minutes after their daily mindfulness practice homework. The authors measured the trajectory of changes in state and dispositional levels of mindfulness using the TMS-state and the FFMQ, as well as the Symptoms Checklist 90-Revised (psychological distress) at four data collection points. They found the participants varied significantly in their rate of change in state mindfulness. However, the trajectory predicted a pre-post change in dispositional mindfulness, and the trajectory was unrelated to the baseline dispositional mindfulness. This result was contrary to previous findings reporting that people with higher baseline dispositional mindfulness showed larger increases in outcome variables (Carmody et al.,

2009). A study by Kiken et al. (2015) provided the first empirical support for theoretical and neurobiological notions that a disposition-like propensity to be mindful in everyday life may be modifiable, for at least some people, through the intentional practice of evoking the corresponding state during meditation. More studies like this are needed to understand how changes in both state and dispositional mindfulness underlie the therapeutic benefits of MBIs.

Mechanisms of Mindfulness

Historically, the study of a therapy's mechanisms of action has received little attention (Kazdin, 2008). Establishing a causal relationship between treatment and its outcomes in a randomized control trial does not explain why the relationship was found. Therefore, knowing the key factors, and the process in which they operate, can foster improvement in the process itself for optimizing the intervention. Mindfulness research in the past decade has been devoted to examining the clinical efficacy of MBIs, yet very few studies have provided a theoretical explanation for the observed effects (Brown, Ryan & Creswell, 2007). However, recently an increasing number of published studies have examined the potential mechanism of mindfulness practice. For example, a recent meta-analysis on MBIs by Gu et al. (2015) analyzed not only the pooled observed effects among the reviewed studies, but also sought to determine whether the increase in dispositional mindfulness partially mediated the improvement in clinical symptoms. Such a study can provide empirical support for a largely conceptual assumption about MBIs that enhancing mindfulness can improve symptoms.

There are two notable models of proposed mechanisms of mindfulness, reperceiving-decentering, which comes from a psychological perspective, and the multi-component model, which integrated the existing literature across disciplines.

Reperceiving-decentering. Continued mindfulness practice is believed to facilitate a shift in perspective and cultivate insight about the self. The process by which the shift in perspective takes place is mediated through detaching the self from the contents of consciousness, such as thoughts, emotions, or bodily sensations, and observing them with greater clarity and objectivity. This cognitive process is termed "reperceiving" (Shapiro & Carlson, 2009). Reperceiving is conceptually very similar to decentering, which is "the ability to observe one's thoughts and feelings as temporary, objective events in the mind, as opposed to reflections of the self, that are not necessarily true" (Safran & Segal, 1990).

Reperceiving may further foster additional mechanisms that can contribute to the health benefits of mindfulness practice; these include (1) self-regulation and self-management of emotion and behavior; (2) personal value clarification; (3) cognitive, emotional, and behavioral flexibility; and (4) exposure to a broader range of thoughts, emotions, and sensations.

Integrated multi-component model. A theoretical integrative review of literature by Hölzel et al. (2011b) proposed the components of mindfulness meditation that have been shown to correspond with structural neuroimaging data showing the neuroscientific processes that underlie these components of mindfulness meditation. These components include: (1) attention regulation, (2) body awareness, (3) emotion regulation-positive reappraisal, (4) emotion regulation-exposure, extinction, (5)

reconsolidation, and (6) change in perspective of the self. These components work together to constitute the process of enhancing self-regulation. Previously, the existing theoretical explanations for the observed effects of mindfulness were derived mostly from a psychological perspective (Brown et al., 2007; Shapiro & Carlson, 2009). The strength of this integrated model is that it consolidated the existing literature from clinical, experimental, qualitative and neuroimaging studies, supported by objective evidence from multiple sources.

Measuring Mindfulness

Quantifying mindfulness in people has provided the empirical evidence for the conceptualization of mindfulness as a naturally occurring—thus differing among individuals—ability to be mindful in everyday life (Brown & Ryan, 2003). Also, the change in the level of mindfulness after an MBI has made possible the investigation of whether the reported health benefits of MBIs are indeed attributed to the improvements in mindfulness (Baer, 2011). Currently, there is no validated behavioral measure of mindfulness, such as direct observation by trained observers, because mindfulness is not readily observable by other people (Baer, 2011). Also, popular behavioral markers of psychological functioning, such as drinking, smoking, and drug abuse have not been identified as a reliable proxy for mindfulness. Current common approaches to measuring mindfulness are self-report measures and qualitative interview.

Self-report measures. Published mindfulness measures are roughly divided between measures at a dispositional/trait level with or without meditation experience, and at a state level, which is typically used immediately following a meditation intervention. As noted earlier, there are a wide variety of operational definitions of mindfulness, as

well as different factor structures among self-report mindfulness measures. The diversity of mindfulness measures reflects the current lack of consensus between Western psychology researchers and Buddhist scholars on the conceptualization of mindfulness that drives the operational definition of mindfulness (Baer, 2011; Gethin, 2015; Grossman, 2011), or diverse intended purposes of measure; i.e., specific clinical indications, meditators, specific age group or general adult population.

Benefits and drawbacks of self-report measures. Self-report mindfulness measures have several distinct benefits in psychology research. First, many variables, particularly among those that investigate the relationship among subjective variables, such as perceived stress, depression, and anxiety, cannot be objectively and directly measured. Also, asking the respondents directly about their own views on the variable of interest is a practical way to collect the data which may not be readily available or inappropriate to gather via observation by others (Baer 2011; Barker, Elliot & Pistrang, 2005). This is especially true in the current mindfulness research, due to the lack of consensus concerning the operationalization of mindfulness, as well as the lack of agreed-upon behavioral or physiological markers of mindfulness (Baer, 2011). Moreover, self-report measures enable within and between subject comparisons of the scores from a large sample, which is particularly useful in studying the epidemiology of the phenomenon, or assessing the effectiveness of interventions.

Critics have also noted some problems with self-report mindfulness measures. Bergomi, Tschacher & Kupper (2012) summarized them under three major headings: (1) the dimensions or facets of mindfulness that are assessed; (2) the nature of the relationship among these facets of mindfulness; and (3) the validity of self-report

approach to quantifying mindfulness. The underlying problem of these three issues seems to be the operational definition of mindfulness. Too narrowly defining mindfulness might lead to "denaturing" of mindfulness, apart from the rich and complex Buddhist traditions in which mindfulness is situated (Grossman & Van Dam, 2011; Kabat-Zinn, 2009). On the other hand, broadly defining mindfulness in order to fit the necessary assumptions of a specific therapeutic context (i.e., the KIMS and the FFMQ for the Dialectal Behavior Therapy to treat chronically suicidal borderline personality disorder patients) risks conceptual overlap with similar yet distinct cognitive constructs (Quaglia et al., 2015; Rosch, 2007).

Despite multiple reported issues, however, studies using a self-report mindfulness measure nonetheless contribute to a comprehensive understanding of how mindfulness affects human health functionally and structurally. It can be especially useful in combination with objective data to augment some of the most important weaknesses in self-report measures, such as response bias (Donaldson & Grant-Vallone, 2002).

Qualitative interview. One published qualitative interview tool to assess metacognitive awareness, a component of mindfulness, is the Measure of Awareness and Coping in Autobiographical Memory (MACAM; Moore, Hayhurst & Teasdale, 1996 as described in Teasdale, Moore & Hayhurst, 2002). The MACAM is a vignette-based interview primarily used to assess whether mildly depressing events escalated to a more persistent and severe form of depression. The MACAM has also been used to measure the therapeutic outcomes of the MBCT. Although reliable, the MACAM is a specialized interview tool specific to a clinical population with depression. It is labor-intensive, time-consuming, and costly, which means it has seen limited use in research (Baer, 2011).

Recently, however, a qualitative interview guide for use in an alternative complementary medicine context has been proposed (Stelter, 2010). The research in mindfulness using a qualitative interview method holds some promises to elucidate the developmental processes of mindfulness training, although it has seen limited use thus far (Quaglia et al., 2015).

Dispositional Mindfulness and Mental Health Symptoms

Dispositional mindfulness has been studied for its association with mental health symptoms among a variety of populations, including undergraduate students, adults and clinical populations in both cross-sectional and intervention studies (Keng, Smoski & Robins, 2011). The level of dispositional mindfulness outside the MBI context is usually assessed as a part of psychological research or correlational studies using healthy samples, often undergraduate students.

As mentioned earlier, the seminal work on dispositional mindfulness and its mental health benefits was a study by Brown and Ryan (2003) in which the authors described the psychometric evidence of the newly developed MAAS. They reported that the MAAS scores were correlated with some cognitive and affective indicators of psychological well-being. For instance, higher MAAS scores were significantly associated with lower levels of depressive symptoms, anxiety, and perceived stress, and higher levels of vitality and self-actualization (Brown & Ryan, 2003). A recent large-population study of 16-year old British twins (n=2118) by Waszczuk et al. (2015) suggested that these mental health benefits of dispositional mindfulness might be due to both genetic and non-shared environmental factors. Perceived stress, depressive

symptoms, anxiety, neuroticism and their relation to dispositional mindfulness were reviewed separately.

Perceived stress. The negative relation between dispositional mindfulness and perceived stress has been well established. A recent meta-analysis analyzing 20 MBIs (9 MBSR and 11 MBCT) among adults indicated that the increase in dispositional mindfulness partially mediated the improvements in clinical symptoms, such as perceived stress and depression (Gu et al., 2015). Several authors provided plausible explanations for this causal relationship. For example, more mindful attention to stimuli may foster an appraisal of stress as benign or neutral, rather than as a threat, because mindfulness promotes desensitization and reduced emotional reactivity to stimuli (Creswell, Way, Eisenberger & Leiberman, 2007). In other words, more mindful people may possess a greater ability to process internal and external stimuli receptively (Brown, Ryan & Creswell, 2007), and are less likely to perceive certain situations as stress-inducing, compared to others who are less mindful (Weinstein, Brown & Ryan, 2009). Others have suggested that enhanced emotional regulation, rather than cognitive control over tasks, might mediate the therapeutic effects of dispositional mindfulness on perceived stress (Schirda, Nicholas, & Prakash, 2015).

Mindfulness stress buffering model. Originally, Cohen and Willis (1985) proposed "the stress buffering model of social support," which posited that social support buffers persons from the potentially harmful effects of stressful conditions. Creswell & Lindsey (2014) recently proposed a related stress buffering model, "the mindfulness stress buffering account," suggesting that mindfulness buffers stress appraisals and stress reactivity, and these stress reduction effects explain how mindfulness influences health.

The mindfulness stress buffering account assumes that effects of mindfulness are most evident among people who are under stress and are sensitive to the adverse effects of stress. This model provides a useful theoretical framework to explain the moderating function of dispositional mindfulness on the causal relationship between stress and health. Moreover, the mindfulness stress buffering account may invite further scholarly discussion and innovative research methodology to elucidate the complex processes in which mindfulness exerts its health benefits.

Depressive symptoms, anxiety, and neuroticism. Dispositional mindfulness has been associated with lower levels of emotional disturbances, such as depressive symptoms and anxiety (Brown & Ryan, 2003; Baer, et al., 2008; Cash & Whittingham, 2010). Similarly, low dispositional mindfulness, as well as difficulty with emotion regulation, has been shown to be associated with symptoms of generalized anxiety disorder symptom severity in both clinical and non-clinical samples (Roemer et al., 2009). In addition, the literature consistently supports the strong inverse relationship between dispositional mindfulness and neuroticism, a personality trait that is characterized by an increased sensitivity to fear, anxiety, and distress (Brown & Ryan, 2003; Feltman, Robinson & Ode, 2009; Giluk, 2009; Thompson & Waltz, 2007). The protective effect of dispositional mindfulness against neuroticism-related psychological distress is most evident among those who are highly neurotic and exhibit higher levels of emotional lability (Feltman et al., 2009). However, it is not known whether neuroticism interferes with mindfulness or mindfulness minimizes the distressful symptoms of neuroticism (Thompson & Waltz, 2007).

Objective Correlates of Dispositional Mindfulness

Compared to the large number of studies focused on meditation practice and mindfulness training, the research examining the correlates of dispositional mindfulness is relatively sparse. However, the extant literature does suggest the potential for emotional benefits stemming from a higher level of dispositional mindfulness across behavioral and neural outcomes.

Behavioral correlates. One behavioral correlate of mindfulness that has been extensively studied is substance abuse, which affects nearly 15% of the U.S. population (Kessler et al., 2005). Researchers have investigated dispositional mindfulness as a protective factor against substance abuse, based on a model suggested by Marlatt and his colleagues (Marlatt et al., 2004). However, the perceived association between dispositional mindfulness and substance abuse has been inconsistent across studies. The recent meta-analysis by Karyadi, VanderVeen and Cyders (2014), which aimed at quantifying the magnitude of this relationship, found a small, negative but significant connection (r = -0.13). However, the magnitude of the relationship varied among substance types, clinical status, and the severity of the abuse. Dispositional mindfulness was negatively related to alcohol and tobacco use, but not marijuana use. Also, there was a strong inverse relationship between dispositional mindfulness and substance abuse among inpatient clinical subjects, but this could also be explained by the more advanced age of the inpatient population. Another notable finding from this meta-analysis was that several facets of the FFMQ, notably “acting-with-awareness”, “nonjudge”, and “non-reactivity” appeared to be important protective factors against substance abuse. However, these results were limited by methodological weaknesses of the studies in question, notably cross-sectional design and the lack of diversity in the study sample.

Neural correlates. The reorganization in the brain's neural pathways at structural and functional levels in response to changes in behaviors, cognition, and emotion is known as neuroplasticity a term that also includes structural alternation due to disease or injury (Melzack, Coderre, Katz & Vaccarino, 2001). Neuroscientists have examined a variety of neuroplastic changes related to dispositional mindfulness, using such noninvasive technology as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI). Use of fMRI allows scientists to measure and map brain activities in order to understand brain functions. This is accomplished by analyzing local blood circulation and metabolism changes between periods of resting and performing a task or stimuli in experiments (Raichle & Mintun, 2007).

The majority of neuroscientific studies that investigated mindfulness-related neuroplastic changes examined meditators. Early EEG studies on experienced meditators provided the initial evidence for neurophysiological changes of the brain by mindfulness training, and laid the groundwork for a neuroscience of mindfulness (Davidson et al., 2003; Lutz, Greischar, Rawlings, Ricard, & Davidson, 2004). However, the literature also mentions distinct changes in the brain regions that are thought to be responsible for cognitive and emotional benefits among people with higher levels of dispositional mindfulness but without meditation experience (Arch & Landy, 2015). For example, a recent study of electrocortical activities in the brain (using scalp-recorded event-related potentials) found that higher dispositional mindfulness was associated with lower late positive potential in response to emotion-provoking unpleasant and pleasant visual stimuli among college student volunteers. The study suggests that higher dispositional mindfulness may be associated with greater acceptance of unpleasant stimuli, as well as

greater non-evaluative processing of perceptual information (Brown, Goodman & Inzlicht, 2013).

Similar to the EEG studies noted above, many neuroimaging studies have compared key brain activities and corresponding anatomical changes between experienced meditators and non-meditators (Hölzel et al., 2007; Luders, Toga, Lepore & Gaser, 2009; Pagnoni & Cekic 2007), or before and after eight-week MBSR (Hölzel et al., 2010, 2011a). Still, a few studies examined the neural correlates of dispositional mindfulness. Creswell and colleagues (2007) reported greater widespread activation of the prefrontal cortex of the brain (which is indicative of executive functioning), reduced activation of the amygdala (which is responsible for fearful and anxious emotions), and greater amygdala-prefrontal connectivity during an emotionally taxing activity among participants with higher dispositional mindfulness. In a related study, dispositional mindfulness predicted lower resting right amygdala activity and reactivity among undergraduate student volunteers (Way, Creswell, Eisenberger & Lieberman, 2010). Moreover, dorsomedial prefrontal cortex activation during reappraisal of negative emotion was increased during reappraisal of negative stimuli among those in the study sample with higher dispositional mindfulness (Modinos, Ormel & Aleman, 2010). Taken together, these studies suggest that people with higher dispositional mindfulness may possess less biased and more accepting attitudes in attention due to neuroplastic changes that promote enhanced top-down regulation of amygdala that generates negative emotions by the prefrontal cortex.

Dispositional Mindfulness as moderator of Mental Health Outcomes

A moderator is a variable that alters the direction or strength of the relationship between a predictor and an outcome (Baron & Kenny, 1986). In other words, a moderator functions through the interaction of the two variables (Frazier, Tix & Barron, 2004). The interaction effect(s) by a moderator can provide important information about the study sample. For instance, investigators can gain insight into individual differences in their response to interventions. Examining key moderators of intervention allows investigators to learn not only the overall effectiveness of the intervention but also which intervention works best for which people (Szabo, Long, Villate & Hayes, 2015).

Testing for a potential moderator variable suggested in the literature in a pre-intervention cross-sectional study may also inform the nature of such key variables in the phenomena of interest among the study population. Additional benefits of a cross-sectional study design may include (1) a single time point for data collection, eliminating the participant loss due to lack of follow-up; and (2) an economical and quick research method for estimating the prevalence of dispositional mindfulness and its clinical significance in mental health, even in a large sample (Sedgwick, 2014).

The literature indicates that dispositional mindfulness is a consistent predictor of greater everyday personal well-being in both experimental and non-experimental studies (Brown et al., 2007). Some studies have also suggested that higher levels of dispositional mindfulness could dampen the negative mental health outcomes of some potential stressors. For example, Marks and colleagues (2010) conducted a cross-sectional survey among Australian high school students age 14-19 ($N = 317$) and assessed the relationship between recent daily hassles, depression, anxiety, stress, rumination, and dispositional mindfulness. Dispositional mindfulness attenuated the negative impact of recent daily

hassles on depression, anxiety, and stress while rumination exacerbated these mental health outcomes. The authors suggested that cognitive styles, such as dispositional mindfulness or rumination, might partially explain individual differences in adjustment among adolescents.

Several authors have investigated the influence of dispositional mindfulness on the connection between personality variables and subjective well-being. For example, Wenzel, von Versen, Hirschmuller and Kubiak (2014) reported that the effect of neuroticism on subjective well-being was partially mediated and moderated by dispositional mindfulness among 108 German adults. Specifically, neurotic individuals in their study reported low subjective well-being only when dispositional mindfulness was also low. This study supported the notion that mindfulness training may be beneficial for improving subjective well-being among highly neurotic people. In addition, Bowlin and Baer (2011) found that dispositional mindfulness was not only positively associated with subjective well-being and negatively with depression, anxiety, and stress, but also moderated the relationship between self-control (tendency to be self-disciplined, reliable, and hardworking) and mental health outcomes among a sample of undergraduate students ($N = 280$). This would suggest that a general tendency to be mindful in everyday life can benefit mental health among people who possess higher levels of self-control.

Furthermore, dispositional mindfulness was positively associated with improved personal communication skill during a brief meeting with a person of the opposite sex. Male undergraduate students who had higher levels of dispositional mindfulness attracted more female peers in the speed dating experiment ($n = 91$) beyond the influence of physical attractiveness (Janz, Pepping & Halford, 2015). The authors of the study

speculated that people with higher dispositional mindfulness might be more attentive to partners during the brief interaction and communicate more effectively.

In addition to these cross-sectional studies, dispositional mindfulness has been suggested as a moderator of intervention effects in MBI studies. For example, Shapiro et al. (2011) found that participants (n = 15) with higher levels of pre-treatment dispositional mindfulness in the eight-week MBSR trial benefited more from the treatment, in terms of: a larger sustained increase in post-treatment mindfulness, higher subjective well-being, empathy, and hope, as well as a larger sustained decrease in perceived stress, for up to a year. However, their study had too small a sample size (15 in both treatment and control groups) to perform a meaningful statistical analysis of the difference between intervention and control groups in the size of the moderation of MBSR treatment effects by dispositional mindfulness.

In summary, the results from both longitudinal and cross-sectional dispositional mindfulness studies collectively suggest that dispositional mindfulness may be an important moderator of the link between some personal characteristics and mental health and behavior outcomes. Cross-sectional dispositional mindfulness studies may offer important information, such as the estimate of prevalence in a large sample, and may inform a hypothesis for a more complex investigation.

Conceptual Framework

The conceptual framework guiding this study was an adaptation of the Transactional Model of Stress and Coping (TMS; Lazarus & Folkman, 1984), which was briefly discussed earlier in the section on psychological stress. Figure 2.1 illustrates interrelationship among the key variables in the model. According to the model, stressful

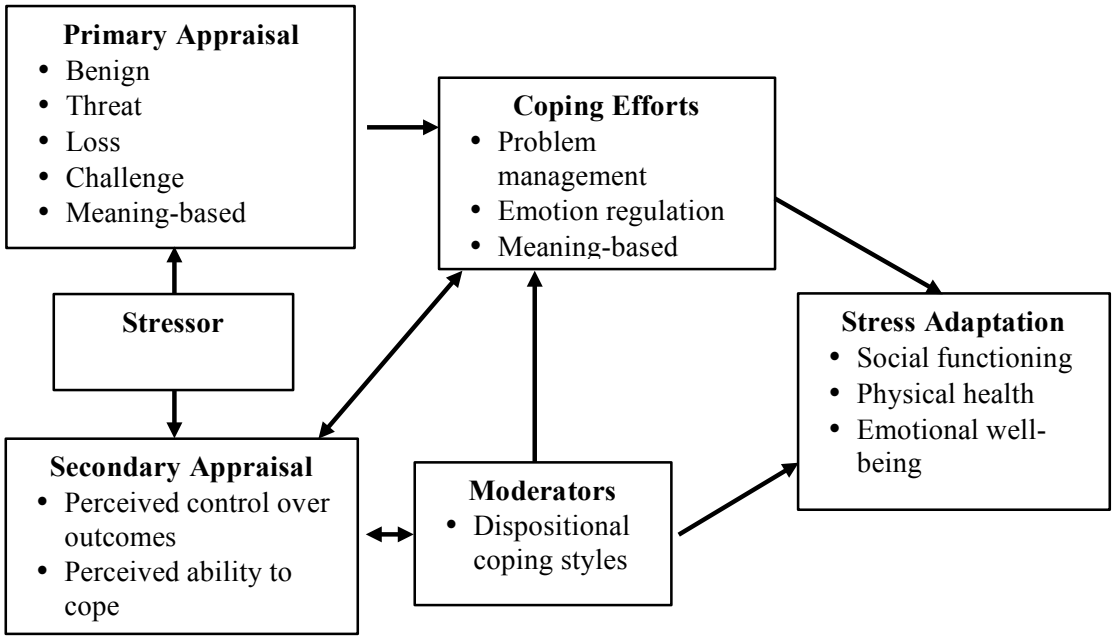
experiences are understood as person-environment transaction, in which the person's cognitive appraisal of the stressor, as well as available coping resources, mediate the impact of the situation.

In the current study, SRNA characteristics, dispositional mindfulness, and daily hassles were considered as key factors in person-environment transactions used to determine adaptational coping outcomes. According to the model, a person evaluates stressors through the two-step process involving primary and secondary appraisals. In primary appraisal, the person evaluates whether the situation is irrelevant (no threat to his/her own well-being), benign-positive (there will be positive outcomes) or stressful. Stress appraisal is made when the person feels that the event is taxing his/her own resources, and is further classified as harm/loss (negative outcomes have already taken place), threat (anticipated harm/loss) and challenge (there is potential for gain or growth). Challenge appraisal is more likely when the person feels a sense of control in the situation; however, threat and challenge appraisals can coexist and change, depending on the course of the transaction. Depression and anxiety are negative emotions related to threat appraisal that accompany the sense of inadequate control in the event due to inadequate coping resources (Lazarus, 1993, p. 31).

The current study hypothesized that dispositional mindfulness would moderate the relationship daily hassles and three negative mental health outcomes (perceived stress, depression, and anxiety). Specifically, a SRNA who was more mindful in everyday life might report less negative mental health outcomes than a SRNA who was less mindful. This relationship might also be modified by individual SRNA characteristics (age, gender, race and ethnicity, marital status, nurse anesthesia training

level, degree type, and curriculum design); therefore, these characteristics had to be controlled when focusing on the moderator effect of dispositional mindfulness. In order to test the hypotheses in the current study, the study conceptual model included only a part of the TMS to focus on the relationship between key study variables. Specifically, primary and secondary appraisals and coping efforts were excluded from the study conceptual model. Given the highly complex nature of psychological stress phenomena, this adaptation was necessary in favor of a parsimonious conceptual model.

Figure 2.1. Transactional Model of Stress and Coping (Not all variables are examined)



Definition of Terms

The following definitions were provided by Glanz & Schwartz (2008).

- Primary appraisal is defined as the evaluation of the significance of a stressor or threatening event.
- Secondary appraisal is defined as the evaluation of the controllability of the stressor and a person's coping recourses.

- Coping efforts are defined as actual strategies used to mediate primary and secondary appraisals.
- Problem management is defined as strategies directed at changing a stressful situation.
- Emotional regulation is defined as strategies aimed at changing how one feels about a stressful situation.
- Adaptation (coping outcomes) is manifested in terms of social functioning, physical health status, and emotional well-being.
- Dispositional coping style is defined as relatively stable general tendency to behave in a way that affects a person's emotional or functional response to a stressor.
- Information seeking is defined as attentional styles that are vigilant monitoring versus avoidance.

Summary

Chronic ongoing stress in nurse anesthesia education is a major threat to effective learning and psychological and physical well-being of SRNAs (Chipas & McKenna, 2011; Chipas et al., 2012; Kendrick, 2000; Perez & Carroll-Perez, 1999; Phillips, 2010). SRNAs are the most stressed group among all nurse anesthesia professional roles, and nearly one half of SRNAs admitted that they felt depressed sometime during their training (Chipas et al., 2012). Some of the SRNAs are more stressed than their fellow students. They include 2nd-year students, female students as a whole, Black and Hispanic students, divorced students, and those who are enrolled in nurse anesthesia education programs with integrated curricula (Chipas et al., 2012). The operating room environment, in which many nurse anesthetists typically spend most of their working hours, has been known to foster interpersonal conflicts among the interdisciplinary

operating room team (Rosenstein & O'Daniel, 2006), and oftentimes the perpetrators of insulting treatment against SRNAs are their clinical preceptors (Elisha & Rutledge, 2011; Kinzl et al., 2007).

Moreover, SRNAs are not equipped with good adaptive coping skills to deal with stress (Chipas et al., 2012; Phillips, 2010). As the result, many SRNAs have trouble with school-life balance and maintaining good social support. The consequences of maladaptive stress coping can be very problematic: nearly 10% of SRNAs leave their programs each year, causing significant loss to both students and nurse anesthesia education programs (Dosch et al., 2008). Chronic ongoing stress can lead to burnout, which is associated with making errors during patient care (de Oliveira et al., 2013). Although chemical dependency is believed to affect less than 1% of all SRNAs (Bozimowski et al., 2015), it remains a very serious issue for the entire nurse anesthesia profession. It is very difficult to recognize chemical dependency among one's peers or students, because healthcare professionals as a whole are so good at hiding the symptoms of addiction (Wright et al., 2012). Unrecognized, and thus untreated, chemical dependency among anesthesia providers and trainees compromises patient safety and may ultimately lead to career-ending formal discipline, or to an accidental death by overdose (Bell et al., 1999; Wright et al., 2012).

Despite the recognition of these known stress-related issues in nurse anesthesia, there is a significant gap in knowledge about stress outcomes among SRNAs. There is paucity of reliable information on such common symptoms as perceived stress, depression, and anxiety among SRNAs, because the only available objective data was not collected using validated measures (Chipas & McKenna, 2011; Chipas et al., 2012).

Without reliable objective data on such key stress variables, it is not possible to elucidate the full extent of stress in nurse anesthesia practice and education, or to gain deeper understanding of the stress-coping processes undertaken by nurse anesthesia professionals.

Furthermore, to date, there are few published research studies on the modifiable protective factors of stress for both CRNAs and SRNAs. Also known as personal coping resources (Lazarus & Folkman, 1984) or stress buffers (Cohen & Willis, 1985), protective factors dampen the impact of stress on SRNAs and optimize the stress-coping process. Dispositional mindfulness might be a key protective factor against stress (Creswell & Lindsey, 2014). Multiple meta-analyses evaluating a variety of mindfulness-based interventions (MBI) have consistently confirmed the effectiveness of MBIs on stress among healthy adults, including healthcare professionals (Gu et al., 2014; Keng et al., 2011; Khoury et al., 2015). Dispositional mindfulness can be cultivated by various mindfulness training techniques, and an increase in dispositional mindfulness is associated with reported health benefits of MBIs (Gu et al., 2015; Kiken et al., 2015). However, to date, there is no known study on dispositional mindfulness among either SRNAs or CRNAs. This is a significant gap in knowledge, because objective data from neuroimaging studies strongly suggests that mindfulness training not only improves perceived stress, depression, anxiety or subjective well-being, but also changes the brain structures and functions that are responsible for cognitive and emotional self-regulation (Hölzel et al., 2010, Hölzel et al., 2011a).

Based on the findings of this review of literature, and underpinned by the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), the purpose of

the current study was to make a reliable measurement of daily hassles, perceived stress, depression, anxiety and dispositional mindfulness in SRNAs, which have not previously been explored in the literature. This study also examined the influence that dispositional mindfulness might have on the relationship between daily hassles, perceived stress, depression, and anxiety.

Chapter 3: Research Design and Methods

Study Design

This cross-sectional descriptive study examined daily hassles, dispositional mindfulness, and negative mental health outcomes among SRNAs and explored correlations among these variables. In addition, the study evaluated the impacts that dispositional mindfulness has on such relationships as a moderator. A cross-sectional descriptive design was chosen, because it will inform future interventions by clarifying the relationship between key drivers of mental health outcomes in the study population (Creswell, 2014). In addition, an online survey offered several methodological advantages, such as the ease of maintaining anonymity among a large sample, viewing of ongoing survey responses, immediate and uncomplicated downloading of survey data, and user-friendly access to study participants as long as they have Internet access (Fowler, 2014).

Study Population

The study population consisted of SRNAs currently enrolled in any accredited nurse anesthesia programs in the U.S. As of July 2015, there were 114 accredited entry-level nurse anesthesia educational programs across the U.S. and the U.S. territories conferring either a master's degree or a practice doctorate degree (COA, 2015). All SRNAs were required to maintain student membership in the AANA during their training; therefore, the AANA student membership denoted the study population. According to the National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA: 2015), a total of 6,379 SRNAs were enrolled in nurse anesthesia educational programs in the Fall 2015 semester. The total number also included 1,005

graduating senior students who completed their degree program requirements during the survey period.

Sample

A total of 5,000 SRNAs were invited to participate in the study (5,000 was approximately 78% of all SRNAs) by the AANA Foundation (AANAF) research staff. The AANAF maintains an up-to-date membership database. There were no exclusion criteria.

Sample Size Determination

Generally, the statistical power of moderation tests in observational studies is low (Aguinis, Beaty, Boik, & Pierce, 2005; Aiken & West, 1991). A similar study, published in 2010, did not provide information about the effect size found in data analysis (Marks et al., 2010). Therefore, 0.02, a small effect size in social science (Cohen, 1988), was assumed for Aim 3 analysis. A power analysis was conducted to calculate appropriate *a priori* sample size using the G*Power software (Faul, Erdfelder, Buchner & Lang, 2009) for multiple linear regression analysis. With a two-tailed alpha set at 0.05, a statistical power of 80%, the effect size of 0.02, and total nine predictor variables including two (estimated) control variables in the final regression model, the minimum sample size was determined at 725.

The two recent similar online survey studies of SRNAs without incentives reported response rates of approximately 25% (Chipas et al., 2012; Elisha & Rutledge, 2011). Based on these data, it was reasonable to expect a similar response rate of 25% in this study, which exceeded the required sample size. For this reason, 5,000 SRNAs were contacted for online survey participation.

Human Subjects

The study was submitted to the Institutional Review Board (IRB) of Oregon Health & Science University for non-committee review on October 7, 2015, and was granted approval on November 4, 2015 (STUDY00015191).

Study Procedure

The online survey was distributed by the AANAF research staff. The decision to use the AANAF online survey service was primarily made to insure a representative sample. Standardized survey administration would minimize potential biases due to non-standardized survey distribution of each participant. An alternative approach that would involve sending a survey request directly to all nurse anesthesia education program administrators in the U.S. was also considered as a back-up plan, in case of initial low survey response rate. However, such an approach might potentially result in a non-standardized survey distribution among the study sample, for reasons unknown to the study investigators. Furthermore, the use of the AANA Foundation online survey instrument deployment-only service insured anonymous survey participation, by eliminating the investigator access to the participant contact information.

Randomization protocol included SRNAs aged between 21 and 55. The e-mail study invitation contained a web link to the secure online survey host website (SurveyMonkey©). The study was described as having its major focus on examining stress in SRNAs. The study participants were clearly informed that the survey was a part of doctoral dissertation research of the principal investigator and that study participation was strictly voluntary.

The AANA Foundation research staff sent an online survey invitation e-mail message, along with a one-time follow-up message, to randomly selected 5,000 SRNAs on November 19 and December 7, 2015 respectively. Due to much lower response rate than expected (approximately 10%), on December 7, 2015, the study author approached all 114 nurse anesthesia educational program administrators by e-mail, which included the same survey invitation letter and the survey web link requesting survey distribution to their students over a two-day period. It is unknown how many program administrators honored the survey request and forwarded the study invitation email to their students. However, the survey participation noticeably increased after December 7. The survey period was extended for 2 weeks to maximize the sample size, and closed on December 31, 2015. There were 887 survey responses at the time of survey closure.

Measures

Data was collected using an online survey consisting of three validated self-report measures assessing daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness. The survey also included selected demographic and curricular information, and a published self-report meditation scale. The latter information was only used to control for the possible influence of meditation experience on dispositional mindfulness in Aim 3 analysis. Each measure has an established history of use in higher education research and has previously been administered online. See Table 3.1.

The pilot online survey was conducted among the Ph.D. students and Ph.D. faculty members at the Oregon Health & Science University School of Nursing (n = 5) in May 2015. The participants reported no difficulties with answering the questions, and took in average 15 minutes to complete the entire online survey.

Table 3.1. Study Variables and Measures

Variables	Aim	Measures	Reliability	Scale Range
Perceived Stress	1-3	Perceived Stress Scale (PSS-10)	Cronbach's α= .91among large general U.S. adult population *N*=2000).	10 items in a single factor. Rate how often felt or thought in a certain way in the last month on **5-point scale (0 to 4).** Higher score indicates higher perceived stress.
Depression and Anxiety	1-3	Depression Anxiety Stress Scale (DASS-21)	Cronbach's α (95% CI) Depression subscale: .87-.89; anxiety subscale: .80-.83. Validated in the general adult population in the U.K. (*N*=1,794) and U.S. (*N*=503)	14 items (depression and anxiety subscales only). Rate the extent to which each state has been experienced over the past week on **4-point scale (0 to 3)**. Higher score indicates higher depression and anxiety.
Daily Hassles	1-3	Inventory of College Student's Recent Life Experiences (ICSRLE)	Cronbach's α (95% CI) .88 and .92. Validated in the undergraduate college students in Canada (N=208) and in the U.S. *(N*=216).	49 items in 7 factors. Rate the extent of experience with each item over the past month on **4-point scale (1 to 4)**. Higher score indicates greater exposure to hassles.
Dispositional Mindfulness	1-3	Five Facet Mindfulness Questionnaire (FFMQ) Act-with-awareness: Nonjudging Nonreactivity	Cronbach's α (95% CI) Act-with-awareness: .87; Nonjudging: .87; Nonreactivity: .75. Validated in the undergraduate college students in the U.S. (*N*=613).	23 items for 3 subscales with 7-8 items each. Rate the extent to which each statement best describes own opinion of what is generally true for oneself on **5-point scale (1 to 5)**. Only summed subscale scores will be used in analysis.
SRNA Characteristics	2, 3	Age, gender, race/ethnicity, marital status Type of degree program, curricular design, the level of training.		
Meditation Experience	3	Meditation Practice Scale	Published questionnaire for use in mindfulness research. The scale quantifies meditation practice experience. Reliability data not published.	6 items with skip logic in item 1 for non-meditators asking whether or not meditate. The remaining five items ask about the type of meditation, frequency, length, and the extent to which meditation is incorporated in daily life.

Perceived Stress-Primary Outcome Variable

Perceived stress was operationalized as "the degree to which one's daily life situations are perceived as stressful" (Cohen, Kamarch & Mermelstein, 1983). Perceived stress was measured using the validated and highly reliable 10-item version of the Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988). The PSS is a self-report measure of perceived stress or stress appraisal, and was based on the transactional model of stress and coping (Lazarus & Folkman, 1984; Monroe & Kelley, 1995). The PSS-10 assesses how unpredictable, uncontrollable, and overloaded respondents find their lives. Response options are presented in a 5-point scale, ranging from "never=0" to "very often=4." A sample item would be "In the past month, how often have you been upset because of something that happened unexpectedly?" The items are written in general terms, and are relatively nonspecific to any sub-population sample. Three national stress survey studies among the general U.S. adult population using the PSS-10 provided extensive normative data across gender, socio-economic status, age groups, and race (Cohen & Janicki-Deverts, 2012). Scores one standard deviation or more above the mean are indicative of a high level of stress.

Depression and Anxiety

Depression was operationalized as "the loss of self-esteem and incentive, and is associated with perceived low probability of attaining one's life goals of significance*"* (Lovibond & Lovibond, 1995). Anxiety was operationalized as a "relatively enduring state of anxiety and acute response of fear*"* (Lovibond & Lovibond, 1995). Both depression and anxiety were measured using the 7-item scales of the Depression, Anxiety, and Stress Scale (DASS-21; Henry & Crawford, 2011; Sinclair et al., 2012).

The DASS-21 and the original DASS (with 42 items) involve three self-report scales designed to measure related negative emotional states (as opposed to disposition or trait): depression, anxiety, and stress. The goal of the developers of the DASS was to create a scale that would achieve better discrimination between depressive and anxiety symptoms, and to avoid contamination with the somatic symptoms of these conditions (Lovibond & Lovibond, 1995). The present study used a shorter 21-item version that has been shown to have a more parsimonious factor structure than the original DASS. The DASS-21 has been shown to have good construct validity and adequate alpha reliability, as well as convergent and discriminant validity comparable with the original 42-item version (Henry & Crawford, 2011; Sinclair et al., 2012). The DASS-21 has been used frequently in research in a variety of populations, including nursing students (Chan et al., 2013); and medical students (Baykan, Naçar & Çetinkaya, 2012; Singh et al., 2012; Warnecke et al., 2011; Yusoff, et al., 2013). The scoring of the DASS-21 involves converting to the full scale DASS scores by multiplying by two. The results are interpreted by reference to the normative values for the full scales (Lovibond & Lovibond, 1995).

The depression scale evaluates levels of mood, motivation, and self-esteem over the past week, on a 4-point scale ranging from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time). A sample item includes “I felt that I had nothing to look forward to.” Higher scores indicate a higher degree of depression, and the cutoff score as indicative of moderate severity for depression is 14. The anxiety scale assesses recent experiences of physiological arousal, perceived panic, and fear. Respondents rate the applicability of seven items to themselves on a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time) to describe

emotions experienced over the past week. A sample item includes "I felt I was close to panic." As with depression, higher scores indicate a higher degree of anxiety; the cutoff score for a moderate level of anxiety is 10.

Daily Hassles

Daily hassles were operationalized as "day-to-day irritating and frustrating demands that to some degree characterize everyday transactions with the environment" (Kanner, et al., 1981). Daily hassles include chance occurrences and annoying practical problems such as losing things or traffic jams. Daily hassles have been shown to be a better predictor of adaptational outcomes, such as psychological stress symptoms, than major life events (Kanner et al., 1981). The concept of daily hassles is especially useful when surveying young adults, who might not yet have experienced many major life events, such as the death of spouse (Kohn et al., 1990).

Daily hassles were evaluated using the Inventory of College Student Recent Life Experiences (ICSRLE; Kohn et al., 1990). The ICSRLE has a total of 49 items used to rate the extent of respondents' experience with daily hassles over the past month, using a 4-point scale from 1 (not at all part of my life) to 4 (very much part of my life). The ICSRLE was designed to assess college students' levels of daily hassles in academic settings, rather than work situations, without the contamination of general psychological symptoms and subjective distress (Kohn et al., 1990). The ICSRLE has been used in educational research among diverse college student populations, including minority/immigrant college students in Canada (Lay & Safdar, 2003), and international college students in the U.S. (Bodenhorn, Miyazaki, Ng & Zalaquett, 2007).

The ICSRLE has been shown to have good internal consistency and high correlations with the 14-item PSS (Kohn et al., 1990; Osman, Barrios, Longnecker & Osman, 1994). The scale development validation study identified a 7-factor structure that included developmental challenges, time pressure, academic alienation, romantic problems, assorted annoyances, general social mistreatment, and friendship problems (Kohn et al., 1990). Sample items include "Too many things to do at once" and "Lower grades than you hoped for." Higher scores indicate greater exposure to daily hassles, and only the total score was used in analysis.

Dispositional Mindfulness

Dispositional mindfulness was operationalized as "an inherent human capacity for awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment*"* (Kabat-Zinn, 2003). Dispositional mindfulness is a multifaceted construct (Baer et al., 2006), with naturally varying individual differences that have significant self-regulatory and psychological well-being consequences (Brown & Ryan, 2003). Dispositional mindfulness was measured using three subscales or facets of the Five Facet Mindfulness Questionnaire (FFMQ): "Acting-with-awareness/automatic pilot/concentration/nondistraction (acting-with-awareness, or act)" (e.g., "I am easily distracted"), "nonjudging of experience (nonjudging, or nonjudge) " (e.g., "I disapprove of myself when I have irrational ideas"), and "nonreactivity to inner experience (nonreactivity, or nonreact)" (e.g., "I watch my feelings without getting lost in them"). All items in the "act" and "nonjudge" facets are reverse-scored. The present study did not use "Observing/noticing/attending to sensations/perceptions/thoughts/feelings (observe)"

and "Describing/labeling with words (describe)," because these two facets often have poorer psychometrics, particularly among non-meditators (Baer, et al., 2008; de Bruin, Topper, Muskens, Bogels & Kamphuis, 2012; Grossman, 2008).

The FFMQ measures the tendency to be mindful in everyday life in both meditating and non-meditating adults. The FFMQ is based on the conceptualization of mindfulness as a naturally occurring individual characteristic of being aware of present moment experiences, such as thoughts, perceptions, sensations, and feelings (Baer et al., 2006; Baer et al., 2008). The FFMQ was chosen because it was the most widely used validated self-report mindfulness measure at the time of this research study (Bergomi et al., 2012). Twenty-three items in three facets are rated on a 5-point scale from 1 (never or very rarely true) to 5 (always or very often true). A higher total FFMQ score suggests a higher level of the mindfulness, and the FFMQ subscale scores indicate the degree of mindfulness in respondents' day-to-day lives. The FFMQ has been extensively used in research among both clinical and healthy volunteers, including medical students (de Vibe et al., 2013; van Dijk, Lucassen & Speckens, 2015).

Descriptive Measures

Descriptive measures included standard demographic and curricular information, such as age, gender, race, marital status, and the AANA regions (1-7; see Table 2) in which students' nurse anesthesia programs were located. The AANA region data was used only to assess the representativeness of the sample. In addition, following the recommendations from Chipas and colleagues (2012), items about nurse anesthesia educational program information (such as the type of degree program, curriculum designs, and the level of training) were also included.

Table 3.2. AANA Regions and the number of nurse anesthesia programs in each state

AANA Region (Number of Program)	Member States (Number of Program; national total 114)
Region 1 (17)	CT(4), ME(1), MA(2), NH, NJ(2), NY(4), PR(2), RI(2), VT
Region 2 (19)	GA(1), KY(1), NC(6), SC(2), TN(6), VA(2), WV(1)
Region 3 (11)	IL(5), IN, MI(5), WI(1)
Region 4 (16)	AR(1), IA(1), KS(2), MN(4), MO(4), NE(2), ND(1), OK, SD(1)
Region 5 (10)	AK, AZ(2), CA(5), CO, HI, ID, MT, NV, NM, OR(1), UT(1), WA(1), WY
Region 6 (23)	DE, DC(1), MD(2), OH(7), PA(13)
Region 7 (19)	AL(2), FL(9), LA(2), MS(1), TX(5)

Meditation Practice Experience (additional variable for Aim 3 ad hoc analysis)

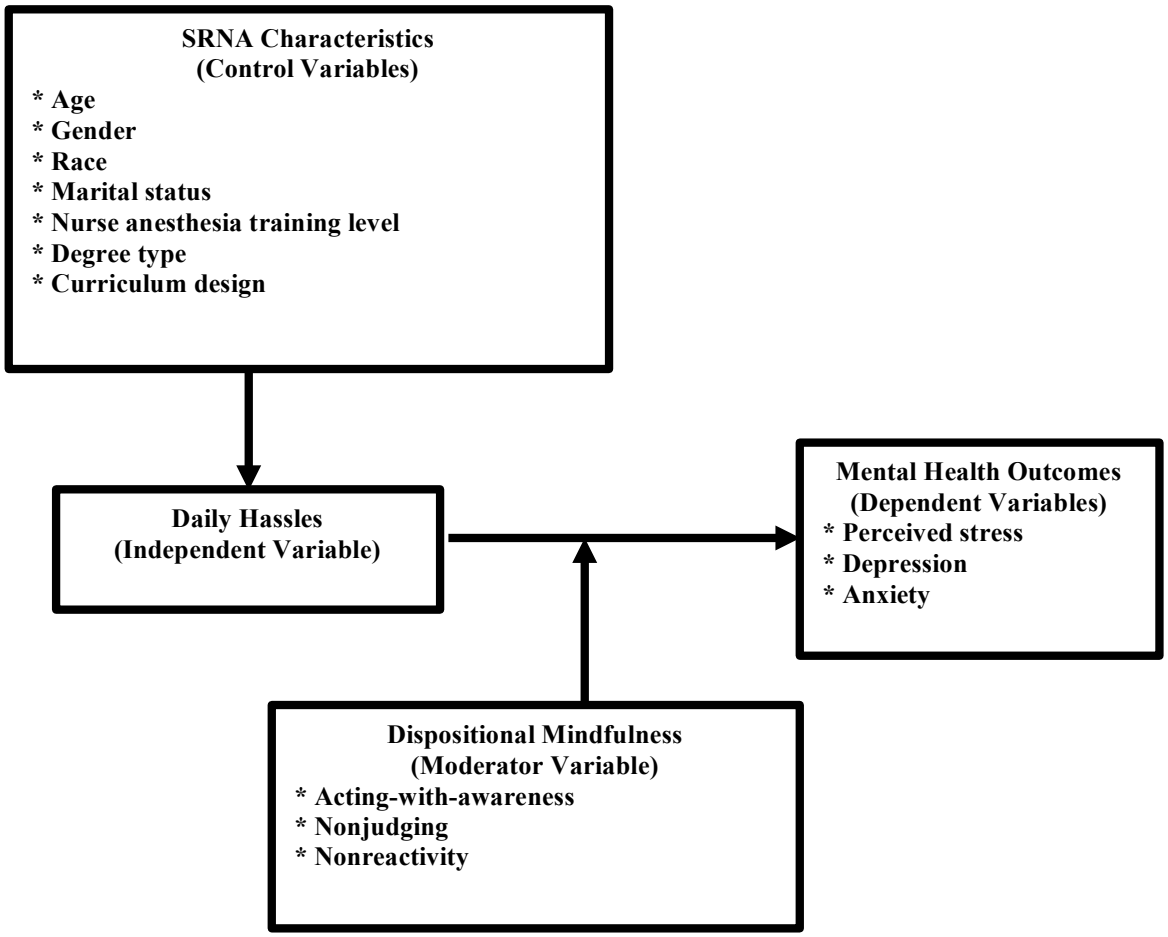
In addition, meditation practice experience was assessed as a control variable for dispositional mindfulness. In general, meditation practices aim at some types of personal and/or spiritual growth, such as enlightenment or transcendental experience (Ospina et al., 2007), and the literature suggests that individuals can increase their level of dispositional mindfulness through regular meditation practice (Quaglia et al, 2015). The Meditation Practice Scale was used to measure meditation practice experience. The same instrument was used in a scale development study for the Mindfulness Attention and Awareness Scale (Brown & Ryan, 2003) as well as in another mindfulness study (Christopher, Ramsey & Antick, 2013). The online questionnaire included skip logic to reduce the potential response burden for non-meditators. The first item asked whether respondents currently meditate. Those who endorsed *no* meditation practice reached the end of the survey screen after they answered the question. Those who endorsed *current*

meditation practice answered an additional five questions, including the length of meditation experience, the duration of each meditative session, a write-in item for the type of meditation they regularly practiced, and the extent to which they carried their meditation practice into daily life.

Ethical Considerations

The online survey service request and the complete study protocol were sent to the AANAF for their final approval, after obtaining the IRB approval. Per AANAF policy, the data sources remained anonymous; the online survey did not ask study participants for any information that might directly or indirectly lead to their identity. Also, the study participants had an option to opt-out from all AANAF-supported research activities, including the present study, and were allowed to stop at any time while they were taking the online survey.

Figure 3.1. Study Conceptual Model (Adapted for SRNAs from Lazarus & Folkman, 1984)



Data Analysis

Survey data was directly downloaded from SurveyMonkey© to an Excel spreadsheet for data cleaning. Cleaned data was imported to the Stata version 14 (College Station, TX) for statistical analysis. The data was examined for missing data, frequency, central tendency and dispersion in exploratory analysis. Missing data was handled by multiple imputation. Main data analyses for Aim 1 and Aim 3 were conducted using complete case analysis and multiply imputed dataset. The analysis for Aim 2 was conducted only on complete case analysis due to the lack of suitable alternatives to the

analysis of variance for comparing means among groups using multiply imputed dataset in Stata.

Missing Data

Rubin (1976) introduced what is currently the most popular missing data classification system. Rubin's classification of missing data includes (1) missing completely at random (MCAR), (2) missing at random (MAR), and (3) missing not at random (MNAR). The determinants of the classification are (1) the variable with missing value, (2) covariates, and (3) the hypothetical underlying mechanism of missing data. MCAR posits that the missingness is due to a random process and is not related to observed or unobserved values. MAR assumes that the probabilities of missingness in the study data depend on observed data, but not on missing data. When the missing pattern was not due to MCAR or MAR, it was due to MNAR, in which case the missingness was due to unobserved data (Schafer & Granam, 2002). In other words, the difference between MAR and MNAR lies in ignorability, that is, whether the missing data mechanism was related to known information. However, no diagnostic procedure has been able to demonstrate that the missingness was not related to MNAR (McKnight, McNight, Sidani, & Figueredo, 2007).

Bridging the Gap. A diagnostic test using Stata was conducted to determine the types and the extent of missing data. The missingness diagnostic procedure started with dummy coding of missing values for all continuous variables with missing values. The newly created variables, "miss_variable name" contained the code 0 for no-missing, and 1 for missing. The missing pattern was identified using "misstable pattern by frequency"

syntax. The probability of missing response among the four scales given the observed covariates was examined using the logit test.

Handling missing values. There are multiple statistical methods to minimize the adverse effects of missing data, such as biased estimates of parameters and standard errors. Broadly speaking, there are two ways of handling missing data: data deletion methods, and model-based methods.

Deletion methods. All deletion methods use procedures that do not replace missing values and make no adjustments due to missing values (McKnight et al., 2007). Complete case analysis drops all observations with a missing value. This is the simplest method for handling missing data and is the default program in most statistical software packages. Though it is the easiest way to handle missing data, a complete case analysis risks biased estimates when the mechanism of missing data is MNAR, and when the effect of large amounts of missing data is not ignorable (McKnight et al., 2007). Also, a complete case analysis reduces statistical power, due to smaller sample size used for statistical analysis.

On the other hand, available case analysis preserves all observed data. However, this method creates a varying number of observations among the variables and poses a significant problem in calculating the correlation matrix, which renders available case analysis inappropriate for this study.

Model-based methods. Model-based methods augment the data with missing values by deriving parameter estimates, such as mean, standard errors, and variance, from the available data and from the underlying assumed distribution or probability model. Maximum likelihood is a general parameter estimate procedure used in various types of

modeling. Maximum likelihood can produce efficient and unbiased parameter estimates of normally distributed data with a large sample (McKnight et al., 2007). Expectation maximization method is a type of maximum likelihood model used when data is missing. The expectation maximization method is not suitable for hypothesis testing, however, because this method may underestimate standard error and could result in increased Type I error (McKnight et al., 2007). Other model-based methods are single imputation and multiple imputation.

Single imputation. Single imputation, an umbrella term for a number of different procedures, actually replaces a missing value with a calculated value and allows statistical analysis as if there was no missing data. There are three groups of procedures used to generate a value for each missing value, including (1) constant (i.e., mean substitution), (2) a randomly selected value (i.e., hot deck imputation), and (3) a non-randomly selected value (i.e., conditional mean imputation). McKnight and colleagues. (2007) cautioned about known common issues inherent in single imputation methods. The most problematic one is inflated Type I error, due to suppressed standard error. In addition, single imputation methods may introduce unforeseen biases that cannot be easily managed, and they often perform poorly even when missingness is ignorable.

Multiple imputation. Multiple imputation is a model-based method considered a superior alternative for handling missing data, especially when the missingness is MAR (McKnight et al., 2007). The principal concept of multiple imputations is to utilize the distribution of observed data to estimate a set of possible values for missing data. Multiple sets of data are created and analyzed, individually and identically, to obtain a set of parameter estimates. The estimates are combined to obtain the overall estimates,

including standard errors, variances, and confidence intervals (White, Royston, & Wood, 2009). Due to the issues associated with other missing data handling methods discussed earlier, the present study used multiple imputation for that purpose.

Multiple imputation model specification. The model specification was guided by the study's main statistical analysis plan for Aim 3 (multiple linear regression modeling), and all variables in the Aim 3 analysis were included in the multiple imputation model. The type of imputation modeling was guided by the pattern of missingness, the type of variable to be imputed, and whether the variable met the linear regression assumptions.

Monotone imputation is a multivariate imputation method preferred for its simplicity when the missingness pattern among all variables with missing values is in the same pattern (monotone). Monotone imputation allows sequential imputation of multiple variables without iteration by using single-variable conditional modeling (StataCorp, 2015). However, when the missingness pattern is not monotone (i.e., a mixed pattern), monotone imputation cannot be used. In such a case, multiple imputation by chained equations (MICE) is the alternative to monotone imputation.

MICE is a type of imputation modeling in which a missing value in multiple variables is filled iteratively by using chained equations. MICE allows fully conditional specifications to precisely match the model to the data. In other words, MICE enables the data analyst to specify a series of univariate models for the conditional distribution of each partially observed variable, given the other variables in the data (Bartlett & Morris, 2015).

Predictive mean matching is an *ad hoc* method of imputing a missing value with an estimate that was sampled only from the observed value. The advantage of predictive mean matching is that the distribution of imputed estimates often closely matches the observed data. This is particularly desirable when imputing skewed continuous variables, and the relationship between the variables of interest is non-linear (White et al., 2011).

Current study. Model variables included all independent and dependent variables, as well as all covariates and three interaction terms (daily hassles × mindfulness - facet) that were used to build multiple linear regression models in Aim 3 data analysis. To accommodate the numerous variable types and distribution patterns among the missing data, MICE was used to build the multiple imputation model. Additional reasons for choosing MICE included the arbitrary missingness in demographic variables (curriculum type and age), which rendered monotone imputation impossible.

Missing values in the perceived stress data were imputed, using truncated regression to keep parameter estimates within the scale response range (0 to 40). Predictive mean matching was used for all other continuous variables, due to skewed distribution -- especially in the anxiety and depression scores. The *k* (constant) nearest neighbors, or knn value, from which to draw imputed values for predictive mean matching was determined based on the diagnostics for multiply imputed datasets using "midiagplots" syntax. "Midiagplots" plots the distributions of the observed, imputed, and completed (combined values between observed and imputed data) values which allow visual inspection of multiply imputed datasets for divergence among the three values for a given variable. For nominal variables, multinomial logistic regression was used. Multinomial logistic regression was augmented to handle the issue of perfect prediction.

The number of imputation (*M*) was guided by the value of the largest fraction of missing information (FMI) in the preliminary multiple imputation estimate report. The Stata Multiple Imputation Reference Manual suggested that a rule of thumb was $M \geq 100$ times FMI score, which should provide an adequate level of reproducibility of multiple imputation analysis (Stata Corp, 2015). The FMI values in the current study ranged from .002 (age) to .152 (mindfulness-nonjudge) among each imputed variable, suggesting that *M* value should be larger than 15. A total of 50 imputations in an incremental calculation of 10 models at a time were made to conduct diagnostics of the distributions of imputed values and observed values using "midiagplots" in the process. *M*=50 was chosen, based on the improvements in "midiagplots" distributions with successive imputations. All variables with missing values were registered as "imputed" in the imputed dataset.

Post-imputation estimates were obtained for the study's dependent variables, to estimate model parameters from multiply imputed data and to adjust coefficients and standard errors of the variability between imputations (Stata Corp, 2015). The imputation model estimation method was chosen to match the planned statistical model. Linear regression was used for perceived stress and general linear modeling (GLM), fitted with the gamma distribution, was used for depression and anxiety. All estimate models contained the same independent variables—daily hassles, three mindfulness facets, three (daily hassles x mindfulness) interaction terms, and all demographic and curricular information. The Stata uses a robust option for estimating the standard errors using the Huber-White sandwich estimators, which can deal with minor regression assumption violations about normality or heteroscedasticity.

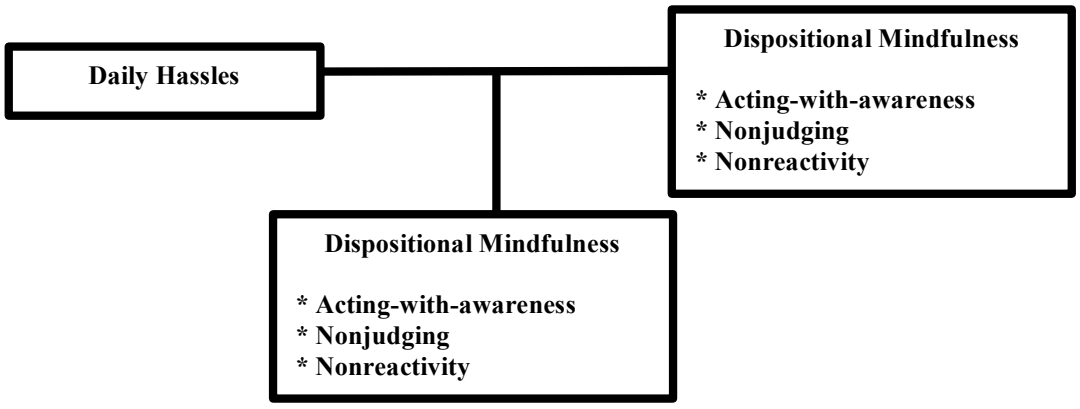
After creating multiply imputed datasets, the exploratory analyses were conducted on complete case analysis with the data after list-wise deletion (default in Stata), and multiply imputed dataset if appropriate for the planned data analysis method.

Exploratory Analysis

The normality assumption was checked by Skewness-Kurtosis test and visual inspection of the histogram of frequency among all continuous variables in the complete case analysis. Likewise, outliers were identified by visual inspection of the graph for dots in either upper, lower, or both tails. Significant outliers were handled by the incremental winsoring procedure.

Aim 1: Examine the relationships between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs.

Figure 3.2. Aim 1 Schematic

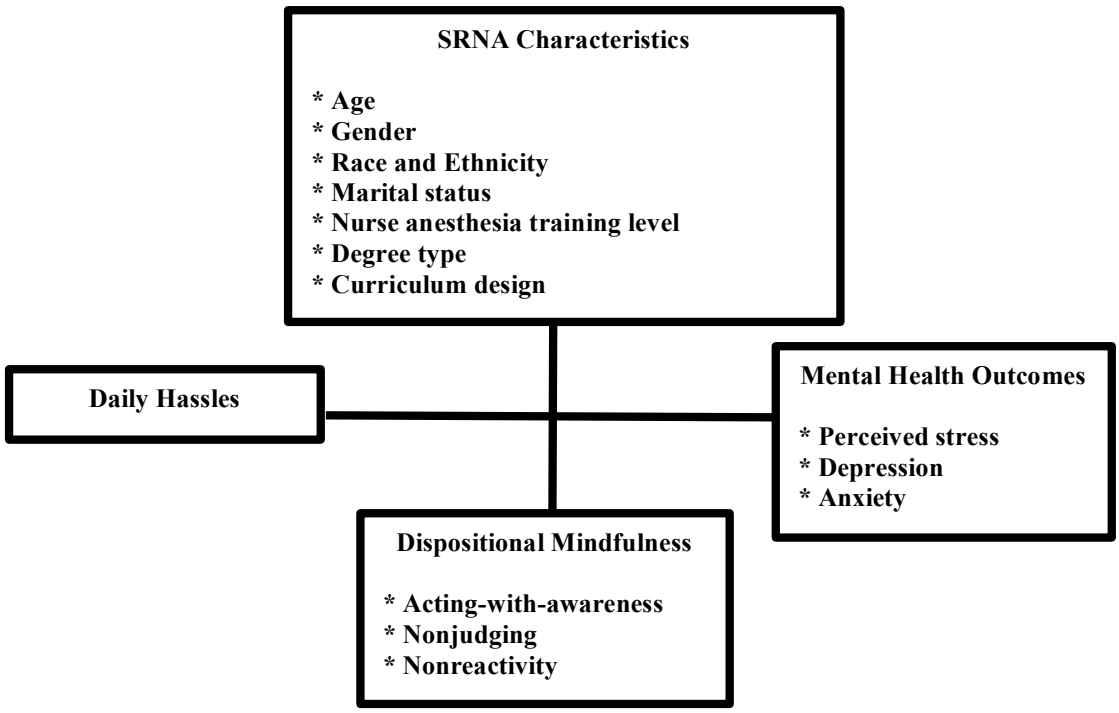


Standard descriptive statistics of frequency, central tendency and dispersion were used to summarize all variables (Wilcox & Keselman, 2003). Outliers were handled by the winsoring at 1% increment, just enough to eliminate severe outliers on both complete case analysis and multiply imputed dataset. Due to non-normal distribution in the daily hassles, depression, and anxiety data, Spearman's rank correlation using Sidák-adjusted

significance level was used to calculate a pairwise correlation between perceived stress, depression, anxiety, and three facets of dispositional mindfulness in complete case analysis. Stata does not officially support correlation analysis that produces multivariate correlation matrix on multiply imputed dataset. Therefore, the user-written correlation syntax "micorr" was used for multiply imputed datasets. However, "micorr" syntax did not provide the test of statistical significance information.

Aim 2: Characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness and SRNA characteristics (demographic and curricular information).

Figure 3.3. Aim 2 Schematic



Aim 2 analysis was conducted only on the complete case analyses data. One-way analysis of variance (ANOVA) and a post hoc Tukey-Kramer test was used to analyze the differences between subgroups of SRNAs on perceived stress. Also, a series of Kruskal-

Wallis tests (omnibus test) with Dunn's test (post-hoc contrast) was used for the analysis of depression, anxiety, and three facets of dispositional mindfulness due to non-normal distribution. Sidák correction was applied in one-way ANOVA test to control for inflated α level (increased Type I error) in multiple hypothesis testing. Similarly, Holms-Sidák's familywise error rate correction was applied on all Kruskal-Wallis tests and Dunn's tests.

Aim 3: Determine whether dispositional mindfulness moderates the relationship between daily hassles and three negative mental health outcomes (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and curricular information.

Figure 3.4. Aim 3 Schematic

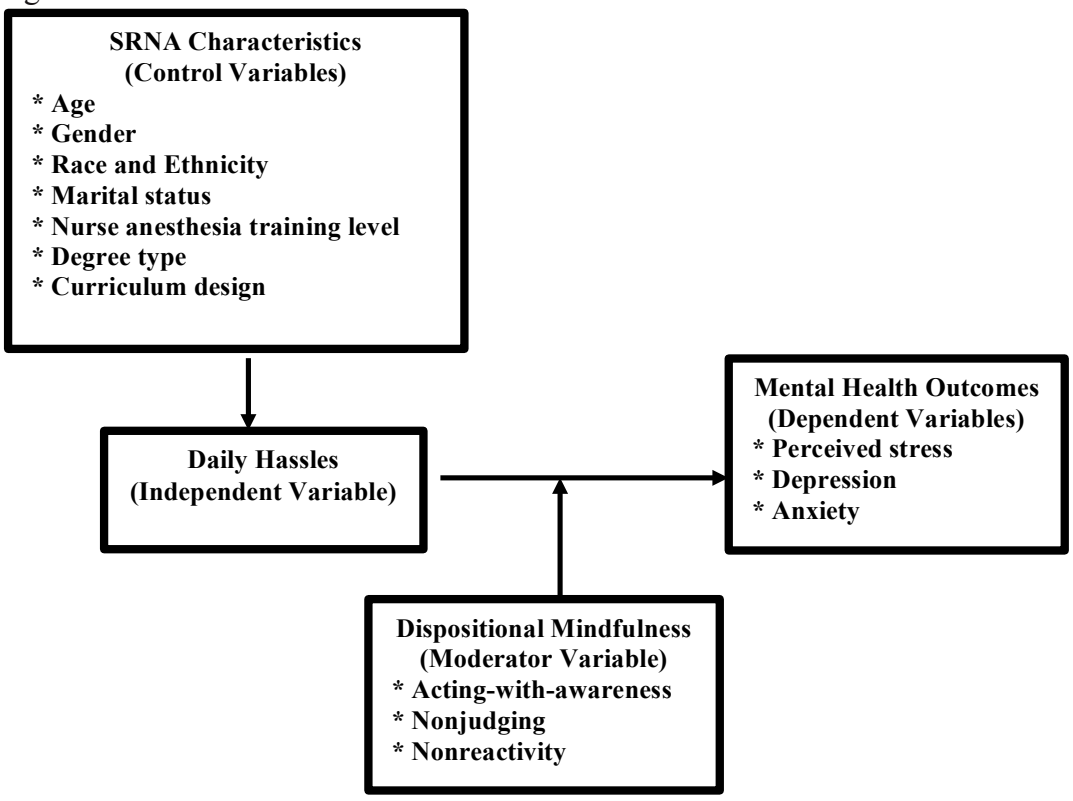
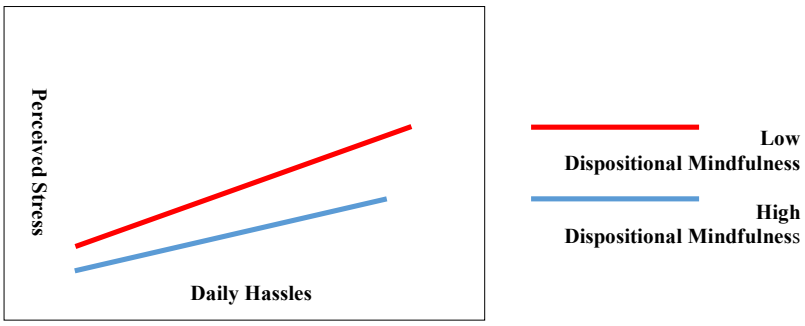


Figure 3.5. Expected moderator effect on IV – DV relationship



Various types of generalized linear models were used for Aim 3 analysis to determine whether the association between daily hassles and perceived stress, depression, and anxiety depended on the levels of dispositional mindfulness among the study sample, controlling for the effects of demographic and curricular covariates. All categorical variables were contrast coded, and all continuous independent variables were centered (Aiken & West, 1991).

To build all the linear models, all demographic and curricular information was entered in a preliminary linear regression model to identify significant covariates for model parsimony (α=0.05, 95% CI). Only significant variables identified in the preliminary analysis were entered in the main linear regression model. In addition, meditation experiences (a binary item: meditate or not meditate) was entered in the final step regression model to control for its potential influence on mindfulness. Finally, all continuous independent variables were centered to improve the interpretability of the results, according to Aiken and West (1991).

Linear regression assumptions were examined for the model including linearity, normality, homoscedasticity and multicollinearity. These assumptions applied to complete case analysis for analyzing the predictor(s) of perceived stress. In multiply

imputed data, however, only the normality assumption needed to be checked if using an imputed parameter estimation method that assumes normality, such as linear regression (Stata Corp, 2015). The homoscedasticity assumption was verified by visual inspection of residual histogram and symplot. Residuals were reasonably shaped in normal distribution in the histogram. However, there was a slight positive skewing of residuals away from the median of residuals in symplot. There was no strong evidence for heteroscedasticity. Correlation between the independent variables that included all covariates, daily hassles, and three facets of mindfulness, were evaluated for multicollinearity in the complete case analysis. The highest correlation among the independent variables was between mindfulness-nonjudge and mindfulness-acting (r =.56), and there was no extreme multicollinearity between two independent variables that would be problematic in linear regression modeling.

Post hoc, Holm's sequential Bonferroni procedure was used when analyzing the significance of the interaction terms in order to minimize an inflated Type-1 error inherent in the test of multiple null hypotheses (Aickin & Gensler, 1996; Gaetano, 2013; Holm, 1979). A p-value of the interaction term in each analysis was extracted when only one interaction term was included in the regression model, as opposed to all three interaction terms together to isolate the effect of the individual interaction term. A total of nine p-values were examined together in both the complete case analysis and the multiply imputed data. Each group contained nine p-values of three interaction terms each from the analysis of three dependent variables. Then, nine p-values were ranked in an ascending order for the Holm's sequential Bonferroni procedure. The resulting adjusted p value was used to determine the statistical significance ($\alpha = 0.05/n$) where n is the

number of multiple comparisons. Otherwise, the significance of all main effect variables (daily hassles and dispositional mindfulness facets) was examined in the full model with all three interaction terms included, and they were not subject to the family-wise inflated alpha correction.

Simple slope analyses for statistically significant interactions was conducted using the PROCESS macro version 2.15 (Hayes, 2013) in SPSS version 24.0. The PROCESS macro is used to analyze the interaction by estimating the conditional effect of independent variable on the dependent variable for various values of moderator variable using ordinary least squares (OLS) regression. In the present study, simple slopes were tested for low (-1SD below the mean), average (mean), and high (+1 SD above the mean) levels of dispositional mindfulness following the recommendation by Aiken and West (1991). The PROCESS macro for SPSS requires complete data and is not available for use in multiply imputed dataset.

Perceived stress. Hierarchical multiple linear regressions were used in the complete case analysis for perceived stress to test whether (1) the main effects of daily hassles and three facets of dispositional mindfulness explained the significant variance in the prediction of perceived stress over and above that accounted for by demographic and curricular information; and (2) whether adding the interaction terms (daily hassles × dispositional mindfulness facet) significantly increased the variance explained in the final model, which would indicate a significant moderation effect. Hierarchical multiple linear regression modeling afforded the inspection of the interaction (moderation) effect apart from the main effect (Aiken & West, 1991; Baron & Kenny, 1986), and whether the

addition of the interaction terms added to the explanatory power of the model (Keller & Kelvin, 2013).

For the multiply imputed dataset, a linear regression model was fitted with estimates and their standard errors were pooled from the multiply imputed data sets (M =50) to explain the variation in perceived stress as the function of covariates and main effect variables. As an alternative approach to hierarchical linear regression modeling available for non-imputed data, a series of four multiple linear regression models were built to examine the changes in the strengths of the main effect variables when the interaction terms were added to the final linear regression model. As with the hierarchical linear modeling in the complete case analysis, each multiple linear model included a single interaction term to tease out the moderation effect by the specific mindfulness facet. Of note, the output of pooled estimates of multiply imputed models fitted with linear regression did not report the variance explained information in Stata.

Model building. To build the hierarchical multiple linear regression model, the significant variables in the preliminary analysis were entered as covariates in Step 1. The main effect variable, daily hassles, was entered in Step 2. Three dispositional mindfulness facets were added together in Step 3. Finally, the interaction term for each dispositional mindfulness facet, (daily hassles × dispositional mindfulness – facet) and meditation practice experience (control variable) was added in Step 4 to examine whether dispositional mindfulness moderated the effects of daily hassles on perceived stress (see Figure 3.5). A significant p value for the effect of the interaction term would imply that there was an interaction (Aiken & West, 1991; Baron & Kenny, 1986). Also, a significant increase in the variance explained between steps 3 and 4 would signal the significant

moderation effect of dispositional mindfulness on the relationship between daily hassles and perceived stress (Marsh, Hau, Wen, Nagengast, & Morin, 2011).

Table 3.3. Aim 3 Hierarchical Multiple Linear Regression Model

Step	Independent Variables	Note
Preliminary analysis	All demographic and curricular information variables.	Only significant variables (p>0.05) will be retained for the following steps.
Step 1	* Significant variables in the preliminary analysis	These are control variables.
Step 2	* Daily hassles	Main effect
Step 3	* Dispositional mindfulness - acting-with-awareness * Dispositional mindfulness - nonjudging * Dispositional mindfulness - nonreactivity	Main effect
Step 4	* Daily hassles X acting-with-awareness * Daily hassles X nonjudging * Daily hassles X nonreactivity * Meditation practice experience	Interaction terms Each term was entered in a separate mode.

Anxiety and depression. A set of four generalized linear models fitted on the gamma distribution with the log link, one with a single interaction term between the daily hassles and dispositional mindfulness facet, was calculated for both anxiety and depression. For each set of generalized linear models, the first model only included covariates. The main effect variables (daily hassles and mindfulness facets) were added sequentially in the second and third linear models to examine the changes in the model fitness indices between the linear models. The interaction term was added in the fourth model to examine its moderation effect. This multi-step approach was taken to mimic the hierarchical linear modeling used for the analysis of perceived stress. The same procedure was repeated for both the complete case analysis and the multiply imputed dataset.

Generalized linear modeling was chosen to handle a large positive skewness over transforming the data in favor of preserving the explanatory power of the independent variables (Agresti, 2015). Generalized linear modeling assumes the independence of observation; however, it does not assume constant variance and normality assumptions (Hutchenson & Sofroniou, 1999), making it suitable for non-normal data analysis. The trade-off of using generalized linear modeling instead of hierarchical linear modeling was that it cannot assess changing amounts of variance explained by stepwise additions of factors. However, it afforded avoidance of data transformation that might reduce the richness of the data, as well as to maintain the simplicity of the interpretation of analysis results.

Chapter 4: Results

This study used a descriptive, cross-sectional survey design. This chapter provides the results of the study, organized by specific aims. The first aim of this study was to examine the relationship between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs. The second aim was to characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness, and SRNA characteristics, based on demographic and curricular information. The third aim was to determine whether dispositional mindfulness moderated the relationship between daily hassles and three negative mental health outcomes (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and curricular information.

Sample Description

The initial online survey request reached 4,944 SRNAs on November 19, 2015. Fifty-nine e-mail addresses were invalid, resulting in a 1.2% bounce rate. Three e-mail recipients opted out of responding to the AANAF online research requests. A total 1,721 SRNAs (35.2%) opened the e-mail message, and 284 SRNAs (5.7%) clicked the online survey link on the day of survey distribution. The follow-up e-mail request reached a slightly smaller number of SRNAs (N = 4,917) than the initial e-mail survey request and bounced back from 59 invalid e-mail addresses. Similar to the initial survey request, two e-mail recipients opted out of the research survey request from the AANAF. In total 1,548 SRNAs opened the survey request message, and 166 SRNAs had clicked the online survey link by the end of the day. The response data for the survey participation request sent to 114 nurse anesthesia administrators was unavailable.

In all, 887 responses were recorded in the SurveyMonkey© online survey site at the time of survey closure on December 31, 2015. Checking for duplicates identified six duplicate responses, resulting in total of 881 valid survey responses. The survey response rate was approximately 17.8%, out of 4,944 SRNAs who received the online survey request from the AANA Foundation on November 19th. Of 881 survey respondents, 728 completed the entire questionnaire (82.6%). Table 4.1 provides sample characteristics.

The majority of the sample was female (66.6%), and White (84%). The respondents ranged in age from 23 to 53, with an average age of 30.5 (SD = 5.0) years. Nearly half of the sample was married (48.9%). The mean age and gender composition were relatively similar to the self-evaluation exam (SEE) examinees (across all training levels) in the fiscal year 2015 (National Board of Certification and Recertification for Nurse Anesthetists, 2016). The mean age of the study sample was slightly younger than the average age of all SEE examinees (31.7), and there were slightly more females in the study sample than SEE examinees (61.3%). The majority of the sample was in the first (43.3%) or second (39.1%) year of their nurse anesthesia education. Approximately three-quarters of the sample (72.8%) were pursuing their Master's degree, and the majority of the nurse anesthesia educational programs were of the front-loaded didactic curriculum type (60.5%). The sample represented seven AANA Regions, with SRNAs from Region 2 (22.5%), Region 7 (19.2%), and Region 6 (18.7%) representing over 60% of the study sample.

Table 4.1. Sample Characteristics (Demographic and Curriculum Variables)

Variables	M (SD)	*n*	%
Age	30.49 (4.96)	Range 23 - 53	
Gender			
Female		587	66.6%
Male		288	32.7%
Prefer not to answer		6	0.7%
Racial/Ethnic Heritage			
American Indian or Alaska Natives		5	0.6%
Asian		39	4.4%
Black or African American		20	2.3%
Hispanic or Latino		35	4.0%
Native Hawaiian or Pacific Islander		2	0.2%
White		740	84.0%
Mixed		27	3.1%
Prefer not to answer		13	1.5%
Marital Status			
Married		431	48.9%
Widowed		2	0.2%
Divorced or Separated		32	3.6%
In a domestic relationship or civil union		15	1.7%
Single, co-habiting with a significant other		127	14.4%
Single, never married		267	30.3%
Prefer not to answer		7	0.8%
Degree Program			
Master's		641	72.8%
Practice Doctorate		240	27.2%
Training Level			
First year		381	43.3%
Second year		344	39.1%
Third or Fourth year		156	17.8%
Curriculum Type			
Front-loaded didactic		531	60.5%
Integrated		347	39.5%
AANA Region in which the program locates			
Region 1		122	13.9%
Region 2		198	22.5%
Region 3		46	5.2%
Region 4		113	12.8%
Region 5		68	7.7%
Region 6		165	18.7%
Region 7		169	19.2%

Missing Data

Among 871 valid responses, there were various instances of missing data across study variables, ranging from zero to 17.5%. There was no item-level missing value in all four study scales, and the study respondents completed all study scales that they had initiated. However, they were allowed to stop the survey anytime they wished. Table 4.2 lists the missing data percentile for each variable.

Table 4.2. Missing Data

Variable	Response	Nonresponse	Missing %
Training level	881	0	0%
Degree Program	881	0	0%
Curriculum Type	878	3	0.3%
Gender	881	0	0%
Age	878	3	0.3%
Race	881	0	0%
Marital Status	881	0	0%
AANA Region	881	0	0%
Perceived Stress	856	25	2.8%
Depression/Anxiety	831	50	5.7%
Daily Hassles	786	95	10.8%
Mindfulness	728	153	17.4%
Meditation (yes or no)	727	154	17.5%

Multiple Imputation

To minimize the adverse effects of missing data, such as biased estimates of parameters and standard errors, multiple imputations were conducted to statistically handle missing data. The missingness diagnostics and multiple imputation procedures are described in the Appendix.

Post-imputation analysis of multiply imputed dataset. Pooled mean values for all three dependent variables were reasonably similar to the corresponding values in the complete case analysis. Most imputed standard errors were slightly reduced in size relative to the complete case analysis. The largest Fractions of Missing Information

(FMI) in the imputation estimates for perceived stress, depression, and anxiety were .019, .033, and .039 respectively.

The relative increase in the variance of the estimate (RVI) is the indicator for the loss of information about the parameter due to missing data. Smaller RVI score indicates less influence from the missing data. Table 4.3 summarizes the pooled estimates of multiply imputed data. RVI scores ranged from .020 (perceived stress) to .136 (mindfulness-nonreact). Also, visual inspection of the diagnostic graph plot, comparing the distributions of the observed, imputed, and completed values for all imputed continuous variables, suggested that the parameter estimates among the 50 imputed models did not differ significantly from observed data.

Table 4.3. Pooled Multiple Imputation Estimates of Perceived Stress, Depression, Anxiety, Daily Hassles, and Dispositional Mindfulness

Variable	M (SD)	SE	95% CI		RVI
			LL	UL	
Perceived Stress	18.1 (6.2)	.21	17.67	18.52	.012
Anxiety	8.4 (7.6)*	.24	7.90	8.85	.035
Depression	7.9 (7.5)*	.25	7.39	8.37	.044
Daily Hassles	92.3 (22.7)	.71	89.87	92.66	.009
Mindfulness-nonjudge	28.0 (7.6)	.28	27.45	28.54	.206
Mindfulness-nonreact	21.7 (5.1)	.17	21.37	22.03	.077
Mindfulness-act	26.83 (6.6)	.24	26.36	27.29	.108

Note. M (SD) are post-winsorizing values; CI = confidence interval; LL = lower limit; UL = upper limit; RVI= relative variance increase due to nonresponse; * mean scores of depression and anxiety were converted to full scale scores.

Exploratory Data Analysis

The data in the complete case analysis and the multiply imputed dataset was examined at the univariate level, including means, median, standard deviation, mean standard error, range, and distributions. The parameter estimates in the imputed data sets were generally similar to the values obtained in the complete case analysis.

Normality - Distribution

The Skewness-Kurtosis test was significant for all continuous variables in the complete case analysis, indicating statistically significant non-normal distribution. Upon examination of the histogram, all continuous variables had moderate leptokurtosis, ranging from 2.54 (anxiety) to 2.92 (daily hassles). Depression and Anxiety had large positive skewness (1.0 and .73 respectively) with the resemblance of the gamma distribution. Likewise, mindfulness facets had negative skewness in the range between –.13 (nonreact) to –.38 (nonjudge). On the other hand, the distribution of perceived stress data had only small positive skewness (.04). Daily hassles also had moderate positive skewness (.54), along with the largest standard error among the four scales (.81).

Outliers. Both types of data also shared a similar outlier pattern in age, perceived stress, depression/anxiety, daily hassles, and mindfulness. The winsoring procedure at one percent increment was conducted was conducted only to the point of eliminating outliers in all continuous variables, which ranged from 0% to 9% per tail. The winsorizing procedure to remove outliers resulted in a minor change in distribution shape in all variables. Also, the Skewness-Kurtosis test became non-significant in perceived stress and mindfulness-nonreact after the winsorizing.

Internal Consistency Reliability

Internal consistency reliability (Cronbach's alpha) obtained with this sample was calculated for each scale in the complete case analysis. Cronbach's alpha was high, ranging from .84 to .95 in the complete case analysis. Table 4.4 describes Cronbach's alpha for each four scales.

Table 4.4. Cronbach's Alpha Reliability in Complete Case Analysis

Variable	α
Perceived Stress	.87
Anxiety	.84
Depression	.89
Daily Hassles	.95
Mindfulness-Nonjudge	.93
Mindfulness-Nonreact	.83
Mindfulness-Act	.91

Mean Test Scores

The mean total scores of primary study variables in the complete case analysis after winsorizing to handle significant outliers were as follows: daily hassles 92.3 (SD = 22.7), perceived stress 18.1 (SD = 6.3), depression 7.9 (SD = 7.3), anxiety 8.4 (SD = 7.1), dispositional mindfulness–nonjudging (mindfulness-nonjudge) 28.1 (SD = 7.6), dispositional mindfulness–nonreactivity (mindfulness-nonreact) 22.0 (SD = 4.9), and dispositional mindfulness–acting-with-awareness (mindfulness-act) 27.0 (SD = 6.7). Also, 14.4% (*n* = 105) of the sample reported some form of meditation practice. Descriptive statistics of the four scales are described in Table 4.5.

Table 4.5. Descriptive Statistics of Perceived Stress, Depression, Anxiety, and Distortional Mindfulness in Complete Case Analysis

Measure	n	M (SD)	SE	Skew	Kurtosis
Perceived Stress	856	18.1 (6.3)	.21	.04	2.68
Depression	825	7.9 (7.3)	.25	1.04	3.19
Anxiety	825	8.4 (7.1)	.25	.73	2.54
Daily Hassles	782	92.3 (22.7)	.81	.54	2.93
Mindfulness-Nonjudge	724	28.1 (7.6)	.28	-.38	2.56
Mindfulness-Nonreact	724	22.0 (4.9)	.18	-.13	2.76
Mindfulness-Act	724	27.0 (6.7)	.25	-.25	2.70

Note. M (SD) are post-winsorizing values; SE = standard error.

Aim 1 Result

Aim 1: Examine the relationships between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs.

Hypothesis 1.1: Daily hassles, perceived stress, depression, and anxiety will be positively correlated.

Hypothesis 1.2: Daily hassles, perceived stress, depression, and anxiety will be negatively correlated with dispositional mindfulness.

The first aim of the study was to describe the relationship between daily hassles and three negative mental health outcomes in the study sample: perceived stress, depression, and anxiety. Due to non-normal distribution in the daily hassles and depression/anxiety data, Spearman's rank correlation using a Sidák-adjusted significance level was employed to calculate an inter-correlation between perceived stress, depression/anxiety, daily hassles, and three facets of mindfulness.

Hypothesis 1.1

The hypothesis of this aim was that daily hassles, perceived stress, and depression/anxiety would be positively correlated.

Daily hassles. Daily hassle was positively correlated with perceived stress, depression, and anxiety, and the degree of correlation in the complete case analysis and multiply imputed data was similar. The correlation with perceived stress was $r = .72$ in the complete case analysis and $r = .70$ in the multiply imputed data. Similarly, the correlation with depression was $r = .67$ in the complete analysis and $r = .65$ in the multiply imputed dataset. Finally, the correlation with anxiety was also similar between the complete case analysis ($r = .58$) and the multiply-imputed dataset ($r = .59$).

***Perceived stress*.** The same pattern was observed between perceived stress and depression, and perceived stress and anxiety. The correlation with depression was $r = .65$ in the complete case analysis and $r = .63$ in the multiply imputed data. Also, the correlation with anxiety was similar between the complete analysis ($r = .59$) and the multiply imputed dataset ($r = .60$).

All correlations in the complete case analysis were statistically significant ($\alpha = .05$). Significance information for multiple imputation estimates of correlation was not available in Stata. Table 4.6 and 4.7 list the results in detail for the complete case analysis, and the multiply imputed dataset respectively. The first hypothesis of Aim 1 was supported by the study data.

Hypothesis 1.2

The second hypothesis of the first aim was that daily hassles, perceived stress, depression, and anxiety would be negatively correlated with dispositional mindfulness. As with the first hypothesis results, the relationships between daily hassles, perceived stress, anxiety, depression, and mindfulness followed the expected negative direction in both complete case analysis and multiply imputed dataset. The strength of the association between the variables was also similar in both data sets.

Perceived stress. Perceived stress had the largest correlation with mindfulness-act compared to the other two facets, and the correlation was the same in both the complete case analysis and the multiply imputed data ($r = –.53$). The correlation with mindfulness-nonjudge was slightly smaller ($r = –.43$) than that with mindfulness-act in the complete case analysis and the multiply imputed data. Finally, the correlation with mindfulness-

nonreact was much smaller than the other two facets, and the correlations in the complete case analysis and the multiply imputed dataset were the same ($r = –.27$).

Depression. Like perceived stress, depression also had the negative correlation with all three mindfulness facets. However, depression had the largest correlation with mindfulness-nonjudge, and the correlation in the complete case analysis ($r = –.50$) was slightly smaller than the multiply imputed data ($r = –.52$). Similarly, the correlations with mindfulness-act in the complete case analysis ($r = –.51$) and the multiply imputed data ($r = –.49$) were close. Mindfulness-nonreact had the smallest correlation with depression in both complete case analysis ($r = –.18$) and the multiply imputed data ($r = –.16$).

Anxiety. Anxiety also had the same correlation pattern with mindfulness that was seen in depression. The largest correlation was found with mindfulness-nonjudge in the complete case analysis ($r = –.44$) and the multiply imputed data ($r = –.45$), followed by mindfulness-act in both the complete case analysis and the multiply imputed data ($r = –.42$). mindfulness-nonreact had the smallest correlation with anxiety in the complete case analysis ($r = –.16$) and the multiply imputed data ($r = –.18$).

Daily hassle. Daily hassles also shared the same correlation pattern with mindfulness seen in three mental health outcome variables. Like perceived stress, daily hassles had the largest correlation with mindfulness-act in the complete case analysis ($r = –.53$) and the multiply imputed data ($r = –.52$), and with mindfulness-nonjudge in the complete case analysis ($r = –.52$) and the multiply imputed data ($r = –.54$). Finally, mindfulness-nonreact had the smallest correlation with daily hassles in the complete case analysis ($r = –.12$) and the multiply imputed data ($r = –.11$).

In summary, daily hassles, perceived stress, depression, and anxiety had a negative correlation with mindfulness facets, and these correlations in the complete case analysis were significant (α =.05). Hypothesis 1.2. was supported by the study data.

Table 4.6. Inter-correlations of Perceived Stress, Depression, Anxiety, Daily Hassles, and Dispositional Mindfulness in Complete Data

Variables	1	2	3	4	5	6	7
1. Perceived Stress	1.00						
2. Anxiety	0.59***	1.00					
3. Depression	0.65***	0.59***	1.00				
4. Daily Hassles	0.72***	0.58***	0.67***	1.00			
5. Mindfulness-Nonjudge	-0.43***	-0.44***	-0.50***	-0.52***	1.00		
6. Mindfulness-Nonreact	-0.27***	-0.16**	-0.18***	-0.12*	0.05	1.00	
7. Mindfulness-Act	-0.52***	-0.42***	-0.51***	-0.53***	0.54***	0.08	1.00

Note. Value indicates Spearnan's correlation coefficient; *** p<0.001, ** p=0.002, * p=0.039 after Sidák significance correction at α=.05.

Table 4.7. Inter-correlations of Multiple Imputation Estimates of Perceived Stress, Depression, Anxiety, Daily Hassles, and Dispositional Mindfulness

Variables	1	2	3	4	5	6	7
1. Perceived Stress	1.00						
2. Anxiety	0.60	1.00					
3. Depression	0.63	0.63	1.00				
4. Daily Hassles	0.70	0.59	0.65	1.00			
5. Mindfulness-Nonjudge	-0.44	-0.45	-0.51	-0.52	1.00		
6. Mindfulness-Nonreact	-0.27	-0.18	-0.16	-0.11	0.05	1.00	
7. Mindfulness-Act	-0.53	-0.42	-0.49	-0.54	0.57	0.07	1.00

Note. No significance information available.

Aim 2 Result

Aim 2: Characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness and SRNA characteristics (demographic and curricular information).

Hypothesis 2.1: Comparing within the respected categories, female, minority, divorced, and 2nd-year SRNAs, and those who are in the programs with integrated curricula will report higher perceived stress, depression, and anxiety.

Hypothesis 2.2: Daily hassles and dispositional mindfulness will be different across SRNAs based on the demographic and curricular information.

The second aim of the study was to identify the subgroup differences among the SRNA samples in three mental health outcomes based on demographic information and nurse anesthesia curriculum type. In this data analysis, 3rd-year and 4th-year training levels were collapsed, due to the small number of observations in the 4th-year category (n = 11). Also, transgender (n = 2) was combined with those who preferred not to reveal their gender (n = 4). Only complete case analysis was used in the Aim 2 analysis, as the planned analysis for Aim2 (ANOVA with planned contrast), was not suited for multiply imputed data using the Stata.

Hypothesis 2.1

The first hypothesis of the second specific aim was that comparing within the respected categories, female, minority, divorced, and 2nd-year SRNAs, and those who were enrolled in programs with integrated curricula would report higher perceived stress, depression, and anxiety. Normality tests (Skewness and Kurtosis normality test and Shapiro-Wilk normality test) were significant (α = .05) in depression, anxiety, mindfulness-nonjudge, and mindfulness-act; therefore, a series of Kruskal-Wallis H-tests (omnibus test) along with the Dunn's test were conducted to compare the means of these variables among the subgroups of SRNAs, based on gender, race, marital status, and curriculum type.

One-way ANOVA with planned contrast was used in the analysis of perceived stress and mindfulness-nonreact. Potential inflated Type 1 errors in multiple hypothesis testing were controlled by Holms-Sidák's familywise error rate correction in Kruskal-

Wallis H-test, and Sidák correction in the one-way ANOVA test. Holms-Sidák's, as well as Sidák corrections, provided less conservative corrected *p*-values than Bonferroni's correction and afforded a good strategy to control for both Type I and Type II error risks. Table 4.8 in the Appendix H lists mean, standard error and 95% confidence interval of perceived stress for SRNA subgroups in complete case analysis, and the pooled estimates of mean and standard deviation in multiply imputed data.

Perceived stress. There were significant effects of gender $F(2, 853) = 15.27$ and training level $F(2, 853) = 4.22$ on the perceived stress mean score. *A priori* hypotheses on gender and training level were tested with planned contrast. Perceived stress was higher among female SRNAs (M = 18.9) than male SRNAs (M = 16.46). $p < .001$, 95% CI = [1.64 11.99], Cohen's d = .39. Zero was not included in the CI, indicating that the effect was significant at $\alpha = .05$. Also, perceived stress was higher among the senior students (3^{rd}- and 4^{th}-year SRNAs; M = 19.12) as opposed to 1^{st}-year (M = 17.47) and 2^{nd}-year (M = 18.37) SRNAs. The *a priori* hypothesis test that 2^{nd}-year SRNAs would have the highest perceived stress across the training level was not supported. A *post hoc* test to explore whether combined senior SRNAs had higher perceived stress than 1^{st}- and 2^{nd}-year SRNAs was significant ($p = .03$, 95% CI = [.20, 4.59], Cohen's d = .25) even after Sidák's alpha correction was applied. Table 4.8 in the Appendix provides the summary of SRNA subgroup differences in the mean score of perceived stress.

Depression. The mean score of depression did not differ significantly based on gender, race, marital status, or curriculum type among the study sample. Table 4.9 in the Appendix H describes the summary of SRNA subgroup differences in the mean score of depression.

Anxiety. Similar to perceived stress, only gender was significantly associated with anxiety at $\alpha = .05$ ($p < .001$) using Kruskal-Wallis H-test. Further examination using the Dunn's test discovered that female SRNAs had significantly higher anxiety (M = 9.1) than male SRNAs (M = 6.9, $p < 0.001$). See Table 4.10 in the The Appendix H for SRNA subgroup differences in the mean score of anxiety.

In summary, the data analysis for the first hypothesis in Aim 2 identified female SRNAs as one of the subgroups most vulnerable to negative mental health outcomes, namely perceived stress and anxiety, among the study sample. Also, senior students (3^{rd}- and 4^{th}- year SRNAs) reported significantly higher perceived stress than 1^{st}- and 2^{nd}- year students. None of the other covariates such as age, race, marital status, or curriculum type was significantly associated with perceived stress or depression/anxiety in the complete case analysis. Accordingly, Hypothesis 2.1 was partially supported regarding female SRNAs' vulnerability to perceived stress and anxiety, as well as senior students' perceived stress, which was higher than their junior peers.

Hypothesis 2.2

The hypothesis of this aim was that there was no difference in daily hassles and dispositional mindfulness across the entire sample, regardless of their demographic and curricular characteristics. Table 4.11 in Appendix H lists mean, standard error, and 95% confidence intervals of daily hassles for SRNA subgroups in complete case analysis, and the pooled estimates of the mean score and standard deviation in multiply imputed data. Also, tables 4.12, 4.13, and 4.14 in Appendix H list the results for mindfulness-nonreact, mindfulness-nonjudge, and mindfulness-act respectively.

Daily hassles. Similar to perceived stress and anxiety in the first hypothesis tests for Aim 2 analysis, female gender was significantly associated with daily hassles at α = .05 (p = .008) using Kruskal-Wallis H-test with Holms-Sidák's familywise error rate correction. Further examination using Dunn's test discovered that female SRNAs had a significantly higher daily hassles mean score (M = 93.9) than male SRNAs (M = 88.6, p < 0.003). In addition, there was a significant group difference between 1st (M = 89.4), 2nd (M = 93.6, p = .008), and senior year (M = 96.5) students in the daily hassles mean score at α = .05 (p = .008). The daily hassles mean score did not differ significantly based on race, marital status, or curriculum type.

Dispositional mindfulness-nonreacticity. There was a significant gender effect on mindfulness-nonreact, $F(2, 725) = 3.95$, p = .002). Female SRNAs had a lower level of mindfulness-nonreact (M = 21.6;) than male SRNAs (M = 22.7). However, a planned contrast test was insignificant (p = .42).

Dispositional mindfulness-nonjudging. All Kruskal-Wallis H-tests to determine the difference in mindfulness-nonjudge based on demographic and curricular characteristics were not significant at α = .05.

Dispositional mindfulness-acting-with-awareness. Similar to daily hassles and mindfulness-nonreact, the mean score of mindfulness-act differed significantly only by gender. Dunn's test indicated that female SRNAs (M = 26.4) had significantly lower mindfulness-act than their male peers (M = 28.3, p < 0.001).

In conclusion, the data analysis for the second hypothesis in Aim 2 identified female gender as an at-risk subgroup, due to the significantly higher amount of daily hassles and the lower level of act and nonreact facets of dispositional mindfulness

compared to the male counterparts in the study sample. None of the other covariates such as age, race, marital status, curriculum type, or degree program significantly influenced the level of daily hassles and dispositional mindfulness. Accordingly, Hypothesis 2.2 was only partially supported, because female SRNAs reported higher daily hassles and lower dispositional mindfulness than male SRNAs.

Aim 3 Results

Aim 3: Determine whether dispositional mindfulness moderates the relationship between daily hassles and three negative mental health outcomes: (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and curricular information.

Hypothesis 3.1: Dispositional mindfulness will moderate the relationship between daily hassles and perceived stress, depression, and anxiety such that daily hassles will be more strongly related to perceived stress, depression, and anxiety when dispositional mindfulness is low than when dispositional mindfulness is high.

The third aim of this study was to determine whether dispositional mindfulness buffered the impact of daily hassles on perceived stress, depression, and anxiety among the study sample, controlling for the effects of demographic and curricular characteristic covariates.

Three hierarchical multiple linear regression analyses and 12 generalized linear model analyses were conducted to test the Aim 3 hypothesis. For each model, daily hassles served as the predictor and three dispositional mindfulness facets served as the moderator, together with their interaction with daily hassles. The Holm-Bonferroni's

sequential alpha correction at α = .05 was only applied when testing for the statistical significance of the interaction terms, and was not applied to the main effect variables.

Perceived Stress

The results of hierarchical regression model analyses in the complete case analysis and multiple regressions model pooled estimates in multiply imputed data are presented in Table 4.15.

Complete case analysis. Gender (male, $p < .001$), race (Asian, $p = .002$), and training level (3^{rd}- and 4^{th}-year, $p = .004$) were chosen as covariates in the main model. All three regression models, each with a different interaction term (daily hassles × mindfulness-nonreact, daily hassles × mindfulness-nonjudge, or daily hassles × mindfulness-act) explained a significant and substantial amount of the variance in perceived stress (58%) in a similar manner. For instance, in the model with (daily hassles × mindfulness-act), adding daily hassles in Step 2 significantly increased explained variance in perceived stress ($R^2 = .52$, $\Delta F(1, 773) = 718.26$, $p < 0.001$; Model $R^2 = 0.51$, $F(12, 773) = 68.46$, $p < 0.001$). Furthermore, in Step 3, three FFMQ facets jointly increased a small amount of the variance explained in perceived stress ($R^2 = .59$, ΔF (3, 712) = 24.516, $p < 0.001$; Model $R^2 = .58$, $F(15, 712) = 68.91$, $p < 0.001$). Finally, adding the interaction term (daily hassles × mindfulness-act) slightly but significantly increased the explained variance in perceived stress ($R^2 = .58$, $\Delta F(17, 709) = 61.15$, $p < 0.001$; Model $R^2 = .58$, $F(17, 61.15) = 61.15$, $p < 0.001$). The regression models with (daily hassles × mindfulness-nonjudge) and (daily hassles × mindfulness-nonreact) interaction terms yielded a similar result.

There were significant main effects of daily hassles and dispositional mindfulness. After controlling for the effects of gender, race, training level, and medication practice, SRNAs who had higher levels of daily hassles reported significantly higher perceived stress ($\beta = .16 \pm .01$; $z = 18.62$; $p < .001$). Also, SRNAs with higher level of dispositional mindfulness had significantly lower scores of perceived stress in two mindfulness facets compared to those who had lower levels of dispositional mindfulness. These facets included mindfulness-act ($\beta = -.18 \pm .03$; $z = -6.91$; $p < .001$) and mindfulness-nonreact ($\beta = -.22 \pm .03$; $z = -6.91$; $p < .001$).

Moderation analysis. There was no significant interaction between daily hassles and mindfulness facets in predicting perceived stress (using $p < .05$ as a cutoff).

Multiply imputed data. The results are also presented in Table 4.15. As in the complete case analysis, gender, race, and training level were chosen as covariates in the main model in the multiply imputed model analysis. Similar to the complete case analysis, SRNAs with higher mindfulness-nonreact scores ($\beta = -.41 \pm .08$; $t = -5.08$; $p < .001$) and mindfulness-act ($\beta = -.36 \pm 0123$ $t = -2.84$; $p = .005$) had also significantly lower perceived stress in the multiply imputed data analysis.

Table 4.15. Multiple Linear Regression Analysis of Perceived Stress for Complete Case Analysis and Multiple Imputation

		Complete Case Analysis				Multiply Imputed Data (*M*=50)			
	Variable	ß	SE	*t*	*p*	ß	SE	*t*	*p*
Step 1	Training Level								
	Gender								
	Race								
Step 2	Daily Hassles	.16	.01	18.62	.000	.06	.04	1.44	.151
	Nonreact	–.22	.03	–6.76	.000	–.41	.08	–5.08	.000
Step 3	Nonjudge	–.04	.03	–1.44	.151	–.04	.11	–.39	.695
	Act	–.18	.03	–5.97	.000	–.36	.13	–2.84	.005
Step 4	DH×Nonreact	.003	.001	2.32	.021	.002	.0008	2.16	.031
	DH×Nonjudge	.001	.0008	1.54	.124	.001	.0001	1.27	.204
	DH×Act	.002	.0009	2.13	.033	.002	.001	1.72	.088
	Meditation	.02	.43	.05	.962	.08	.464	.18	.858

Note. *P*-values in bold were significant after Holms-Bonferroni Familywise Error Correctionα (=.05)

Depression

The result of the generalized linear model analyses of depression is presented in Table 4.16.

Complete case analysis. Marital status (single, never married, $p = .017$) and training level (3^{rd}- and 4^{th}-year, $p = .005$) were chosen as the covariates in the analyses of depression. The addition of main effect variables and the interaction term in the second through fourth models increasingly improved the model fitness indices. For example, the Akaike information criterion (AIC) score shifted toward zero from 5.67 to 5.63, and the Bayesian information criterion (BIC) score from –4447.21 to –4424.37 in the fourth model with the interaction term (daily hassles × mindfulness-act). These changes suggested that a better model fit resulted from the addition of the interaction term.

After controlling for the effects of marital status, training level, and medication practice, SRNAs with the higher levels of dispositional mindfulness had significantly lower scores of depression across three mindfulness facets compared to those who had

the lower levels of dispositional mindfulness (mindfulness-act [β = .03 ± .00; z = –5.02; p < .001], mindfulness-nonreact [β = –.02 ± .01; z = –2.82; p = .005], and mindfulness-nonjudge [β = –.02 ± .01; z = –4.00; p < .001]). Also, similar to the analysis of perceived stress, higher scores of daily hassles was significantly associated with higher levels of depression (β = .02 ± .00; z = 12.18; p < .001) in the SRNA sample.

Moderation analysis. One interaction term was statistically significant. The product of daily hassles and mindfulness-nonjudge was significant, indicating the presence of a significant moderation effect of dispositional mindfulness on the association between daily hassles and depression (β = -.19 ± .03; t = -5.54; p < .001). Although the interactions were significant, daily hassles significantly predicted depression at low (conditional effect = .18, SE = .015, t = 12.45, p < .001) average (conditional effect = .15, SE = .013, t = 11.99, p < .001) and high levels (conditional effect = .12, SE = .015, t =8.38, p < .001) of dispositional mindfulness-nonjudge. Figure 4.1 plots the simple slopes for the interaction.

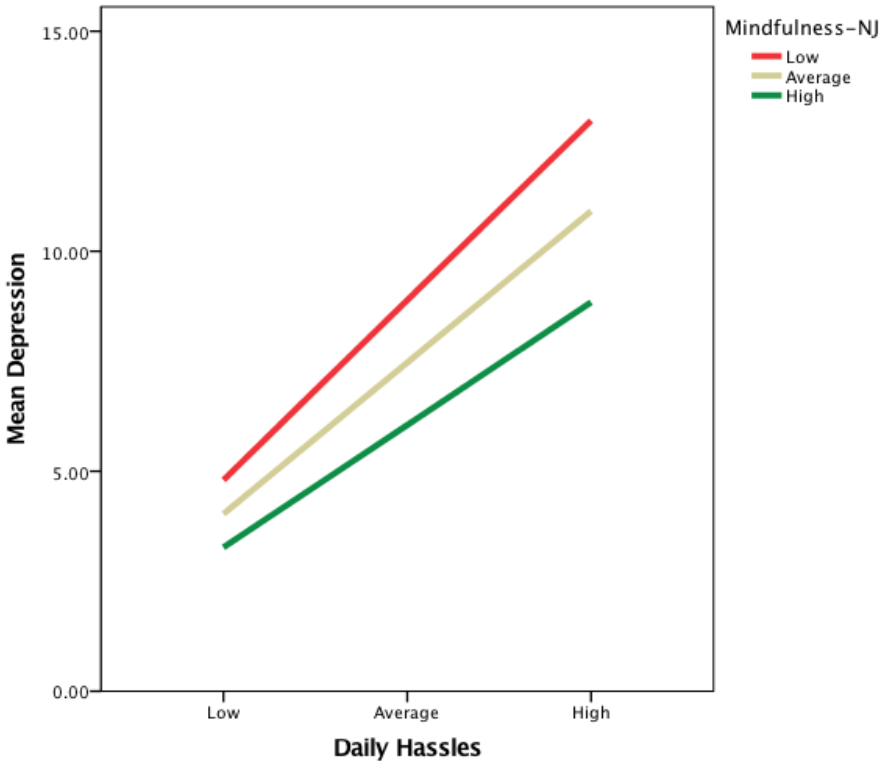
Multiply imputed data. The significant covariates were the same as the complete case analysis (marital status and training level) in the main linear model. The only significant main effect observed in depression was mindfulness-act. SRNAs with higher mindfulness-act levels had significantly lower scores of depression (β = –.09 ± .03; z = –3.19; p = .002).

Table 4.16. Generalized Linear Model Analysis of Depression for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis				Multiply Imputed Data (*M*=50)			
Variable	ß	SE	*z*	*p*	ß	SE	*z*	*p*
Training Level								
Marital Status								
Daily Hassles	.03	.00	11.12	.000	.01	.01	1.55	.121
Nonreact	–.02	.01	–3.40	.001	–.01	.02	–.83	.405
Nonjudge	–.03	.01	–3.46	.001	–.01	.02	–.08	.937
Act	–.03	.01	–3.84	.000	–.09	.03	–3.19	.002
DH-Nonreact	.0004	.0003	1.93	.038	–.00008	.0002	–.46	.643
DH-Nonjudge	.001	.0002	4.62	**.000**	.0002	.0002	.85	.398
DH-Act	.001	.0002	5.55	**.000**	.0005	.0002	2.35	.020
Meditation	.11	.12	1.06	.291	–.08	.09	–.87	.385

Note. *P*-values in bold were significant after Holms-Bonferroni Familywise Error Correctionα (=.05)

Figure 4.1. Simple Slopes for the 2-way Interaction Between Daily Hassles and Mindfulness-Nonjudging Predicting Depression



Anxiety

The results of the general linear model analyses of anxiety in the complete case analysis and multiply imputed data are presented in Table 4.17.

Complete case analysis. The preliminary step found gender as the only significant covariate of anxiety (p =.003). Similar to the analyses of depression, adding main effect variables and the interaction term in the second through fourth models progressively improved the model fitness indices. For instance, the AIC score moved toward zero from 65.93 to 5.91 and the BIC score from –4494.64 to –4477.28 in the fourth model after adding the interaction term (daily hassles × mindfulness-nonjudge).

Similar to depression, there were significant main effects of dispositional mindfulness on anxiety. SRNAs with the higher levels of mindfulness-nonreact (β = –.01 ± .002; z = –3.63; p < .001), mindfulness-nonjudge (β = –.03 ± .005; z = –5.44; p < .001), and mindfulness-act (β = –.02 ± .006; z = –3.91; p < .001) had significantly lower scores of anxiety, controlling for the influence of gender and meditation practice. In addition, higher daily hassles scores predicted significantly higher anxiety (β = .02 ± .0002; z = 10.94; p <.001).

Moderation analysis. There was no significant interaction between daily hassles and mindfulness facets in predicting anxiety (using p < .05 as a cutoff).

Multiply imputed data. The covariates for the analysis of anxiety using the multiply imputed data were the same as the complete case analysis (gender and marital status). Only one dispositional mindfulness facet, mindfulness-act had a significant negative main effect on the variability of anxiety scores (β = –.08 ± .03; z = –2.86; p = .005).

Table 4.17. Generalized Linear Model Analysis of Anxiety for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis				Multiple Imputation (*M*=50)			
Variable	ß	SE	*t*	*p*	ß	SE	*t*	*p*
Gender								
Marital Status								
Daily Hassles	.02	.00	11.07	.000	−.00	.01	−.47	.638
Nonreact	−.02	.00	−3.59	.000	−.03	.02	−1.78	.076
Nonjudge	−.03	.01	−5.27	.000	−.03	.02	−1.43	.154
Act	−.02	.01	−3.03	.030	−.08	.03	−2.86	.005
DH-Nonreact	.00001	.00008	.15	.880	.00005	.0002	.28	.781
DH-Nonjudge	.0008	.0002	5.41	**.000**	.0005	.0002	2.49	**.013**
DH-Act	.001	.0002	6.40	**.000**	.0007	.0002	3.28	**.001**
Meditation	−.04	.03	−1.40	.161	.10	.10	1.21	.225

Note. *P*-values in bold were significant after Holms-Bonferroni Familywise Error Correctionα (=.05)

Summary

The goal of Aim 3 was to test an *a priori* hypothesis that dispositional mindfulness buffered the impact of daily hassles on perceived stress, depression, and anxiety, controlling for the effects of demographic and curricular characteristics covariates. Two types of linear models–a hierarchical multiple linear model and a generalized linear model with the gamma distribution−were used to test the Aim 3 hypothesis using the complete case analysis.

The results of main effect of independent and moderator variables from the two types of datasets were fairly similar in all three mental health outcomes. For perceived stress, both data types shared a common finding, yet not completely congruent results. For example, the significant main effect of daily hassles was only observed in the complete case analysis. However, both data types indicated that the same dispositional mindfulness facets—mindfulness-act and mindfulness-nonreact—were significantly related to lower levels of perceived stress in the study sample. Likewise, for depression

and anxiety, not all dispositional mindfulness facets or daily hassles were significant in both the complete case analysis and the multiply imputed dataset. Specifically, mindfulness-nonjudge and mindfulness-nonreact and daily hassles were only significantly associated with the variability in the depression scores only in the complete case analysis.

The analyses of moderation by dispositional mindfulness facets revealed one significant interaction between daily hassles and dispositional mindfulness facet among nine interaction terms tested. Mindfulness-nonjudging significantly attenuated the impact of daily hassles on the levels of depression. There was no observed moderation effect of dispositional mindfulness on the prediction of perceived stress and anxiety levels. In conclusion, Aim 3 hypothesis was supported for the moderation of dispositional mindfulness-nonjudging on the relationship between daily hassles and depression, and was not supported for eight other interaction terms tested.

Chapter 5: Discussion, Summary, and Implications

The present study investigated the differences of daily hassles, three mental health outcomes: (1) perceived stress; (2) depression; and (3) anxiety, and dispositional mindfulness in SRNAs. The role of dispositional mindfulness was further examined in relationship to daily hassles, demographic and curricular characteristics and three mental health outcomes. The results are discussed in relation to supportive or contrary evidence in the literature in three sections, organized by the study-specific aims.

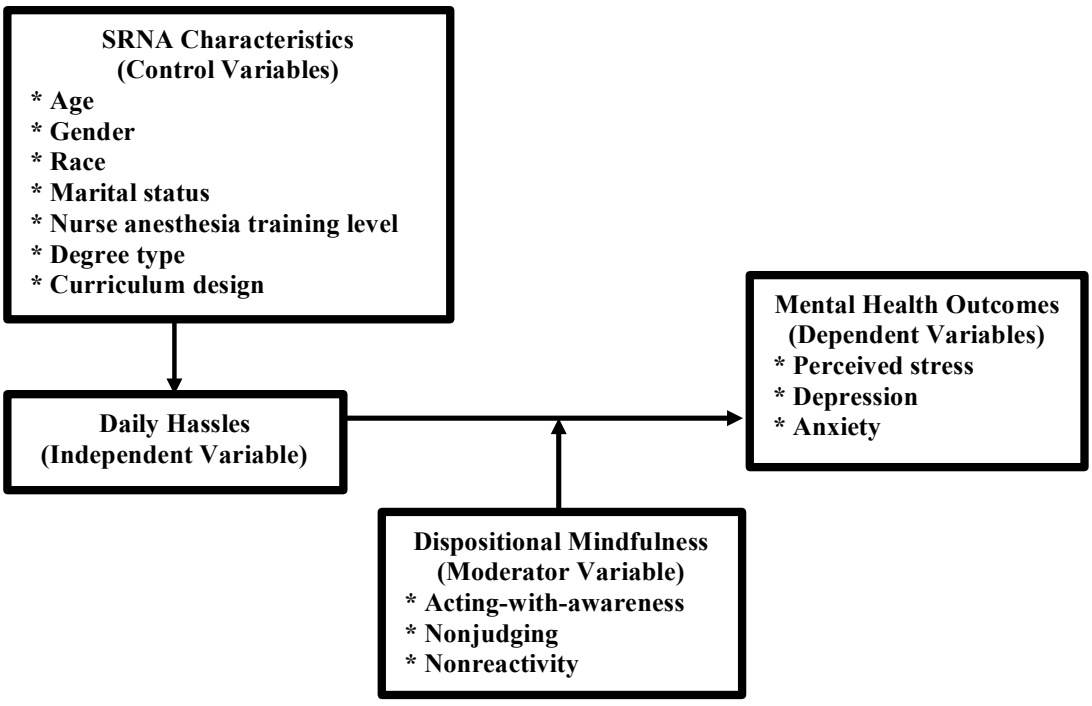
First, the present study of SRNAs has contributed five important findings to the nurse anesthesia student wellness education literature. (1) dispositional mindfulness was innately present, even among the SRNAs who were not engaging in mindfulness or other contemplative practice; (2) there was a gender difference in the level of dispositional mindfulness (acting-with-awareness), with male SRNAs demonstrating significantly higher levels than their female peers; (3) female SRNAs experienced significantly higher daily hassles, perceived stress and anxiety than their male counterparts; (4) senior SRNAs (3^{rd}- and 4^{th}-year SRNAs) reported significantly more perceived stress and daily hassles than freshman SRNAs; and (5) dispositional mindfulness (nonjudging of experience) significantly buffered the negative impact of daily hassles on depression among SRNAs.

The Transactional Model of Stress and Coping, also known as TMS (Figure 5.1) was the conceptual model guiding the present study. It provided the rationale for the hypothesized relationship between the independent variable (daily hassles), the moderator variable (dispositional mindfulness), the control variables or covariates (demographic and curricular information), and the dependent variables (mental health outcomes of daily hassles). The model also provided a theoretical explanation for how the interplay among

the covariates (person- and school-related factors) and the independent variable (stressors) might be influenced by the moderator variable (personal resource for adaptive coping). Accordingly, the present study examined between-subject differences as the independent variables and the moderator variable as the dependent variables.

The present study also contributed to validity and reliability evidence of the four scales: PSS-10, DASS-21, ICSRLE, and FFMQ, which were used among the national sample of SRNAs for the first time, insofar as could be determined. Thus, the present study provided the first robust estimates of perceived stress, depression, anxiety, and dispositional mindfulness among SRNAs.

Figure 5.1. Study Conceptual Model (Adapted for SRNAs from Lazarus & Folkman, 1984)



Sample Characteristics

The sample characteristics in the present study were similar to the SRNA sample reported in the most recent national online SRNA stress study conducted by Chipas and colleagues (2012). The percentage of female participants was identical, at 66.6%, in both studies. The percentage of male SRNAs in the present study was slightly smaller than that used in Chipas and colleagues' study, which was due to additional answer categories (Mixed and Prefer Not to Answer) in the present study. Addition of the Prefer Not to Answer category in the present study reflected the ethical concern for participant autonomy regarding whether to choose a response to survey questions from predetermined response options.

Also, the racial breakdown of the SRNA sample in the present study was similar to that of Chipas and colleagues' study, except for lower participation among Black or African American students (2.3% compared to Chipas and colleagues' study (4.3%), and lower proportion of White students (84.0% vs 87.3%). Since the overall percentages of other non-White participants were very similar between the two studies, some of Black and White SRNAs might have chosen Mixed or Prefer Not to Answer categories in the present study.

Also, marital status of the sample in the present study differed from that in the study by Chipas and colleagues' study. Less than a half of the study sample was married in the present study (48.9%), which was a noticeable difference from Chipas and colleagues' sample. (65.5%). Likewise, there were fewer participants from front-loaded didactic curriculum types in the present study (60.5%) compared to Chipas and colleagues (71.0%). Over a quarter of the study participants were enrolled in pre-

licensure practice doctorate programs, reflecting the increasing numbers of nurse anesthesia educational programs transitioning to doctoral degree education before the December 31, 2021 deadline. Finally, the study sample of the present study had a comparable make up of training levels to Chipas and colleagues' study, except for slightly more 2nd-year students (39.1% vs. 36.5%) and fewer senior SRNAs (3rd- and 4th-year students; 17.8% vs. 19.7%). Smaller study participation from senior SRNAs in the present study might be due to the timing of data collection, which paralleled the Class of Fall 2015's graduation season. In summary, the SRNA sample demographic and curriculum characteristics in the present study were fundamentally compatible with the most recent similar study conducted by Chipas and colleagues (2012).

Relationships Between Daily Hassles, Mental Health Outcomes, and Dispositional Mindfulness

The present study, which used four validated psychological scales (ICSRLE, PSS-10, DASS-21, and FFMQ) to measure daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness among SRNAs, is unique insofar as the author can determine. The results from Aim 1 analyses were consistent with the past findings demonstrating that daily hassles are negatively associated with mental health in the student population (Arbona & Jimenez, 2014; D'Angelo & Wierzbicki, 2003; Fogle & Pettijohn, 2013; Kohn et al., 1990; Lay & Safdar, 2003; Liffman, Thorsteinsson, Brown, & Hine, 2012; Marks et al., 2010; Osman et al., 1994). In the following section, the psychometrics of the four scales in SRNAs are presented.

Scale Psychometric Evidence

Perceived stress. Perceived stress was measured using the PSS-10. The PSS-10 is one of the most widely used tools for measuring subjective appraisal of potentially stressful situations in people' lives. The PSS-10 has been described as "a short and easy to use scale" with established psychometric validity evidence for use mainly in the general adult population (Cohen & Janicki-Deverts, 2006; Lee, 2014; Taylor, 2015). To this author's knowledge, the present study was the first to measure perceived stress in a large sample of SRNAs using the PSS-10. The Cronbach's alpha internal reliability of the PSS-10 in the present study was .87, which was slightly lower than the alpha (.91) reported in the most recent national normative data (Cohen & Janicki-Deverts, 2012).

The mean total score of the SRNA sample ($M = 18.1 \pm 6.3$) was slightly higher than the corresponding age group (25-34 years) in the national normative data sample ($M = 17.5 \pm 7.3$). However, the difference between the two means was not statistically significant at alpha = .05; t (762.7) = -1.55; $p = 0.12$. The present study also found significant gender bias in the PSS-10, which is consistent with the literature (Cohen & Janicki-Deverts, 2012; Taylor, 2015). Female SRNAs ($M = 18.9 \pm 6.0$) reported a significantly higher mean score of perceived stress than their male peers ($M = 16.4 \pm 6.6$). This finding was contrary to the result in Chipas and colleagues' (2012) study, which did not find a gender difference in the level of self-reported stress. However, Chipas and colleagues used a single item, 1 to 10 Likert-type scale to measure stress, rather than a validated multi-item scale such as the PSS-10. Similar to Cohen & Janicki-Deverts' research (2012), the mean scores of the PSS-10 in the SRNA sample did not differ significantly based on race. It is interesting that, contrary to the finding in Cohen &

Janicki-Deverts (2012), increasing age was not significantly associated with decreasing level of mean PSS-10 score in the present study sample. However, the drop in the level of perceived stress in Cohen & Janicki-Deverts's study was not appreciable until the 55 to 64 age group, which was older than the sample in the present study. Also, age has not been associated with significantly lower levels of stress in the previous SRNA stress study (Chipas et al., 2012). In summary, the PSS-10 results in the present study were aligned with the general stress literature, and the scale seems to be appropriate for use in SRNA samples to measure perceived stress.

Daily hassles. Daily hassles were measured using the ICSRLE. The alpha reliability of the ICSRLE in the present study was high at .95, which was slightly higher than the alpha levels reported in the earlier scale validation studies, including .89 in Kohn and colleagues. (1990) and .92 in Osman and colleagues. (1994). Also, the mean ICSRLE total score ($M = 92.6 \pm 23.6$) among the SRNAs was compatible with the mean score recently reported by the undergraduate college student sample ($n = 137$; mean age 24.48 ± 9.46; $M = 91.36 \pm 17.58$) in Liffman and colleagues (2012). Also, the top five endorsed items in the ICSRLE in the present study were: "Dissatisfaction with school", "Struggling to meet the academic standards of others", "Being taken for granted", "Dissatisfaction with your reading ability", and "Dissatisfaction with your mathematical ability". These hassle items resonate with the reported challenges from both didactic and clinical learning that SRNAs are facing (Elisha & Rutledge, 2011; Phillips, 2010; Wildgust, 1986). Collectively, these psychometric data indicate that ICSRLE developed to measure daily hassles specifically among an undergraduate college student population may also be appropriate for use in graduate professional students, such as SRNAs.

Depression and anxiety. Depression and anxiety were measured using the 7-item depression and the 7-item anxiety scales of the DASS-21. The Cronbach's alpha internal reliability of the DASS-21 depression scale in the present study was .89, which was slightly lower than the alpha (.91) reported in the most recent normative data among the American adults (*n* = 503; Sinclair et al, 2012), but is compatible with the alpha (.88) in the initial normative data for the DASS-21 among the non-clinical British adults (*n* = 1,794; Henry & Crawford, 2004). Likewise, the internal reliability of the anxiety scale in the present study (alpha = .84) was compatible with or slightly higher than the normative data generated by Sinclair and colleagues (alpha = .80) as well as Henry and Crawford (alpha = .82).

The mean total scores in the present study, after converting the raw score to the full-scale DASS scores and managing the significant outliers by winsorizing, were for depression (*M* = 7.9 ± 7.5) and for anxiety (*M* = 8.4 ± 7.6). According to the DASS Manual (Lovibond & Lovibond, 1995), the mean depression score in the present study was within the normal range (0–9) of the severity ratings, while the mean anxiety scores were in the mild range (8–9). Approximately 11% of the SRNAs experienced a mild level of depression, about 14% had depression score at a moderate level, and 8.4% had depression that was at a severe level. The 2012 national prevalence of major depression based on the DSM-IV criteria (7.6%) was only slightly lower than that of SRNAs who reported severe depression. Compared to the normative sample scores in the age 30-39 group, the SRNA sample reported slightly higher depression levels (normative sample score 5.44 ± 7.13) and anxiety levels more than twice as high (normative sample score 3.72 ± 5.02). Approximately 60% of the SRNA sample had anxiety levels below the

mean, and 51% of the sample had a normal level of anxiety. A mild level of anxiety was reported by 9% of the SRNA sample, and about one-fifth of the sample had moderate anxiety. The remaining group of SRNAs had severe (7.6%) or extremely severe anxiety (11.4%). Nearly a fifth of the SRNAs in the present study reported severe or extremely severe anxiety, and this is more concerning than the state of depressive symptoms among the SRNAs as a substantial proportion (19%) of the SRNAs reported severe or extremely severe anxiety.

Similarly, the depression and anxiety scores in the SRNA sample were higher than the levels among Australian medical students (n = 65, depression M = 6.2 ± 6.3, anxiety M = 7.1 ± 6.7) reported by Warnecke and colleagues (2011). However, depression and anxiety scores in the present study sample were compatible with those reported in the Turkish senior medical student sample (n =193, depression M = 8.3 ± 8.1, anxiety M = 9.1 ± 6.6) studied by Baykan and colleagues (2012). In summary, depression and anxiety levels reported by the SRNA sample using the DASS-21 in the present study were higher than the normative data among the community adults in the similar age groups, and were within the expected level for students in a similar healthcare discipline. Along with its parsimonious scale structure with only seven items each, DASS-21 seems appropriate for use to measure depression and anxiety in SRNAs.

Dispositional mindfulness. Dispositional mindfulness was measured using the FFMQ. To this author's knowledge, the present study was the first to measure dispositional mindfulness in a SRNA sample. The FFMQ measures five elements or facets of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity of inner experience. Some psychometric studies on the

FFMQ have suggested using individual facet scores, rather than a total score for the entire scale to assess mindfulness, due to the lack of an overarching mindfulness factor that encompasses all five facets (Van Dam, Hobkirk, Danoff-Burg, & Earleywine, 2012). In the present study, only acting with awareness, non-judging of inner experience, and non-reactivity of inner experience were assessed in the SRNA sample.

The Cronbach's alpha internal reliability of each FFMQ facet in the present study was consistent with the literature: FFMQ-nonjudge alpha = .93, FFMQ-nonreact alpha = .83, and FFMQ-act alpha = .91. These alpha values were slightly higher that the reported alpha values in the published literature using undergraduate student samples. For example, the initial scale development study by Baer and colleagues (2006) using an undergraduate student sample (n = 268) who participated for a psychology course credit had the alpha values of FFMQ-nonjudge .87, FFMQ-nonreact .75, and FFMQ-act .87. However, a larger similar undergraduate sample (n = 435) in the study by Van Dam and colleagues (2012) reported alpha values closer to the present study: FFMQ-nonjudge .91, FFMQ-nonreact .81, and FFMQ-act .89. Christopher and his colleagues (2012) used a mixed sample that was mostly students and psychology professionals (n = 349), and the alpha levels in their study were also similar to the present study: FFMQ-nonjudge .93, FFMQ-nonreact .86, and FFMQ-act .90.

The correlations among the three facets were positive and in the expected direction. The correlation between FFMQ-nonjudge and FFMQ-act (r_s = .54, p < .001) was consistent with the previously published literature (e.g., Baer et al., 2006, 2008, 2011; Christopher et al., 2012; Neuser, 2010; Van Dam et al., 2012). However, the correlation between FFMQ-nonreact and two other facets was unexpectedly small (r_2

=.05 and .08) and not statistically significant (p = .05). Unlike FFMQ-nonjudge and FFMQ-act, FFMQ-nonreact is positively worded, and therefore not reverse coded for scoring. Van Dam et al. (2012) raised concern for whether unfamiliar questionnaire items for survey respondents, such as mindfulness for non-meditating respondents, may lead to differential endorsements of positively and negatively written items, resulting in their recommendation for using the FFMQ at a facet-level, rather than a total scale score. The SRNA sample in the present study was largely non-meditators (85.6%). Even among the respondents who endorsed the question of whether they were currently engaging in meditative practices (14.4%), half of them had been practicing some kinds of meditation for 12 months or less (51.5%), and only 25% of the meditators in the SRNA sample reported meditative practice(s) of 36 months or longer. Therefore, a low correlation between FFMQ-nonreact and two negatively worded FFMQ-nonjudge and FFMQ-act might reflect a type of differential item functioning as described in Van Dam et al. (2012), although differential item functioning on the FFMQ among non-meditators has generally been discussed on another facet (observing) that was not used in the present study (e.g., Jones, Mist, Casselberry, Ali, & Christopher, 2015). The correlations with depression and anxiety in the present study are discussed in a later section.

The mean scores of the FFMQ in the present study were also consistent with the literature: FFMQ-nonjudge 28.1 ± 7.6, FFMQ-nonreact 22.0 ± 4.9, and FFMQ-act 27.0 ± 6.7. The undergraduate psychology student sample in Baer et al. (2008) had very similar mean scores to the SRNA sample: FFMQ-nonjudge 27.8, FFMQ-nonreact 20.5, and FFMQ-act 25.3. A similar result of baseline FFMQ mean scores was reported among Spanish primary care physicians who participated in a one-year long mindfulness-based

intervention ($N = 87$) by Martin-Asuero and colleagues (2013): FFMQ-nonjudge 26.4, FFMQ-nonreact 20.6, and FFMQ-act 24.3.

In summary, the internal reliability alpha of three facets of the FFMQ and the correlations between FFMQ-nonjudge and FFMQ-act were consistent with the literature. The correlation between FFMQ-nonreact and other two facets was also in the expected direction, yet the size of the correlation was noticeably smaller than the correlations reported in the published literature, and was statistically non-significant. This unexpected finding might be due to a type of differential item functioning on the basis of positively versus negatively worded questionnaire items in the FFMQ among a largely non-meditating SRNA sample. Nevertheless, the three facets of the FFMQ used in the present study appeared to be an appropriate scale to measure dispositional mindfulness among SRNAs.

Correlations between daily hassles, mental health outcomes, and dispositional mindfulness

It was hypothesized that daily hassles, perceived stress, depression, and anxiety would be positively correlated, and perceived stress, depression, and anxiety would be negatively correlated. The present study utilized Spearman's rank order test to examine the relationships between these variables. The findings from the present study suggest that daily hassles and dispositional mindfulness were significant important correlates of perceived stress, depression, and anxiety. This is an important finding, because previously little was known about SRNAs' experience with daily hassles, as the majority of SRNA stress research studies have been devoted to uncovering major life event-type stressors (such as death of a family member, marriage, or birth of a child) experienced by

SRNAs (Chipas et al., 2012; Perez & Carroll-Perez, 1999). The mean age of the SRNA population is relatively young -- around 30. Therefore, these understandably stressful major events may occur so infrequently as not be as useful as a predictor of adjustment in SRNAs than more constant and common everyday stressors experienced by a young adult population. In fact, research has shown that daily hassles, the on-going chronic strains of everyday living, are seen as a better predictor of adverse health outcomes, particularly mental health, than infrequent stressful life events (DeLongis et al., 1982). To this author's knowledge, this is the first study that has explored the relationship between daily hassles and three negative mental health outcomes (i.e., perceived stress, depression, and anxiety), and found significant positive correlation among these four variables as hypothesized and expected direction.

Daily hassles and perceived stress. The positive correlation between daily hassles and perceived stress was the strongest among the three mental health outcomes. This was also an expected result, because the developers of the ICSRLE avoided items that tapped into the symptoms of stress or stress appraisal; they kept only the items which correlated positively and significantly with Cohen and colleagues' PSS (1983) to maintain an indirect relationship to the stress appraisal process as described in the TMS, this study's conceptual model (Kohn et al. 1990). Daily hassles are considered a more proximal measure of stress than major life events, involving "here-and-now" transactions between the individuals and their environment that have personal meaning and are appraised as threatening (Hutchinson & Williams, 2007). A strong positive correlation between daily hassles and perceived stress in the present study supports the existing empirical knowledge about the predictive power of daily hassles (which are on-going

strains of daily living), of their global appraisal of their stress, health and adjustment (Burks & Martin, 1985; DeLongis et al., 1981, 1988; Rowlinson & Feiner, 1988).

The direction of the correlation between daily hassles and perceived stress in the present study was consistent with previous findings; however, the magnitude of the correlation in the SRNA sample (r_s = .72 in complete case analysis and r_s = .70 in multiply imputed dataset) was larger than that found in Canadian undergraduate college students by Kohn and colleagues. (1990; r_s = .59) and their American counterparts in Osman and colleagues (1994; r_s = .61). A higher correlation between daily hassles and perceived stress in the SRNA sample may suggest that in general SRNAs, who undergo vigorous nurse anesthesia training at a graduate level, may be more likely than undergraduates to perceive everyday minor yet upsetting occurrences as unpredictable, uncontrollable, and even overwhelming. This positive association between daily hassles and perceived stress may be even more prominent among those who have not acquired adequate stress coping skills to manage both everyday life- and school-related stressors.

There is still much to learn about stress perception or appraisal in SRNAs. The conceptual model of the present study, the TMS, posits that an appraisal of a potentially stressful situation is based on the interplay between the person's unique characteristics, including the readiness to successfully manage the situation and the nature of the situation itself (Lazarus & Folkman, 1984). Stress appraisal and personal resources to handle the situation are the key drivers of stress coping, yet they have not been fully explored in SRNAs.

Daily hassles, depression, and anxiety. Significantly positive correlations between daily hassles, depression, and anxiety among a student population were also

observed in the present study and were consistent with the previous findings in the literature (D'Angelo & Wierzbicki, 2003; Lu, 1994; Saravanan & Wilks, 2014). The correlation between daily hassles and depression was slightly smaller than that of daily hassles and perceived stress but still significant according to Cohen (1988; r_s = .67 in complete case analysis and r_s = .65 in multiply imputed dataset). As far as this author is aware of, the present study is notable for reporting the relationship between daily hassles, depression, and anxiety as well as their frequency and the severity information among SRNAs for the first time. There is the dearth of knowledge regarding the prevalence and the nature of anxiety related to stressors in SRNAs. The only study that has investigated depression among a large sample of SRNAs was conducted by Chipas and colleagues (2012). The study authors asked their participants whether they have felt depressed sometime in school, and have also had suicidal ideation, using a binary Yes-No response format (Chipas et al., 2012). Nearly a half of their study sample endorsed the statement about being depressed while in school; however, due to the nature of the question they asked, Chipas and colleagues were unable to assess the severity of depression in their SRNA sample, nor did they control for retrospective recall and instrument biases, subjecting their estimates of depression prevalence among SRNAs to potential measurement errors.

Depression is fairly common in healthcare professional students (Compton et al., 2008; Dyrbye et al., 2006; Goebert et al., 2009), and one study involving 336 of American medical students revealed up to 60% of their respondents having depressive symptoms (Chang et al., 2012). The major challenges that SRNAs face are significant transitions or many first-time experiences, such as new professional role as a nurse

anesthetist in training, a new way of managing school and life demands, new clinical and academic culture, and new types of patient cases and clinical skills. When SRNAs do not feel that they are adequately prepared to cope with these constant new challenges, they may be more likely to struggle and become susceptible to depression and anxiety. Therefore, identifying at-risk students for negative mental health outcomes of stress by obtaining the valid estimates of the prevalence, the severity, and the change in the signs and the symptoms of depression and anxiety in SRNAs is an important initial step in tackling these pervasive mental health problems in healthcare professional education, including nurse anesthesia.

Approximately two-thirds of the SRNA sample in the present study (66%) reported a normal level of depressive symptoms based on the normative sample data in the DASS Manual (Lovibond & Lovibond, 1995). This is consistent with the overall incidence of depression among approximately one-third of American college students. The SRNA sample in this study may have depressive symptoms, but the symptoms were not as severe, and the majority of SRNAs only had a small amount of depressive symptoms, as expected in this population. However, the reports of substance abuse among CRNAs and SRNAs (Bell et al., 1999; Bozimowski et al., 2014; Wright et al., 2012) makes it worthwhile conducting further research on how best to identify at-risk SRNAs (severely depressed, personal or family history of substance abuse) for substance abuse earlier in their anesthesia training and to initiate necessary interventions to achieve positive outcomes that are beneficial to both students and nurse anesthesia practice.

For anxiety, the mean score in the present study was in the mild anxiety level and nearly twice as high as the normative data (8.4 vs. 3.7) in a similar age group (Lovibond

& Lovibond, 1995). Nearly a fifth of the SRNAs in the present study reported severe or extremely severe anxiety, and this is very concerning. The impact of severe anxiety on SRNA wellness and learning may be significant. Anxiety is characterized by a state of arousal and high levels of negative emotions associated with a sense of uncontrollability, hypervigilance, and the inability to focus on normal daily activities (Rosen & Schulkin, 1998). Situationally-induced heightened anxious state is known to enhance the brain circuitry between major emotional and cognitive control processing areas, the amygdala, dorsal medial prefrontal cortex, and dorsal anterior cingulate cortex, driving a bias toward aversive information for harm avoidance at a cost of working memory, leading to potential cognitive errors (Robinson, Vytal, Cornwell, & Grillon, 2013). Moreover, a heightened arousal state is linked with poor sleep habits, which are strongly indicated in allostatic load (McEwen, 2006). Therefore, severe levels of anxiety in the present SRNA sample should warrant urgent attention by nurse anesthesia educators to identify those who are the most affected by inadequate stress coping leading to heightened levels of anxiety, and to provide targeted interventions to enhance adaptive emotional stress coping.

In addition to daily hassles and three mental health outcomes, the present study was the first to assess dispositional mindfulness in a large group of SRNAs, finding a significant negative correlation with daily hassles and all three mental health outcomes, as hypothesized. This finding illuminates dispositional mindfulness as a novel and important factor that can be strengthened to reduce negative mental health and to promote positive psychological well-being in SRNAs. Cultivating mindfulness may benefit the portion of SRNAs who have suffered from significant levels of depression and anxiety by

reducing and preventing the recurrence of the symptoms of these negative affective states; it is also likely to benefit those who do not currently have depression or anxiety symptoms by further strengthening their emotional well-being to prepare them for future stressful circumstances.

Group Differences in Daily Hassles, Mental Health Outcomes, and Dispositional Mindfulness

Group differences in daily hassles, mental health outcomes, and dispositional mindfulness were examined in the second aim of the study. It was hypothesized that female, minority, divorced, and 2nd-year SRNAs and those who were enrolled in nurse anesthesia educational programs with an integrated curriculum would report higher perceived stress, depression, and anxiety. It was also hypothesized that the levels of daily hassles and dispositional mindfulness would be different based, on the demographic and curricular information.

Difference in daily hassles

Consistent with the literature and as hypothesized, the present study found female SRNAs experienced significantly more daily hassles as a part of their lives than male SRNAs. Also, 2nd-year SRNAs reported more daily hassles than 1st-year students. Mean daily hassle score did not differ significantly by other demographic and nurse anesthesia curricular information. Intuitively, it makes sense for 2nd-year SRNAs to have more on their plate than 1st-year students, as the majority of SRNAs are enrolled in the front-loaded didactic curriculum (60.5%) and start their clinical training during their second year.

Differences in the perception of daily hassles by gender have been described in the literature (Bhatia & Dey, 2011; Kohn et al., 1990; Osman et al., 1994), and may be related to the gender differences in stress appraisal. Women were more likely than men to view stressors as more severe or threatening than men. (Tamres, Janicki, & Helgeson, 2002 (Gly). Higher perceived stress among women may encourage them to engage in more coping strategies, particularly emotion-focused coping, and increase their sense of having more hassles in their daily life. Also, multiple women's roles, (e.g., wife, parent, and student) among the SRNAs' age groups in certain cultures may overload female SRNAs and be reflected in a higher daily hassles score than males in the present study. A study among Canadian women in a comparative age group (age 25 to 54) found a strong link between role overload unique to female gender and poorer mental health outcomes (Glynn, 2009). Further research is needed to explore female SRNAs' comprehensive experience of their many social obligations and their relationship with stress

Differences in mental health outcomes

This study also examined group differences in perceived stress, depression, and anxiety. Insofar as the author is aware, the present study is also the first to report the severity of anxiety and depressive symptoms in a large sample of SRNAs. The sole published research study on depression in SRNAs only reported the overall prevalence among the sample, and the study authors did not examine the severity of depression (Chipas et al., 2012). The present study identified a significant difference in the mean value of all but two of the hypothesized demographic and curricular variables. Consistent with the literature, female SRNAs reported significantly higher levels of perceived stress and anxiety than their male peers. This was not surprising, because, in the literature,

female gender is consistently associated with higher perceived stress in a college student population (Campbell et al., 1992; Kanner, et al., 1981, Kohn et al., 1990) general adult population (Bolger et al., 1989; Cohen et al., 1988; Cohen & Jankcki-Deverts, 2012), and hospital staff (Edward et al., 2016; Stecker & Stecker, 2014). Similar findings have been reported for anxiety among female college students (Bayram & Bilgel, 2008; Garcia-Williams et al., 2014).

Gender. Female SRNAs, particularly the younger group, may suffer from more severe effects of anxiety-provoking workplace/training stressors than their male counterparts, such as being a target of sexual harassment or verbal abuse perpetrated by hospital staff, including their clinical preceptors (Sakellaropoulos et al., 2011; Stecker & Stecker, 2014), yet they may possess inadequate coping skills to support their emotional well-being. Maladaptive stress coping styles, such as self-blame and rumination, are known to have a stronger correlation with depression and anxiety than more adaptive coping strategies, such as positive refocusing or positive reappraisal (Garnefski, Kraaij, & Spinhoven, 2001). Moreover, a recent systematic review and meta-analysis of factors related to aggression against nurses has found that while male nurses had higher odds of physical abuse, female nurses were highlighted as having greater odds of experiencing verbal abuse than males (Edward et al., 2015). Verbal abuse in nursing practice has been linked to high staff turnover or the intent to leave the clinical staff position (Sofiled & Salmond 2003). Leaving an abusive work environment may be the simplest and perhaps the best action to take for some nurses, but leaving the nurse anesthesia training may not be an agreeable option for the vast majority of SRNAs. Thus, being in a trainee status may impose particularly difficult emotional on female SRNAs.

Training level. Also, students in senior-levels training reported significantly higher stress than 1st-and 2nd-year SRNAs, which differed from the findings reported in Chipas and colleagues. (2012) and Kendrick (2000), who discovered that the perceived stress levels peaked during the 2nd-year of study or the 5th semester/term and remained relatively steady until graduation. However, the statistical significance of the differences in the levels of stress in Chipas et al. (2012) across all training levels was not provided and was assumed to be non-significant, given only one-tenth of a point difference from the next highest score. The literature on college student stress suggests that the levels of stress may steadily increase as students progress through their program of study (Bewick, Koutsopoulou, Miles, Slaa, & Barkham, 2010). Findings from SRNA stress research also corroborate the notion that upper standing students may experience more stress, as senior SRNAs may manage more complex anesthesia cases in patients with higher acuity and with less supervision by their clinical preceptors. Also, the literature has consistently reported that preparation for the national certification exam was significantly stressful for senior students (Perez & Caroll-Perez, 1999; Phillps, 2010; Wildgust, 1986).

Other demographic and nurse anesthesia training characteristics. None of other demographic or nurse anesthesia curricular information, such as minority race/ethnicity, was significantly associated with higher levels of stress, depression, or anxiety. This is contrary to the literature reporting the link between major depressive disorders and certain demographic characteristics, such that those most likely to experience depression were female, older, non-White, and unmarried (Kessler et al., 2005). Training level has also been reported as a predictor of depression and anxiety in medical students. Aktekin and colleagues (2001) have reported that the prevalence of

depression and anxiety among 2nd-year medical students was double that of 1st-year students. Although the present study did not find a significant association between a female gender and higher depression, it should not be regarded as unimportant for SRNA wellness. Anxiety-depression co-morbidity mediated by a style of response to anxiety, coupled with hopelessness and rumination, has been hypothesized (Starr & Davila, 2012).

Other potential protective factors against depression in a student population are social support and spirituality (Lamis & Lester, 2012; Wilson et al., 2014). Other than personal experience with meditation practice, these variables were not measured in the current study. Further research is needed to explore coping styles among SRNAs, to determine how individual coping styles, particularly emotion-focused coping, may illustrate the stress-related mental health vulnerability of SRNAs. Also, more research is needed to explore the role of social support and spirituality on psychological well-being, particularly depression, in SRNAs, due to the well-known association between poorly managed depression and suicide risk.

Race and ethnicity. For perceived stress, non-significant group difference by race/ethnicity was contrary to the finding by Chipas and colleagues (2012) of significantly higher perceived stress among Black and Hispanic SRNAs. This discrepancy may be due in part to the differences in measurement between Chipas and colleagues (2012) and the present study. While Chipas and colleagues opted to use a single 1 to 10 Likert-type scale to measure global perception of stress, the present study used a widely implemented PSS-10, which asked the respondents to rate the degree to which their daily life situations are perceived as stressful in the past month in a 5-point scale (Cohen et al., 1983). Also, the subgroup representation by the minority SRNAs in

the present study (Black $n = 20$, Hispanic $n = 35$) was smaller than the study by Chipas and colleagues (Black $n = 59$, Hispanic $n = 45$); therefore, non-significant group difference by race/ethnicity in the present study might have been a function of lower statistical power of these minority samples in the present study to detect a subgroup differences in the levels of perceived stress.

Previous studies on the relationship between minority race/ethnicity and psychological distress (such as burnout, depression, and mental quality of life) among students in similar graduate-level healthcare programs have shown equivocal results. A large cross-sectional survey on this topic by Dyrbye and colleagues (2006) did not find a significantly different level of depression across various racial groups; however, minority medical students who have experienced racial discrimination, racial prejudice, feelings of isolation, and different cultural expectations were more likely to report psychological distress than those who have not had such negative experiences associated with their race.

Nurse anesthesia curriculum type. Finally, contrary to the study hypothesis, nurse anesthesia curriculum type (front-loaded didactic versus integrated) was not associated with higher perceived stress in the present study. This finding was contrary to Chipas and colleagues (2012) whose SRNA sample enrolled in nurse anesthesia educational programs with an integrated curriculum reported a higher mean perceived stress level than their peers in the front-loaded didactic curriculum (7.9 vs. 7.1) which was statistically significant ($p < .05$). In the present study, the mean score of PSS-10 in SRNAs enrolled in the integrated curriculum was slightly higher than those who were enrolled in the front-loaded didactic curriculum (18.0 vs. 18.3 respectively), but the difference between the two mean scores was not statistically significant ($p = .39$). This

unexpected finding may be due in part to on-going changes in the nurse anesthesia curriculum, which is transitioning from 24 to 36-month Master's to a 36-month practice doctorate level with the mandatory complete transition by the end of 2021. The greater length of the doctoral level nurse anesthesia educational program might have given SRNAs enrolled in an integrated curriculum more time to adjust.

Differences in Dispositional Mindfulness

Group differences in dispositional mindfulness were also examined in the second aim of the study. Contrary to the study hypothesis, the mean scores of three dispositional mindfulness facets did not differ by age, race, marital status, or curricular variables. However, this non-significant finding was not surprising. The literature suggests that the level of dispositional mindfulness as measured using validated self-report dispositional mindfulness scales does not differ significantly by demographic characteristics (Brown & Ryan, 2003; Baer et al., 2006). Age and gender are often examined as a potential confounder in the levels of dispositional mindfulness in the literature and have been ruled out as such (McCracken, Gauntlett-Gilbert, & Vowles, 2007; Shapiro, Brown, & Biegel, 2007). There was a notable exception involving age and mindfulness; Baer et al. (2008) have found that age and education were small but significantly related to the acting-with-awareness facet among the multi-nation study sample comprised of non-meditating student and community adult samples as well as meditating sample, which was largely drawn from mental health professionals.

However, the finding from the present study suggests a significant gender difference in one of three dispositional mindfulness facets: acting-with-awareness. Spearman's rank order test and Dunn's planned contract test results indicated that the

difference in the mean score for female (M = 26.4, SD = 6.7) and male (M = 28.3, SD = 6.4) was statistically different ($p < .001$). High scores on the acting-with-awareness in male SRNAs may indicate a greater tendency to be attentive to and aware of present-moment experience in daily life. Also, there was a significant gender difference in the mean score of the nonreactivity facet in an omnibus test, but this gender difference was not significant in the planned contrast test (p = .42).

The literature concerning the gender difference in the levels of dispositional mindfulness is scarce. Gender and age are often measured and analyzed as covariates of dependent variables in the mindfulness research literature. Several studies have reported that male participants had higher nonreactivity facet scores than females (Bränström, Duncan, Moskowitz, 2011; Gilbert & Waltz, 2010; Fogarty, Lu, Sollers, & Krivoschekov, 2013). One study reported a gender difference concerning the attention and awareness dimension of dispositional mindfulness. MacKillp & Anderson (2007) conducted a confirmatory factor analysis of the Mindfulness Attention Awareness Scale (MAAS) using a college student sample (N = 727) that was 33% male (n = 233). Their study did not find a gender effect on the mean MAAS score; however, the single-factor structure of the MAAS was only confirmed in the females, suggesting the equivocal validity of the MASS in male sample. Their finding indicated a potential differential validity of the MAAS by gender. Since the acting-with-awareness facet of the FFMQ was largely derived from the MAAS items (six out of eight items), MacKillp & Anderson's finding may have some practical implications in interpreting the results of the MAAS or the FFMQ. Also, the initial validation study of the Self-Compassion Scale, which includes 4-item mindfulness dimension, showed a significant gender difference in the

mindfulness subscale (Neff, 2003), with the males having significantly higher mindfulness subscale score than females (3.57 vs. 3.27, $p < .005$). The author attributed this gender difference to women having a stronger tendency to over-identify and to be less mindful of their negative emotions than men, which was consistent with the literature that suggested a female tendency to be more critical of themselves and to ruminate on their negative feelings than men (Nolen-Hoeksema, Grayson, & Larson, 1999).

The findings from these two studies reporting gender differences in dispositional mindfulness-acting-with-awareness may provide some explanation for the present study's finding of the gender difference in this mindfulness facet. It could also be possible that the SRNA sample in the present study was different from a general adult population in the community or college undergraduate students who were recruited in mindfulness research projects in unmeasured attributes. However, whether male SRNAs' higher dispositional mindfulness levels have contributed to the gender differences in the mental health outcomes (perceived stress and anxiety) remains speculative at best. Further research is needed to explore the gender difference in dispositional mindfulness in SRNAs in a larger sample, with a strong statistical power to detect a small gender effect.

Dispositional Mindfulness as Moderator

The third aim of the present study examined whether dispositional mindfulness moderated the relationship between daily hassles and three mental health outcomes. It was hypothesized that dispositional mindfulness would moderate the relationship such that daily hassles would be more strongly related to perceived stress, depression, and anxiety when dispositional mindfulness was low than when dispositional mindfulness was high. The complete case analysis data and the multiply imputed data were analyzed

separately to examine the main effect of independent and moderator variables. Significant covariates (demographic and curricular information) in a preliminary analysis, as well as meditation experience (a binary variable with yes or no response), were included in the generalized linear modeling as control variables. The hypothesized moderation effect of dispositional mindfulness would be confirmed if the interaction terms (daily hassles × mindfulness-facet) were significant in simple slope analysis.

Perceived Stress

Contrary to the hypothesis, none of the three interaction terms were significant in simple slope analysis. This finding indicates that dispositional mindfulness did not moderate the relationship between daily hassles and perceived stress in the SRNA sample above and beyond the effects of control variables and the main effects of daily hassles and dispositional mindfulness. However, SRNAs with higher dispositional mindfulness (nonreactivity and acting-with-awareness) had significantly lower perceived stress. The latter finding was consistent with the substantial evidence on the negative relationship between self-reported mindfulness and perceived stress (Bao, 2015; Carmody & Baer, 2007; Weinstein et al., 2009). Still, non-significant moderation by dispositional mindfulness was an unexpected finding. The study among Australian adolescents by Marks and colleagues (2010) suggested a significant moderation effect by dispositional mindfulness as measured by the MAAS (attention and awareness) on the relationship between daily hassles (measured by using the adolescent-version of the ICRLE) and depression, anxiety, and stress as measured by the DASS-21.

It is possible that the true effect size was smaller than the estimated effect size of .02. Similarly, the sample size in the present study ($N = 728$) that barely met the

minimum sample size ($N = 725$) to detect a small effect size for the moderation lacked statistical power. However, the sample size in the present study was more than twice the size of Marks and colleagues' study ($N = 317$); therefore, the different study results among the present study and Marks and colleagues (2010) could be due to the use of a different dispositional mindfulness measure (MAAS vs. FFMQ) or unmeasured unique characteristics of the samples in both studies.

Alternatively, it could be due to the different statistical analysis approach used in both studies. One unique feature in their statistical analysis was that they used bootstrapping to address potentially problematic standard errors associated with beta coefficients due to residual heteroscedasticity in their regression analysis. Also, there was no evidence of making family-wise error correction in their multiple hypothesis (total six) testing. This could have resulted in inflated significance levels in their final regression models. Nevertheless, the present study provided empirical support for the protective effect of dispositional mindfulness on perceived stress in SRNAs. Further research is needed to determine why dispositional mindfulness did not buffer the impact of daily hassles on perceived stress in SRNAs.

Depression

As hypothesized, the interaction term between daily hassles and dispositional mindfulness-nonjudging was significant in simple slope analysis, controlling for the main effects of daily hassles, dispositional mindfulness facets, and covariates. This means that the SRNAs with greater tendencies to take a non-evaluative stance toward thoughts and feelings had attenuated the negative effect of daily hassles on the levels of depression. Also consistent with the literature, increase in three dispositional mindfulness facets was

a significant predictor of decrease in depression, controlling for the effects of marital status, training level, and meditation experiences.

Three mindfulness facets used in the present study were known to be related to lower general psychological symptoms (Baer et al., 2006), including depression even among the clinical population (Bohlmeijer, ten Klooster, Flederus, Veehof, & Baer, 2011). Therefore, the current finding was not surprising, given the known protective function of nonjudging facet of mindfulness on depression (Cash & Whittingham, 2010). Also, the findings in the present study highlighted the importance of assessing and addressing personal vulnerability factors, such as low dispositional mindfulness of unrecognized and unmanaged depression, which has potentially devastating consequences for the SRNAs.

Surprisingly, however, the present study did not find the significant protective main effect of the non-reactivity and acting-with-awareness facets on depression, despite previous research reports providing the evidence for such an effect (Desrosiers, Klemanski, Nolen-Hoeksema 2013; Marks et al., 2010; Paul, Stanton, Greeson, Smoski, & Wang, 2013). For instance, Paul and colleagues (2013) have suggested that dispositional mindfulness-nonreactivity may be a critical protection against negative bias by reducing automatic emotional response to negative stimuli, which was postulated as the buffer against depression. This unexpected result might be due to differential item functioning of the FFMQ among non-meditator respondents, due to the positively worded nonreactivity items as previously discussed. Or, similar to the case with perceived stress, the protective effect of nonreactivity to inner experience aspect of dispositional

mindfulness against depression in the SRNA sample may be through its main effect, and not through moderation.

Anxiety

Akin to the finding for perceived stress, dispositional mindfulness did not significantly moderate the relationship between daily hassles and anxiety in the SRNA sample. However, the main effects of all three facets of dispositional mindfulness predicting anxiety were significant. This finding was contrary to the study results in Soysa & Wilcomb (2010) which found a significant moderation effect of nonjudging and nonreactivity facets on anxiety among an undergraduate student sample. Therefore, it may be possible that the SRNAs who had stronger tendency to remain in mindful state simply had fewer worries (regardless of the number of hassles in everyday life) than those who had lower dispositional mindfulness.

Also, only the acting-with-awareness facet was a significant predictor of anxiety in multiply imputed data. The potential causes of this discrepancy in the results between the complete case analysis and the multiply imputed data may include multiple imputation model misspecification, the misuse of multiple imputation to handle missing data due to missing-not-at-random (MNAR) missingness in the present study data, the inherent weakness of multiple imputation in estimating the interaction effect when auxiliary information or significant covariates were not sufficiently specified in the model, or an overestimated interaction effect in the complete case analysis, due to large standard error estimates related to a sample of a size insufficient to detect a small interaction effect (Desai et al., 2011).

Multiple imputations are said to be robust against biased estimates due to minor missing-at-random (MAR) assumption violation, especially when all covariates that are related to the missingness of both dependent variables and covariates are included in the model (McKnight et al., 2007). However, due to the emerging nature of the knowledge in dispositional mindfulness in SRNAs, *a priori* information necessary to identify all key auxiliary information for multiple imputation model specification was not available for the present study. Given the lower-than-expected response rate and significant missing information rate (> 10%) in some of the measures in the present study, further research is also needed to explore the best survey methodology to minimize missing information in the data derived from a busy SRNA sample.

Further research is needed to explain this discrepancy between the complete case analysis and the multiply imputed data, as well as to why dispositional mindfulness did not buffer the impact of daily hassles on anxiety among SRNAs.

Strengths and Limitations of the Study

Study Strengths

There were several notable strengths in the present study. First, the present study used one of the most influential models of psychological stress and coping, the Transactional Model of Stress (TMS; Lazarus & Folkman, 1984). The TMS was chosen as the study's conceptual model because of its emphasis on the transaction or interplay between person and environment. The TMS guided the present study's core assumption that stress vulnerability can arise from one's personal factors, instead of being solely the product of the environment. More specifically, the present study assumed that the transaction between the exposure to various levels of daily hassles and the person factors

(such as demographic and nurse anesthesia educational curricular information), as well as dispositional mindfulness, would explain the variability of mental health outcomes among the study sample. The TMS's other main focus, the individual appraisal of the situation, was not included in the present study's conceptual model. However, stress appraisal could further guide the design of future interventions that aim to change the individual's maladaptive appraisal to one that is more constructive, e.g., positive reappraisal through adaptive stress coping.

Second, the online survey protocol using the AANA Foundation's electronic survey assistance program enabled efficient and standardized data collection among the national sample of SRNAs in a short period. Although the present study did not reach the expected survey response rate of 25%, the smallest sample size (n = 728) among the four psychological scales met the minimum sample size of 725 calculated from *a priori* power analysis to detect the estimated small effect size of .02. Thirdly, the use of multiple imputations to handle missing data statistically reduced the effects of study bias due to non-representative sample. The present study also minimized the risk of familywise Type I error in multiple hypothesis testing by using Holms- or Sidák-error reductions in data analysis. Third, the use of valid and reliable measures to operationalize the study concepts examined will allow the comparison of findings from this study to others using the same instruments in similar populations (i.e., young adults, healthcare professional students). Finally, the present study also contributed to psychometric evidence of the four scales, PSS-10, DASS-21, ICSRLE, and FFMQ, which were used for a national sample of SRNAs for the first time, insofar as the study author was aware. Thus, the present

study provided the first robust estimates of perceived stress, depression, anxiety, and dispositional mindfulness among SRNAs.

Study Limitations

It is also important to acknowledge that there were several limitations that warrant caution for generalizing this study's findings to other populations. The cross-sectional design prevented the inquiry of temporal and causal relationships among the study variables. Also, the present study did not introduce interventions to alter the relationship between the dependent and the independent study variables. As such, all significant findings in the present study do not make an inference for cause-and-effect relationships between the study variables.

Also, the study sample was randomly drawn from the large sample pool maintained by the AANA Foundation, approximately 77.5% of all SRNAs. However, less than 20% of the SRNAs who received the online survey request participated in the study. Therefore, the study sample may not be representative of all SRNAs, even though the missing data was dealt with using robust means, namely multiple imputations. SRNAs who have a particular interest in the subject matter, such as stress interventions and mindfulness meditation, or research itself might have been more likely to respond to the survey request. Finally, there was a mixture of Masters and practice doctorate students in the study sample. The practice doctorate program is longer than the Masters' and has different required courses and expectations, potentially affecting the levels of study variables. However, there was no statistically significant differences in any measured outcomes between Masters' and practice doctorate students in the present study.

Those who did not respond to the survey participation request may have experienced levels of perceived stress, depression, anxiety, daily hassles, and dispositional mindfulness that were different from the study sample. Likewise, the study participants who did not answer all the study questions may be different on unmeasured variables from those who gave the complete response, indicating MNAR missingness. The anonymous survey design prevented the study author from contacting the non-respondents, as well as the study participants who gave an incomplete survey response, to test MNAR missingness and to obtain more complete data.

The primary implication of potential MNAR missingness in the present study data is the possibly faulty assumption made to justify using the multiple imputation techniques to handle missing data, leading to unreliable pooled estimates of missing information in the data.

However, multiple imputations can still produce satisfactory results with minor violation of missing-at-random (MAR) assumptions, such as minor non-randomness and non-ignorable missing data (McKnight et al., 2007). McKnight and colleagues (2007) stressed the importance of the prevention of missing data over handling missing data. One well-known strategy to improve survey response and survey completion is the use of a mail survey approach, which typically yields a higher response rate than an online survey approach (Fowler, 2014).

However, many SRNAs, especially those in the front-loaded didactic curriculum type are often required to travel to distant clinical rotation sites after their first year and may not have been reachable at their mailing address maintained by the AANA during

the data collection period. Accordingly, a mail survey approach was not an appropriate choice to reach up to 5,000 SRNAs for the present study.

Another alternative strategy to reduce survey non-response and incompletion was using an incentive to encourage survey participation and completion. However, the electronic survey assistance service provided by the AANA Foundation to standardize the data collection prohibited any incentives in the study protocol. During the third week of the data collection, it had become apparent that the response rate, which remained beneath 10% during the first three weeks, would not significantly improve without an additional means for reaching out to the study sample. The decision was made during the early week 4 to deploy "Plan B", and the survey participation request was sent out to all 114 nurse anesthesia program administrators by email. After all nurse anesthesia program administrators had been contacted, the survey response noticeably increased, reaching above the 15% response rate by the end of week 4. The major drawback of using the assistance from nurse anesthesia program administrators was the inconsistency in the manner in which the survey request was forwarded to their students. For instance, it was unknown to the study author how many students saw the email survey request, or how and when their program administrator forwarded the request encouraging survey participation, with or without an additional personal comment. These inconsistencies might have introduced a potential measurement bias.

Additionally, the study sample consisted of advanced practice nursing students in nurse anesthesia who had previously worked as critical care registered nurses. Therefore, the study findings may not be generalizable to pre-licensure healthcare professional students lacking previous staff clinical practice experience. The majority (82.4%) of the

study participants were in the first two years of their nurse anesthesia education. Therefore, the study results may not adequately reflect the responses from the graduating senior SRNAs, who were facing multiple major life events, such as graduation, the national board examination, job hunting, and possibly relocation. Similarly, the study data collection period overlapped with the Fall graduation season, major holiday seasons in November and December, as well as the end of term/semester examination week for some study participants. The impact of these major events on daily hassles, and their relationship with mental health outcomes, particularly among senior SRNAs, may be significant.

Summary and Study Implications

Summary

The present study investigated the current state of daily hassles and their mental health outcomes: perceived stress, depression, and anxiety, as well as the level of dispositional mindfulness among a national sample of SRNAs. Also, the present study assessed for hypothesized at-risk subgroups of SRNAs for maladaptive stress. Furthermore, this study examined the hypothesized moderating effect of dispositional mindfulness that might buffer the negative impact of daily hassles on psychological wellbeing among SRNAs.

The present study found that daily hassles, perceived stress, depression, and anxiety were positively correlated. Also, daily hassles, perceived stress, depression, and anxiety were negatively correlated with dispositional mindfulness among the SRNA sample. Also, female SRNAs were the most at-risk subgroup of nurse anesthesia students for maladaptive stress coping who demonstrated significantly higher perceived stress and

anxiety and lower dispositional mindfulness than their male peers. Further, senior SRNAs (3rd- and 4th-year students) reported significantly higher perceived stress than their junior counterpart. Dispositional mindfulness was found to be a significant buffer against depression, but not against perceived stress and anxiety among SRNAs. Specifically, the present study found the SRNAs with higher levels of nonjudging of experience facet of dispositional mindfulness had statistically significantly lower levels of depression than their peers with lower levels of this mindfulness facet.

Implications for Nurse Anesthesia Education

The results of the present study may be used to enhance nursing knowledge about how to assess individual vulnerability to maladaptive stress coping and its adverse effects on mental health well-being and, ultimately, the academic and clinical success of SRNAs. For example, the present study revealed that the SRNA sample had a 54% higher mean anxiety score than age-matched population normative mean, and nearly a fifth of the sample had anxiety at two highest levels using the DASS-21 scoring system. There is no doubt that all SRNAs experience significant anxiety during their nurse anesthesia training. However, it is imperative to have an initial intervention focus primarily on the students who are the most affected by it, rather than SRNAs as a whole. In this way, nurse anesthesia educators can utilize available recourses appropriately based on clinical presentations. Adaptive stress coping skill curriculum, for example, can be tailored for individual needs based on the psychological manifestations of their stress. The individualized approach for SRNA wellness is important, because not all SRNAs have the same baseline adaptive stress coping, which was the direct implication of the varying individual scores of the present study outcome variables (standard deviation).

Adaptive stress coping or the ability to adapt to change, has been implicated in academic success for nursing students (Pugachov, Maxwell, Youmans, & Wahnscha, 2015). Also, successfully managing emotions and facilitating thoughts which are the components of emotional intelligence—the ability to carry out accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thought (Mayer, Roberts, & Barsade, 2008)—have been indicated as playing a role in the academic success of graduate nursing students (Beauvais, Stewart, DeNisco, & Beauvais, 2014). Therefore, teaching adaptive stress coping skills that include the enhancement of emotion and cognitive regulations in SRNAs is a critical component of ensuring SRNAs' successful nurse anesthesia training. The findings from the present study suggest that mindfulness-based intervention may be a good candidate for SRNA wellness programs in order to cultivate emotion (primarily anxiety and depression to start) and cognitive (attention and awareness) regulations in SRNAs.

Cognitive errors, which are faulty thought processes caused by bias, heuristic, emotion, and other non-rational cognitive elements in decision-making, can lead to devastating patient injury in anesthesia. Sound cognition is known as a significant predictor of situation awareness, an essential skill in making sound clinical decisions in the dynamic and complex situations inherent in anesthesia practice (Wright & Fallacaro, 2011). However, the best method to uncover the soundness of decision-making solely through observable outcomes, e.g., behaviors and actions, in SRNAs in time-pressured settings (such as a simulation or in a busy operating room) has yet to be fully investigated. Therefore, it is imperative that nurse anesthesia educators teach SRNAs a metacognitive skill, which is to self-monitor and to select their thinking deliberately, to

avoid cognitive errors in anesthesia decision-making (Stiegler & Gaba, 2015). Mindfulness training, which is known to cultivate metacognition, may be a suitable educational method -- not only to enhance adaptive stress coping, but also to teach an important skill for sound medical decision-making in SRNAs.

The data on individual stress vulnerabilities -- high exposure to stressors, low adaptive stress coping skills, inadequate emotion and cognitive regulation -- can assist planning and providing preemptive personalized stress interventions based on the risk factors at the early stage of nurse anesthesia training. For example, the present study identified female gender as a risk factor for lower dispositional mindfulness and higher perceived stress and anxiety while experiencing higher daily hassles than male students. Also, students in their final year of nurse anesthesia training reported higher levels of perceived stress than did students in the earlier stage of nurse anesthesia training. Therefore, nurse anesthesia educational programs could plan and implement a higher dose intervention for 1st-year female students to mitigate their higher risk for ineffective stress coping.

Areas for Future Research

The present study only included SRNAs as study subjects. Future studies are needed to expand the study population to the entire nurse anesthesia community. Also, future studies should examine the extent to which the members of the nurse anesthesia community incorporate contemplative practice into their lives to improve wellness and physical, psychological, and spiritual well-being.

The present study did not measure physiological markers of stress-induced allostasis in the SRNA sample. However, it may be worth investigating how a unique

feature of depression (e.g., low positive emotion) and of anxiety (e.g., hyperarousal) may correspond with objective stress biomarkers, such as heart rate variability, and be alleviated by adaptive stress coping training, such as mindfulness-based interventions. Past clinical trials of mindfulness-based interventions in healthcare employees and trainees aiming to improve mental health outcomes of stress have reported favorable results (Geary & Rosenthal, 2011; Lamothe, Rondeau, Malboeuf-Hurtubise, Duval, & Sultan, 2016).

Future studies are needed to test clinical interventions for SRNAs to teach skills that cultivate long-term mindfulness rather than merely dealing with immediate or short-term issues. Such intervention studies should examine not only individual wellness and well-being as study outcomes, but also observable cognitive errors and non-technical skills. Simulation-based research methodology may allow standardized testing of the effectiveness of mindfulness interventions to improve the non-technical skills that are critical for effective and safe nurse anesthesia practice, such as non-judgmental attitude, clear communication, teamwork, and curiosity. In the future, improvements in non-technical skills through long-term mindfulness interventions may be tested *in situ* to assess the impact of effective adaptive stress coping on patient safety and larger healthcare issues regarding reduced cognitive errors in medical decision-making and better patient outcomes.

Also, the potentially testable outcomes of mindfulness intervention might include the reduction of substance abuse among the nurse anesthesia community, the maintenance of sobriety and the return to clinical anesthesia practice among those who are recovering from their addiction. Finally, future studies are needed to conduct

randomized controlled trials to test the therapeutic effectiveness of mindfulness-based interventions for adaptive stress coping in SRNAs, comparing them to other known adaptive stress coping techniques to examine the causal relationship between mindfulness-based interventions and the improvements in adaptive stress coping and, ultimately, patient outcomes.

References

Abela, J. R. Z., & D'Alessandro, D. U. (2002). Beck's cognitive theory of depression: a test of the diathesis-stress and causal mediation components. *The British Journal of Clinical Psychology / the British Psychological Society*, *41*(Pt 2), 111–128.

Agresti, A. (2015). *Foundations of Linear and Generalized Linear Models.* Retrieved from http://www.eblib.com

Aguinis, H., Beaty, J. C., Boik, R. J., & Pierce, C. A. (2005). Effect size and power in assessing moderating effects of categorical variables using multiple regression: a 30-year review. *The Journal of Applied Psychology*, *90*(1), 94–107. http://doi.org/10.1037/0021-9010.90.1.94

Aickin, M., & Gensler, H. (1996). Adjusting for multiple testing when reporting research results: the Bonferroni vs Holm methods. *American Journal of Public Health*, *86*(5), 726–728

Aiken, L. S. & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks, CA: Sage

Aktekin, M., Karaman, T., Senol, Y. Y., Erdem, S., Erengin, H., & Akaydin, M. (2001). Anxiety, depression and stressful life events among medical students: a prospective study in Antalya, Turkey. *Medical Education*, *35*(1), 12–17.

Alves, S. L. (2005). A study of occupational stress, scope of practice, and collaboration in nurse anesthetists practicing in anesthesia care team settings. *AANA Journal*, *73*(6), 443–452.

American Association of Nurse Anesthetists (AANA). (2015). *Certified Registered Nurse Anesthetists Fact Shee*t. Retrieved from http://www.aana.com/ceandeducation/becomeacrna /Pages/Nurse-Anesthetists-at-a-Glance.aspx

American Heart Association (AHA). (2015). *Leading causes of death infographic*. Retrieved from http://news.heart.org/heart-disease-death-rate-continues-to-drop/causes-of-death_option-1/

Arbona, C., & Jimenez, C. (2014). Minority stress, ethnic identity, and depression among Latino/a college students. *Journal of Counseling Psychology*, *61*(1), 162–168. http://doi.org/10.1037/a0034914

Arch, J. J., & Craske, M. G. (2010). Laboratory stressors in clinically anxious and non-anxious individuals: the moderating role of mindfulness. *Behaviour Research and Therapy*, *48*(6), 495–505. http://doi.org/10.1016/j.brat.2010.02.005

Arch, J. J. & Landy, L. N. (2015). Emotional benefits of mindfulness. In K. W. Brown,

J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 208-224). New York, NY: Guilford Press.

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*. http://doi.org/10.1093/clipsy.bpg015

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27–45. http://doi.org/10.1177/1073191105283504

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., et al. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment*, *15*(3), 329–342. http://doi.org/10.1177/1073191107313003

Baer, R. A. (2011). Measuring mindfulness. *Contemporary Buddhism, 12*(1), 241-261. http://doi.org/10.1080/14639947.2011.564842

Baer, R. A., Carmody, J., & Hunsinger, M. (2012). Weekly change in mindfulness and perceived stress in a mindfulness-based stress reduction program. *Journal of Clinical Psychology*, *68*(7), 755–765. http://doi.org/10.1002/jclp.21865

Baldisseri, M. R. (2007). Impaired healthcare professional. *Critical Care Medicine*, *35*(2 Suppl), S106–16. http://doi.org/10.1097/01.CCM.0000252918.87746.96

Bao, X., Xue, S., & Kong, F. (2015). Dispositional mindfulness and perceived stress: The role of emotional intelligence. *Personality and Individual Differences*, *78*(C), 48–52. http://doi.org/10.1016/j.paid.2015.01.007

Barker, C., Elliott, R., & Pistrang, N. (2005). Self-Report Methods. In *Research Methods in Clinical Psychology* (2nd ed., pp. 94–118). Chichester, UK: Wiley. http://doi.org/10.1002/0470013435.ch6

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. http://doi.org/10.1037/0022-3514.51.6.1173

Bartlett, J. W., & Morris, T. P. (2015). Multiple imputation of covariates by substantive-model compatible fully conditional specification. *The Stata Journal*, *15*(2), 437-456.

Baykan, Z., Naçar, M., & Cetinkaya, F. (2012). Depression, anxiety, and stress among last-year students at Erciyes University Medical School. *Academic*, *36*(1), 64–65. http://doi.org/10.1176/appi.ap.11060125

Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social Psychiatry and Psychiatric Epidemiology*, *43*(8), 667–672. http://doi.org/10.1007/s00127-008-0345-x

Beauvais, A. M., Stewart, J. G., DeNisco, S., & Beauvais, J. E. (2014). Factors related to academic success among nursing students: a descriptive correlational research study. *Nurse Education Today*, *34*(6), 918–923. http://doi.org/10.1016/j.nedt.2013.12.005

Beck, A. T., (1967). *The Diagnosis and Management of Depression*. Philadelphia, PA: University of Pennsylvania Press

Beck, A. T. (2008). The evolution of the cognitive model of depression and its neurobiological correlates. *The American Journal of Psychiatry*, *165*(8), 969–977. http://doi.org/10.1176/appi.ajp.2008.08050721

Beck, D. L., & Srivastava, R. (1991). Perceived level and sources of stress in baccalaureate nursing students. *Journal of Nursing Education*, *30*(3), 127–133

Beddoe, A. E., & Murphy, S. O. (2004). Does mindfulness decrease stress and foster empathy among nursing students? *Journal of Nursing Education*, *43*(7), 305–312.

Bell, D. M., McDonough, J. P., Ellison, J. S., & Fitzhugh, E. C. (1999). Controlled drug misuse by Certified Registered Nurse Anesthetists. *AANA Journal*, *67*(2), 133–140.

Bergomi, C., Tschacher, W., & Kupper, Z. (2012). The assessment of mindfulness with self-report measures: Existing scales and open issues. *Mindfulness*, *4*(3), 191–202. http://doi.org/10.1007/s12671-012-0110-9

Bewick, B., Koutsopoulou, G., Miles, J., Slaa, E., & Barkham, M. (2010). Changes in undergraduate students' psychological well-being as they progress through university. *Studies in Higher Education*, *35*(6), 633–645. http://doi.org/10.1080/03075070903216643

Bhatia, S., & Dey, S. (2011). Gender differences in depressive symptoms: The role of daily hassles, coping styles, social support and personal mastery. *Journal of the Indian Academy of Applied Psychology*.

Biddle, C., & Aker, J. (2011). The national study of sleep-related nehaviors of nurse anesthetists: Personal and professional implications. *AANA Journal*, *79*, 324–330.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*(3), 230–241. http://doi.org/10.1093/clipsy.bph077

Blankstein, K. R., Flett, G. L., & Koledin, S. (1991). The Brief College Student Hassles

Scale: Development, validation, and relation with pessimism. *Journal of College Student Development, 32*(3), 258-264.

Bodenhorn, N., Miyazaki, Y., & Ng, K. M. (2007). Analysis of the inventory of college students' recent life experiences. *Multicultural Learning and Teaching*, *2*(2). http://doi.org/10.2202/2161-2412.1022

Bodhi, B. (2011). What does mindfulness really mean? A canonical perspective. *Contemporary Buddhism*, *12*(1), 19–39. http://doi.org/10.1080/14639947.2011.564813

Bohlmeijer, E., Klooster, ten, P. M., Fledderus, M., Veehof, M., & Baer, R. (2011). Psychometric properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. *Assessment*, *18*(3), 308–320. http://doi.org/10.1177/1073191111408231

Bolger, N., DeLongis, A., Kessler, R. C., & Schilling, E. A. (1989). Effects of daily stress on negative mood. *Journal of Personality and Social Psychology*, *57*(5), 808–818. http://doi.org/10.1037/0022-3514.57.4.651

Booth, M. J. (1998). Nurse anesthetist reaction to the unexpected or untimely death of patients in the operating room. *Holistic Nursing Practice*, *13*(1), 51–58.

Bowen, S., Chawla, N., Collins, S. E., Witkiewitz, K., Hsu, S., Grow, J., et al. (2009). Mindfulness-based relapse prevention for substance use disorders: a pilot efficacy trial. *Substance Abuse*, *30*(4), 295–305. http://doi.org/10.1080/08897070903250084

Bowlin, S. L., & Baer, R. A. (2012). Relationships between mindfulness, self-control, and psychological functioning. *Personality and Individual Differences*. http://doi.org/10.1016/j.paid.2011.10.050

Bozimowski, G., Groh, C., Rouen, P., & Dosch, M. (2014). The prevalence and patterns of substance abuse among nurse anesthesia students. *AANA Journal*, *82*(4), 277–283.

Bränström, R., Duncan, L. G., & Moskowitz, J. T. (2011). The association between dispositional mindfulness, psychological well-being, and perceived health in a Swedish population-based sample. *British Journal of Health Psychology*, *16*(Pt 2), 300–316. http://doi.org/10.1348/135910710X501683

Brotman, D. J., Golden, S. H., & Wittstein, I. S. (2007). The cardiovascular toll of stress. *Lancet*, *370*(9592), 1089–1100. http://doi.org/10.1016/S0140-6736(07)61305-1

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848. http://doi.org/10.1037/0022-3514.84.4.822

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Addressing fundamental questions about mindfulness. *Psychological Inquiry*, *18*(4), 272–281. http://doi.org/10.1080/10478400701703344

Brown, K. W. & Gordon, S. (2009). Toward a phenomenology of mindfulness: Subjective experience and emotional correlates. In F. Didonna (Ed.). *Clinical Handbook of Mindfulness*. (pp. 59-81). New York, NY: springer.

Brown, K. W., Goodman, R. J., & Inzlicht, M. (2013). Dispositional mindfulness and the attenuation of neural responses to emotional stimuli. *Social Cognitive and Affective Neuroscience*, *8*(1), 93–99. http://doi.org/10.1093/scan/nss004

Brownson, C., Drum, D. J., Smith, S. E., & Burton Denmark, A. (2011). Differences in suicidal experiences of male and female undergraduate and graduate students. *Journal of College Student Psychotherapy*, *25*(4), 277–294. http://doi.org/10.1080/87568225.2011.605692

Bryson, E. O., & Hamza, H. (2011). The drug seeking anesthesia care provider. *International Anesthesiology Clinics*, *49*(1), 1–157–171.

Buchanan, J. L. (2012). Prevention of depression in the college student population: a review of the literature. *Archives of Psychiatric Nursing*, *26*(1), 21–42. http://doi.org/10.1016/j.apnu.2011.03.003

Bughi, S. A., Sumcad, J., & Bughi, S. (2009). Effect of brief behavioral intervention program in managing stress in medical students from two southern California universities. *Medical Education Online*.

Bullis, J. R., Bøe, H. J., Asnaani, A., & Hofmann, S. G. (2014). The benefits of being mindful: trait mindfulness predicts less stress reactivity to suppression. *Journal of Behavior Therapy and Experimental Psychiatry*, *45*(1), 57–66. http://doi.org/10.1016/j.jbtep.2013.07.006

Burgess, L., Irvine, F., & Wallymahmed, A. (2010). Personality, stress and coping in intensive care nurses: a descriptive exploratory study. *Nursing in Critical Care*, *15*(3), 129–140. http://doi.org/10.1111/j.1478-5153.2009.00384.x

Burks, N., & Martin, B. (1985). Everyday problems and life change events: ongoing versus acute sources of stress. *Journal of Human Stress*, *11*(1), 27–35. http://doi.org/10.1080/0097840X.1985.9936735

Campbell, D. A., Jr, Sonnad, S. S., Eckhauser, F. E., Campbell, K. K., & Greenfield, L. J. (2001). Burnout among American surgeons. *Surgery*, *130*(4), 696–705. http://doi.org/10.1067/msy.2001.116676

Campbell, R. L., Svenson, L. W., & Jarvis, G. K. (1992). Perceived level of stress among university undergraduate students in Edmonton, Canada. *Perceptual and Motor Skills*, *75*(2), 552–554. http://doi.org/10.2466/pms.1992.75.2.552

Cannon, W. B. (1932). *The Wisdom of the Body*. New York, NY: W. W. Norton

Carmody, J., & Baer, R. A. (2007). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine*, *31*(1), 23–33. http://doi.org/10.1007/s10865-007-9130-7

Carmody, J., Reed, G., Kristeller, J., & Merriam, P. (2008). Mindfulness, spirituality, and health-related symptoms. *Journal of Psychosomatic Research*, *64*(4), 393–403.

Carmody, J., Baer, R. A., L B Lykins, E., & Olendzki, N. (2009). An empirical study of the mechanisms of mindfulness in a mindfulness-based stress reduction program. *Journal of Clinical Psychology*, *65*(6), 613–626. http://doi.org/10.1002/jclp.20579

Carmody, J. (2015). Reconceptualizing mindfulness: The psychological principles of attending in mindfulness practice and their role in well-being. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 62-78). New York, NY: Guilford Press.

Cash, M., & Whittingham, K. (2010). What facets of mindfulness contribute to psychological well-being and depressive, anxious, and stress-related symptomatology? *Mindfulness*, *1*(3), 177–182. http://doi.org/10.1007/s12671-010-0023-4

Cavagnaro, M. A. (1983). A comparison study of stress factors as they affect CRNAs. *AANA Journal*, *51*(3), 290–294.

Center for Disease Control and Prevention, National Center for Health Statistics. (2015). *Illegal Drug Use*. Retrieved from http://www.cdc.gov/nchs/fastats/drug-use-illegal.htm#

Chan, E. S., Koh, D., Teo, Y. C., Tamin, R. H., Lim, A., & Fredericks, S. (2013). Biochemical and psychometric evaluation of Self-Healing Qigong as a stress reduction tool among first year nursing and midwifery students. *Complementary Therapies in Clinical Practice*, *19*(4), 179–183. http://doi.org/10.1016/j.ctcp.2013.08.001

Chang, E., Eddins-Folensbee, F., & Coverdale, J. (2012). Survey of the prevalence of burnout, stress, depression, and the use of supports by medical students at one school. *Academic Psychiatry*, *36*(3), 177–182. http://doi.org/10.1176/appi.ap.11040079

Chen, Y., Yang, X., Wang, L., & Zhang, X. (2013). A randomized controlled trial of the

effects of brief mindfulness meditation on anxiety symptomes and systolic blood pressure in Chinese nursing students. *Nurse Education Today*, *33*(10), 1166–1172. http://doi.org/10.1016/j.nedt.2012.11.014

Chiesa, A., Anselmi, R., & Serretti, A. (2014). Psychological mechanisms of mindfulness-based interventions: what do we know? *Holistic Nursing Practice*, *28*(2), 124–148. http://doi.org/10.1097/HNP.0000000000000017

Chipas, A., & McKenna, D. (2011). Stress and burnout in nurse anesthesia. *AANA Journal*, *79*(2), 122–128.

Chipas, A., Cordrey, D., Floyd, D., Grubbs, L., Miller, S., & Tyre, B. (2012). Stress: perceptions, manifestations, and coping mechanisms of student registered nurse anesthetists. *AANA Journal*, *80*(4 Suppl), S49–55.

Chiron, B., Michinov, E., Olivier-Chiron, E., Laffon, M., & Rusch, E. (2010). Job satisfaction, life satisfaction and burnout in French anaesthetists. *Journal of Health Psychology*, *15*(6), 948–958. http://doi.org/10.1177/1359105309360072

Christopher, M. S., Neuser, N. J., Michael, P. G., & Baitmangalkar, A. (2012). Exploring the psychometric properties of the Five Facet Mindfulness Questionnaire. *Mindfulness*, *3*(2), 124–131. http://doi.org/10.1007/s12671-011-0086-x

Christopher, M., Ramsey, M., & Antick, J. (2013). The role of dispositional mindfulness in mitigating the impact of stress and impulsivity on alcohol-related problems. *Addiction Research & Theory*, *21*(5), 429–434. http://doi.org/10.3109/16066359.2012.737873

Cochran, A., & Elder, W. B. (2014). A model of disruptive surgeon behavior in the perioperative environment. *Journal of the American College of Surgeons*, *219*(3), 390–398. http://doi.org/10.1016/j.jamcollsurg.2014.05.011

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences (2nd ed.)*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310–357.

Cohen, S., & Williamson, G. M. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The Social Psychology of Health* (pp. 31–67).

Cohen, S., Tyrrell, D. A., & Smith, A. P. (1993). Negative life events, perceived stress,

negative affect, and susceptibility to the common cold. *Journal of Personality and Social Psychology*, *64*(1), 131–140. http://doi.org/10.1037/0022-3514.64.1.131

Cohen, S., Kessler, R. C., & Underwood Gordon, L. (1995). Strategies for measuring stress in studies of psychiatric and physical disorders. In S. Cohen, R. C. Kessler, & L. Underwood Gordon (Eds.). *Measuring Stress: A Guide for Health and Social Scientists* (pp. 3-26). New York, NY: Oxford University Press.

Cohen, S., Frank, E., Doyle, W. J., Skoner, D. P., Rabin, B. S., & Gwaltney, J. M. (1998). Types of stressors that increase susceptibility to the common cold in healthy adults. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *17*(3), 214–223.

Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *JAMA: the Journal of the American Medical Association*, *298*(14), 1685–1687. http://doi.org/10.1001/jama.298.14.1685

Cohen, S. & Janicki-Deverts, D. (2012), Who's stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006, and 2009. *Journal of Applied Social Psychology, 42*, 1320–1334. doi: 10.1111/j.1559-1816.2012.00900.x

Compton, M. T., Carrera, J., & Frank, E. (2008). Stress and depressive symptoms/dysphoria among US medical students: results from a large, nationally representative survey. *The Journal of Nervous and Mental Disease*, *196*(12), 891–897. http://doi.org/10.1097/NMD.0b013e3181924d03

Council On Accreditation of Nurse Anesthesia Educational Programs (COA). *List of Recognized Educational Programs Current Status as of July 28, 2015.* Available at http://home.coa.us.com/accredited-programs/Documents/LOAP%20-%20072815.pdfAccessed October 19, 2015.

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine*, *69*(6), 560–565. http://doi.org/10.1097/PSY.0b013e3180f6171f

Creswell, J. D., & Lindsay, E. K. (2014). How does mindfulness training affect health? A mindfulness stress buffering account. *Current Directions in Psychological Science*, *23*(6), 401–407. http://doi.org/10.1177/0963721414547415

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (4th ed.).* Thousand Oaks, CA: Sage

Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep Medicine Reviews*, *10*(5), 323–337. http://doi.org/10.1016/j.smrv.2005.11.001

D'Angelo, B. & Wierzbicki, M. (2003). Relations of daily hassles and both anxious and depressed mood in students. Psychological Reports, 92, 416-418.

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., et al. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, *65*(4), 564–570. http://doi.org/10.1097/01.PSY.0000077505.67574.E3

Davidson, R. J. (2010). Empirical explorations of mindfulness: Conceptual and methodological conundrums. *Emotion*, *10*(1), 8–11. http://doi.org/10.1037/a0018480

Davis, J. H. & Thompson, E. (2015). Developing attention and decreasing affective bias. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 42-61). New York, NY: Guilford Press.

Davis, K. M., Lau, M. A., & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the Toronto Mindfulness Scale. *Journal of Cognitive Psychotherapy, 23*(3), 185–197. http://doi.org/10.1891/0889-8391.23.3.185

Deanfield, J. E., Halcox, J. P., & Rabelink, T. J. (2007). Endothelial function and dysfunction: testing and clinical relevance. *Circulation*, *115*(10), 1285–1295. http://doi.org/10.1161/CIRCULATIONAHA.106.652859

de Bruin, E. I., Topper, M., Muskens, J. G. A. M., Bogels, S. M., & Kamphuis, J. H. (2012). Psychometric Properties of the Five Facets Mindfulness Questionnaire (FFMQ) in a Meditating and a Non-meditating Sample. *Assessment*, *19*(2), 187–197. http://doi.org/10.1177/1073191112446654

DeLongis, A., Coyne, J. C., Dakof, G., Folkman, S., & Lazarus, R. S. (1982). Relationship of daily hassles, uplifts, and major life events to health status. *Health Psychology*, *1*(2), 119–136. http://doi.org/10.1037/0278-6133.1.2.119

de Oliveira, G. S., Jr., Chang, R., Fitzgerald, P. C., Almeida, M. D., Castro-Alves, L. S., Ahmad, S., & McCarthy, R. J. (2013). The prevalence of burnout and depression and their association with adherence to safety and practice standards. *Anesthesia & Analgesia*, *117*(1), 182–193. http://doi.org/10.1213/ANE.0b013e3182917da9

Desai, M., Esserman, D. A., Gammon, M. D., & Terry, M. B. (2011). The use of complete-case and multiple imputation-based analyses in molecular epidemiology studies that assess interaction effects. *Epidemiologic Perspectives & Innovations*, *8*(1), 5. http://doi.org/10.1186/1742-5573-8-5

Desrosiers, A., Klemanski, D. H., & Nolen-Hoeksema, S. (2013). Mapping mindfulness facets onto dimensions of anxiety and depression. *Behavior Therapy*, *44*(3), 373–384.

http://doi.org/10.1016/j.beth.2013.02.001

de Vibe, M., Solhaug, I., Tyssen, R., Friborg, O., Rosenvinge, J. H., Sørlie, T., & Bjørndal, A. (2013b). Mindfulness training for stress management: a randomised controlled study of medical and psychology students. *BMC Medical Education*, *13*(1), 107. http://doi.org/10.1186/1472-6920-13-107

Dimsdale, J. E. (2008). Psychological stress and cardiovascular disease. *Journal of the American College of Cardiology*, *51*(13), 1237–1246. http://doi.org/10.1016/j.jacc.2007.12.024

Dobkin, P. L., & Hutchinson, T. A. (2013). Teaching mindfulness in medical school: where are we now and where are we going? *Medical Education*, *47*(8), 768–779. http://doi.org/10.1111/medu.12200

Dohrenwend, B. S., Dohrenwend, B. P., Dodson, M., & Shrout, P. E. (1984). Symptoms, hassles, social supports, and life events: problem of confounded measures. *Journal of Abnormal Psychology*, *93*(2), 222–230.

Dolansky, M. A., Drusche, K., Helba, M., & Courtney, K. (2013). Nursing student medication errors: A case study using root cause analysis. *Journal of Professional Nursing*, *29*(2), 102–108. http://doi.org/10.1016/j.profnurs.2012.12.010

Domen, R., Connelly, C. D., & Spence, D. (2015). Call-shift fatigue and use of countermeasures and avoidance strategies by certified registered nurse anesthetists: a national survey. *AANA Journal, 83*(2), 123-131.

Donaldson, S. I., & Grant-Vallone, E. J. (2002). Understanding self-report bias in organizational behavior research. *Journal of Business and Psychology*.

Dosch, M. R., Jarvis, S., & Schlosser, K. (2008). Attrition in nurse anesthesia educational programs as reported by program directors: the class of 2005. *AANA Journal*, *76*(4), 277–281.

Downey, R. L., Farhat, T., & Schumann, R. (2012). Burnout and coping amongst anesthesiologists in a US metropolitan area: A pilot study. *Middle East Journal of Anesthesiology*, *21*(4), 529–534.

Dumouchel, M., Boytim, M., Gorman, N., & Weismuller, P. (2015). Does moral distress differ between California certified registered nurse anesthetists in independent versus medically supervised practice: An exploratory study. *AANA Journal*, *83*(3), 203–209.

Dyrbye, L. N., Thomas, M. R., & Shanafelt, T. D. (2006). Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Academic Medicine*, *81*(4), 354–373.

Dyrbye, L. N., Thomas, M. R., Massie, F. S., Power, D. V., Eacker, A., Harper, W., et al. (2008). Burnout and suicidal ideation among U.S. medical students. *Annals of Internal Medicine*, *149*(5), 334–341.

Edward, K.-L., Stephenson, J., Ousey, K., Lui, S., Warelow, P., & Giandinoto, J.-A. (2015). A systematic review and meta-analysis of factors that relate to aggression perpetrated against nurses by patients/relatives or staff. *Journal of Clinical Nursing*, *25*(3-4), 289–299. http://doi.org/10.1111/jocn.13019

Elias, H., Ping, W. S., & Abdullah, M. C. (2011). Stress and academic achievement among undergraduate students in Universiti Putra Malaysia. *Procedia-Social and Behavioral Sciences*. http://doi.org/10.1016/j.sbspro.2011.11.288

Elisha, S., & Rutledge, D. N. (2011). Clinical education experiences: perceptions of student registered nurse anesthetists. *AANA Journal*, *79*(4 Suppl), S35–42.

Elmblad, R., Kodjebacheva, G., & Lebeck, L. (2014a). Workplace incivility affecting CRNAs: A study of prevalence, severity, and consequences with proposed interventions. *AANA Journal*, *82*(6), 437–445.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. http://doi.org/10.3758/BRM.41.4.1149

Feldman, G., Hayes, A., Jumar, S., Greeson, J., & Laurenceau, J. P. (2007). Mindfulness and emotion regulation: The development and initial validation of the Cognitive and Affective Mindfulness Scale—Revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment, 29*(3), 177-190.

Feltman, R., Robinson, M. D., & Ode, S. (2009). Mindfulness as a moderator of neuroticism-outcome relations: A self-regulation perspective. *Journal of Research in Personality*, *43*(6), 953–961. http://doi.org/10.1016/j.jrp.2009.08.009

Fogarty, F. A., Lu, L. M., Sollers, J. J., III, & Krivoschekov, S. G. (2015). Why it pays to be mindful: Trait mindfulness predicts physiological recovery from emotional stress and greater differentiation among negative emotions. *Mindfulness*, *6*, 175–185. http://doi.org/10.1007/s12671-013-0242-6

Fogle, G. E., & Pettijohn, T. F. (2013). Stress and health habits in college students. *Open Journal of Medical Psychology*, *02*(02), 61–68. http://doi.org/10.4236/ojmp.2013.22010

Fortney, L., Luchterhand, C., Zakletskaia, L., Zgierska, A., & Rakel, D. (2013). Abbreviated mindfulness intervention for job satisfaction, quality of life, and compassion in primary care clinicians: A pilot study. *The Annals of Family Medicine*, *11*(5), 412–420. http://doi.org/10.1370/afm.1511

Fowler, F. J. (2014). *Survey Research Methods (5th ed.)* [Kindle version]. Retrieved from http://www.amazon.com/Survey-Research-Methods-Applied-Social/dp/1452259003

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*.

Furr, S. R., Westefeld, J. S., McConnell, G. N., & Jenkins, J. M. (2001). Suicide and depression among college students: A decade later. *Professional Psychology: Research and Practice*, *32*(1), 97–100. http://doi.org/10.1037/0735-7028.32.1.97

Gaba, D. M., Howard, S. K., & Jump, B. (1994). Production pressure in the work environment. California anesthesiologists' attitudes and experiences. *Anesthesiology*, *81*(2), 488–500.

Gaetano J. (2013). Holm-Bonferroni sequential correction: An EXCEL calculator (1.1) [Microsoft Excel workbook]. Retrieved from https://www.researchgate.net/publication/236969037_Holm-Bonferroni_Sequential_Correction_An_EXCEL_Calculator . doi:10.13140/RG.2.1.4466.9927

Garcia-Otero, M., & Teddlie, C. (1992). The effect of knowledge of learning styles on anxiety and clinical performance of nurse anesthesiology students. *AANA Journal, 60*(3), 257-260.

Garcia-Williams, A. G., Moffitt, L., & Kaslow, N. J. (2014). Mental health and suicidal behavior among graduate students. *Academic Psychiatry*, *38*(5), 554–560. http://doi.org/10.1007/s40596-014-0041-y

Garman, A. N., Corrigan, P. W., & Morris, S. (2002). Staff burnout and patient satisfaction: Evidence of relationships at the care unit level. *Journal of Occupational Health Psychology*, *7*(3), 235–241. http://doi.org/10.1037//1076-8998.7.3.235

Garnefski, N., Kraaij, V., & Spinhoven, P. (2001). Negative life events, cognitive emotion regulation and emotional problems. *Personality and Individual Differences*, *30*(8), 1311–1327. http://doi.org/10.1016/S0191-8869(00)00113-6

Gaultney, J. F. (2010). The prevalence of sleep disorders in college students: impact on academic performance. *Journal of American College Health*, *59*(2), 91–97. http://doi.org/10.1080/07448481.2010.483708

Gazoni, F. M., Durieux, M. E., & Wells, L. (2008). Life after death: the aftermath of perioperative catastrophes. *Anesthesia & Analgesia*, *107*(2), 591–600. http://doi.org/10.1213/ane.0b013e31817a9c77

Geary, C., & Rosenthal, S. L. (2011). Sustained impact of MBSR on stress, well-being, and daily spiritual experiences for 1 year in academic health care employees. *The Journal of Alternative and Complementary Medicine*, *17*(10), 939–944. http://doi.org/10.1089/acm.2010.0335

Gethin R. (1998). *The Foundation of Buddhism*. New York, NY: Oxford University Press.

Gethin, R. (2011). On some definitions of mindfulness. *Contemporary Buddhism*, *12*(1), 263–279. http://doi.org/10.1080/14639947.2011.564843

Gethin, R. (2015). Buddhist conceptualizations of mindfulness. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 9-410. New York, NY: Guilford Press.

Gilbert, D., & Waltz, J. (2010). Mindfulness and health behaviors. *Mindfulness, 1*, 227-234. http://doi.org/10.1007/s12671-010-0032-3

Giluk, T. L. (2009). Mindfulness, Big Five personality, and affect: A meta-analysis. *Personality and Individual Differences*. http://doi.org/10.1016/j.paid.2009.06.026

Glanz, K., & Schwartz, M.D. (2008). Stress, coping, and health behavior. In K. Glanz, B. K., Rimer, & K. Viswanath (Eds.). *Health Behavior and Health Education* (4th ed.). (pp. 211-236). San Francisco, CA: Jossey-Bass.

Glynn, K., Maclean, H., Forte, T., & Cohen, M. (2009). The association between role overload and women's mental health. *Journal of Women's Health (2002)*, *18*(2), 217–223. http://doi.org/10.1089/jwh.2007.0783

Goebert, D., Thompson, D., Takeshita, J., Beach, C., Brynson, P., Ephgrave, K., et al. (2009). Depressive symptoms in medical students and residents: A multischool study. *Academic Medicine, 84*(2), 236-241

Goh, C., & Agius, M. (2010). The stress-vulnerability model how does stress impact on mental illness at the level of the brain and what are the consequences? *Psychiatria Danubina*, *22*(2), 198–202.

Goldhagen, B. E., Kingsolver, K., Stinnett, S. S., & Rosdahl, J. A. (2015). Stress and burnout in residents: impact of mindfulness-based resilience training. *Advances in Medical Education and Practice*, *6*, 525–532. http://doi.org/10.2147/AMEP.S88580

Greeson, J. M., Toohey, M. J., & Pearce, M. J. (2015). An adapted, four-week mind-body skills group for medical students: reducing stress, increasing mindfulness, and enhancing self-care. *Explore*, *11*(3), 186–192. http://doi.org/10.1016/j.explore.2015.02.003

Grossman, P. (2008). On measuring mindfulness in psychosomatic and psychological research. *Journal of Psychosomatic Research*, *64*(4), 405–408. http://doi.org/10.1016/j.jpsychores.2008.02.001

Grossman, P. (2011). Defining mindfulness by how poorly I think I pay attention during everyday awareness and other intractable problems for psychology's (re)invention of mindfulness: Comment on Brown et al. (2011). *Psychological Assessment*, *23*(4), 1034–1040. http://doi.org/10.1037/a0022713

Grossman, P., & Van Dam, N. T. (2011). Mindfulness, by any other name…: Trials and tribulations of sati in western psychology and science. *Contemporary Buddhism*. http://doi.org/10.1080/14639947.2011.564841

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and well-being? A systematic review and meta-analysis of meditation studies. *Clinical Psychology Review*.*37*(4), 1-12. http://doi.org/10.1016/j.cpr.2015.01.006

Gunaratana, B. H. (2011). *Mindfulness in Plain English* (20th anniversary ed.). Somerville, MA: Wisdom Publications.

Hanley, A. W., & Garland, E. L. (2014). Dispositional mindfulness co-varies with self-reported positive reappraisal. *Personality and Individual Differences*, *66*, 146–152. http://doi.org/10.1016/j.paid.2014.03.014

Harrison, E. L. R., & McKee, S. A. (2011). Non-daily smoking predicts hazardous drinking and alcohol use disorders in young adults in a longitudinal U.S. sample. *Drug and Alcohol Dependence*, *118*(1), 78–82. http://doi.org/10.1016/j.drugalcdep.2011.02.022

Hayes, A. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach.* New York, NY: Guildford Press.

Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy: An experiential approach to behavior change*. New York, NY: Guilford Press.

Henry, J. D., & Crawford, J. R. (2011). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, *44*(2), 227–239. http://doi.org/10.1348/014466505X29657

Hobfoll, S. E., Schwarzer, R., & Chon, K. K. (1998). Disentangling the stress labyrinth: Interpreting the meaning of the term stress as it is studied in health context. *Anxiety*, *11*(3), 181–212. http://doi.org/10.1080/10615809808248311

Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, *6*(2), 65–70. http://doi.org/10.2307/4615733?ref=no-x-

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*. http://doi.org/10.1002/smi.2460060306

Hölzel, B. K., Ott, U., Hempel, H., Hackl, A., Wolf, K., Stark, R., & Vaitl, D. (2007). Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neuroscience Letters*, *421*(1), 16–21. http://doi.org/10.1016/j.neulet.2007.04.074

Hölzel, B. K., Carmody, J., Evans, K. C., Hoge, E. A., Dusek, J. A., Morgan, L., et al. (2010). Stress reduction correlates with structural changes in the amygdala. *Social Cognitive and Affective Neuroscience*, *5*(1), 11–17. http://doi.org/10.1093/scan/nsp034

Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., & Lazar, S. W. (2011a). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research*, *191*(1), 36–43. http://doi.org/10.1016/j.pscychresns.2010.08.006

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011b). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science*, *6*(6), 537–559. http://doi.org/10.1177/1745691611419671

Howard, S. K., Rosekind, M. R., Katz, J. D., & Berry, A. J. (2002). Fatigue in anesthesia: implications and strategies for patient and provider safety. *Anesthesiology*, *97*(5), 1281–1294.

Hudlicka, E. (2013). Virtual training and coaching of health behavior: example from mindfulness meditation training. *Patient Education and Counseling*, *92*(2), 160–166. http://doi.org/10.1016/j.pec.2013.05.007

Hussong, A. M. (2003). Further refining the stress-coping model of alcohol involvement. *Addictive Behaviors*. http://doi.org/10.1016/S0306-4603(03)00072-8

Hutcheson, G. D., & Sofroniou, N. (1999). Multivariate Social Scientist: Introductory Statistics Using Generalized Linear Models. Retrieved from http://www.ebrary.com.

Hutchinson, J. G., & Williams, P. G. (2007). Neuroticism, daily hassles, and depressive symptoms: An examination of moderating and mediating effects. *Personality and Individual Differences*, *42*(7), 1367–1378. http://doi.org/10.1016/j.paid.2006.10.014

Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review

of studies of depression prevalence in university students. *Journal of Psychiatric Research*, *47*(3), 391–400. http://doi.org/10.1016/j.jpsychires.2012.11.015

Institute of Medicine (IOM), National Academy of Sciences. (1982). *Stress and Human Health: Analysis and Implications of Research* (IOM Report No. 81-05). New York, NY: Springer.

Irving, J. A., Dobkin, P. L., & Park, J. (2009). Cultivating mindfulness in health care professionals: A review of empirical studies of mindfulness-based stress reduction (MBSR). *Complementary Therapies in Clinical Practice*, *15*(2), 61–66. http://doi.org/10.1016/j.ctcp.2009.01.002

Irving, J. A., Fitzpatrick, M., Dobkin, P. L., Chen, A., & Hutchinson, T. (2012). Experiences of health care professionals enrolled in Mindfulness-based medical practice: A grounded theory model. *Mindfulness*. Online publication. http://doi.org/10.1007/s12671-012-0147-9

Irving, J. A., Farb, N. A. S., & Segal, Z. V. (2015) Mindfulness-based cognitive therapy for chronic depression. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 348-366). New York, NY: Guilford Press.

Janz, P., Pepping, C. A., & Halford, W. K. (2015). Individual differences in dispositional mindfulness and initial romantic attraction: A speed dating experiment. *Personality and Individual Differences*. http://doi.org/10.1016/j.paid.2015.02.025

Jenkins, C. L., Elliott, A. R., & Harris, J. R. (2006). Identifying ethical issues of the Department of the Army civilian and Army Nurse Corps certified registered nurse anesthetists. *Military Medicine*, *171*(8), 762–769.

Joint Commission. (2008). *Sentinel event alert: Behaviors that undermine a culture of safety,* (40) July. Retrieved from www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_40.htm.

Jones, K. D., Mist, S. D., Agnew, M. C., Ali, A., & Christopher, M. S. (2015). Fibromyalgia impact and mindfulness characteristics in 4,986 people with fibromyalgia. *EXPLORE: The Journal of Science & Healing, 11,* 304-309. http://doi.org/10.1016/j.explore.2015.04.006

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *General Hospital Psychiatry*, *4*(1), 33–47.

Kabat-Zinn, J. (1990). *Full Catastrophe Living: using the Wisdom of your Body and Mind to Face Stress, Pain, and Illness*. New York, NY: Bantam Doubleday Dell Publishing.

Kabat-Zinn, J. (1994). *Wherever You Go, There You Are*. New York, NY: Hyperion

Kabat-Zinn, J. (2003). Mindfulness‐based interventions in context: past, present, and future. *Clinical Psychology: Science and Practice*, *10*(2), 144-156. http://doi.org/10.1093/clipsy.bpg016

Kabat-Zinn, J. (2009). Foreword. In F. Didonna (Ed.). *Clinical Handbook of Mindfulness*. (pp. xxv-xxxiii). New York, NY: Springer.

Kabat-Zinn, J. (2011). Some reflections on the origins of MBSR, skillful means, and the trouble with maps. *Contemporary Buddhism*. http://doi.org/10.1080/14639947.2011.564844

Kabat-Zinn, J. (2015, April). Mindfulness, ethics, and intervention. In S. F. Santorelli (Chair). *Meeting the World: Exploring the Ethics, Values and Responsibility of Bringing Mindfulness into Society*. Center for Mindfulness in Medicine, Health Care, and Society Spring Conference. Shrewsbury, MA.

Kang, Y. S., Choi, S. Y., & Ryu, E. (2009). The effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea. *Nurse Education Today*, *29*(5), 538–543. http://doi.org/10.1016/j.nedt.2008.12.003

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, *4*(1), 1–39.

Karyadi, K. A., VanderVeen, J. D., & Cyders, M. A. (2014). A meta-analysis of the relationship between trait mindfulness and substance use behaviors. *Drug and Alcohol Dependence*, *143*, 1–10. http://doi.org/10.1016/j.drugalcdep.2014.07.014

Kazdin, A. E. (2008). Evidence-based treatment and practice: new opportunities to bridge clinical research and practice, enhance the knowledge base, and improve patient care. *The American Psychologist*, *63*(3), 146–159. http://doi.org/10.1037/0003-066X.63.3.146

Keller, S. P. & Kelvin, E. A. (2013). *Munro's Statistical Methods for Health Care Research (6th ed.)*. Philadelphia, PA: Wolters Kluwer.

Kendrick, P. (2000). Comparing the effects of stress and relationship style on student and practicing nurse anesthetists. *AANA Journal*, *68*(2), 115–122.

Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review*, *31*(6), 1041–1056. http://doi.org/10.1016/j.cpr.2011.04.006

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, *62*(6), 593–602. http://doi.org/10.1001/archpsyc.62.6.593

Khoury, B., Sharma, M., Rush, S. E., & Fournier, C. (2015). Mindfulness-based stress reduction for healthy individuals: A meta-analysis. *Journal of Psychosomatic Research*, 1–48. http://doi.org/10.1016/j.jpsychores.2015.03.009

Kiken, L. G., Garland, E. L., Bluth, K., & Palsson, O. S. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual Differences, 81,* 41-46. http://doi.org/10.1016/j.paid.2014.12.044

Kinzl, J. F., Traweger, C., Trefalt, E., Riccabona, U., & Lederer, W. (2007). Work stress and gender-dependent coping strategies in anesthesiologists at a university hospital. *Journal of Clinical Anesthesia*, *19*(5), 334–338. http://doi.org/10.1016/j.jclinane.2006.08.014

Knight, J. R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E. R., & Schuckit, M. A. (2002). Alcohol abuse and dependence among U.S. college students. *Journal of Studies on Alcohol*, *63*(3), 263–270.

Kohn, P. M., Lafreniere, K., & Gurevich, M. (1990). The Inventory of College Students' Recent Life Experiences: a decontaminated hassles scale for a special population. *Journal of Behavioral Medicine*, *13*(6), 619–630.

Kraemer, H. C., Gullion, C. M., Rush, A. J., Frank, E., & Kupfer, D. J. (1994). Can state and trait variables be disentangled? A methodological framework for psychiatric disorders. *Psychiatry Research*, *52*(1), 55–69. http://doi.org/10.1016/0165-1781(94)90120-1

Lamis, D. A., & Lester, D. (2013). Risk and protective factors for reasons for living in college men. *International Journal of Men's Health*, *11*(3), 189–201. http://doi.org/10.3149/jmh.1103.189

Lamothe, M., Rondeau, É., Malboeuf-Hurtubise, C., Duval, M., & Sultan, S. (2016). Outcomes of MBSR or MBSR-based interventions in health care providers: A systematic review with a focus on empathy and emotional competencies. *Complementary Therapies in Medicine*, *24*, 19–28. http://doi.org/10.1016/j.ctim.2015.11.001

Larsson, J., & Sanner, M. (2010). Doing a good job and getting something good out of it: on stress and well-being in anaesthesia. *British Journal of Anaesthesia*, *105*(1), 34–37. http://doi.org/10.1093/bja/aeq125

Laschinger, H. K ., Leiter, M., Day, A. & Gilin, D. (2009). Workplace empowerment, incivility, and burnout: impact on staff nurse recruitment and retention outcomes. *Journal of Nursing Management*, *17*(3), 302–311. http://doi.org/10.1111/j.1365-2834.2009.00999.x

Laschinger, H. K., Wong, C., Regan, S., Young-Ritchie, C., & Bushell, P. (2013). Workplace incivility and new graduate nurses' mental health: the protective role of resiliency. *The Journal of Nursing Administration*, *43*(7-8), 415–421. http://doi.org/10.1097/NNA.0b013e31829d61c6

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., et al. (2006). The Toronto Mindfulness Scale: Development and validation. *Journal of Clinical Psychology*, *62*(12), 1445–1467. http://doi.org/10.1002/jclp.20326

Lazarus, R. S. (1966). *Psychological Stress and the Coping Process*. New York, NY: McGraw-Hill

Lazarus, R. S. & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York, NY: Springer

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R. (1985). Stress and adaptational outcomes. The problem of confounded measures. *The American Psychologist*, *40*(7), 770–785.

Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*.

Lay, C. H., & Safdar, S. F. (2003). Daily hassles and distress among college students in relation to immigrant and minority status. *Current Psychology*, *22*(1), 3–22. http://doi.org/10.1007/s12144-003-1009-3

Lederer, W., Kinzl, J. F., Trefalt, E., Traweger, C., & Benzer, A. (2005). Significance of working conditions on burnout in anesthetists. *Acta Anaesthesiologica Scandinavica*, *50*(1), 58–63. http://doi.org/10.1111/j.1399-6576.2005.00867.x

Lee, E. H., Chung, B. Y., Suh, C.-H., & Jung, J. Y. (2014). Korean versions of the Perceived Stress Scale (PSS-14, 10 and 4): psychometric evaluation in patients with chronic disease. *Scandinavian Journal of Caring Sciences*, *29*(1), 183–192. http://doi.org/10.1111/scs.12131

Lee, S., Colditz, G., Berkman, L., & Kawachi, I. (2003). Caregiving to children and grandchildren and risk of coronary heart disease in women. *American Journal of Public Health*, *93*(11), 1939–1944. http://doi.org/10.1016/S0749-3797(02)00582-2

Lewinsohn, P. M., & Talkington, J. (1979). Studies on the measurement of unpleasant events and relations with depression. *Applied Psychological Measurement*, *3*(1), 83–

101. http://doi.org/10.1177/014662167900300110

Liffman, S., Thorsteinsson, E. B., Brown, R. F., & Hine, D. W. (2012). Mediators and moderators of stress - Fatigue and psychological distress - Fatigue relationships in a non-clinical sample. *Psychology and Education, 49*, 29-45.

Lin, S. H., & Huang, Y. C. (2013). Life stress and academic burnout. *Active Learning in Higher Education*. http://doi.org/10.1177/1469787413514651

Linehan, M. M., Heard, H. L. & Armstrong, H. E. (1993). Naturalistic follow-up of a behavioural treatment of chronically parasuicidal borderline patients. *Archives of General Psychiatry 50*(12), 971–974. http://doi.org/10.1001/archpsyc.1993.01820240055007.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335–343

Lu, L. (1994). University transition: major and minor life stressors, personality characteristics and mental health. *Psychological Medicine, 24,* 81-87. http://doi.org/10.1017/S0033291700026854

Luders, E., Toga, A. W., Lepore, N., & Gaser, C. (2009). The underlying anatomical correlates of long-term meditation: larger hippocampal and frontal volumes of gray matter. *Neuro Image*. http://doi.org/10.1016/j.neuroimage.2008.12.061

Lund, H. G., Reider, B. D., Whiting, A. B. & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of Adolescent Health, 46*(2), 124-132.

Lutz, A., Greischar, L. L., Rawlings, N. B., Ricard, M., & Davidson, R. J. (2004). Long-term meditators self-induce high-amplitude gamma synchrony during mental practice. *Proceedings of the National Academy of Sciences of the United States of America*, *101*(46), 16369–16373. http://doi.org/10.1073/pnas.0407401101

MacKillop, J., & Anderson, E. J. (2007). Further psychometric validation of the mindful attention awareness scale (MAAS). *Journal of Psychopathology and Behavioral Assessment, 29,* 289-293. http://doi.org/10.1007/s10862-007-9045-1

Marks, A., & Sobanski, D. J. (2010). Do dispositional rumination and/or mindfulness moderate the relationship between life hassles and psychological dysfunction in adolescents? *Australian and New Zealand Journal of Psychiatry, 44*(9), 831-838. http://doi.org/10.3109/00048674.2010.487478

Marlatt, G. A., Witkiewitz, K., Dillworth, T. M. et al. (2004). Vipassana meditation as a

treatment for alcohol and drug use disorders. In S. C. Hayes, V. M. Follette, & M. M. Linehan (Eds.). *Mindfulness and Acceptance: Expanding the Cognitive-Behavioral Tradition* (pp. 261-287). New York, NY: The Guilford Press.

Marsh, H. W., Hau, K. T., Wen, Z., Nagengast, B., & Morin, A. J. S. (2013). In Little, TD. (Ed) *The Oxford Handbook of Quantitative Methods Volume 2*. *Statistical Analysis. (pp. 1-28)* New York, NY: Oxford University Press; 2011.

Martín-Asuero, A., Rodríguez Blanco, T., Pujol-Ribera, E., Berenguera, A., & Moix Queraltó, J. (2013). Evaluación de la efectividad de un programa de mindfulness en profesionales de atención primaria. *Gaceta Sanitaria*, *27*(6), 521–528. http://doi.org/10.1016/j.gaceta.2013.04.007

Maslach, C., Schaufeli, W. B. & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology, 52*(1), 397–422. http://doi.org/10.1146/annurev.psych.52.1.397

Mayer, J. D., Roberts, R. D., & Barsade, S. G. (2008). Human abilities: Emotional intelligence. *Annual Review of Psychology*, *59*, 507–536. http://doi.org/10.1146/annurev.psych.59.103006.093646

McCracken, L. M., Gauntlett-Gilbert, J., & Vowles, K. E. (2007). The role of mindfulness in a contextual cognitive-behavioral analysis of chronic pain-related suffering and disability. *Pain*, *131*(1-2), 63–69. http://doi.org/10.1016/j.pain.2006.12.013

McEwen, B. S. (1998). Stress, adaptation, and disease. Allostasis and allostatic load. *Annals of the New York Academy of Sciences*, *840*, 33–44.

McEwen, B. S. & Lasley, E. N. (2002). *The End of Stress As We Know It*. New York, NY: Dana Press.

McEwen, B. S. (2006). Sleep deprivation as a neurobiologic and physiologic stressor: Allostasis and allostatic load. *Metabolism: Clinical and Experimental*, *55*(10 Suppl 2), S20–3. http://doi.org/10.1016/j.metabol.2006.07.008

McEwen, B. S., & Gianaros, P. J. (2011). Stress- and allostasis-induced brain plasticity. *Annual Review of Medicine*, *62*, 431–445. http://doi.org/10.1146/annurev-med-052209-100430

McKay, K. A. C., Buen, J. E., Bohan, K. J., & Maye, J. P. (2010). Determining the relationship of acute stress, anxiety, and salivary alpha-amylase level with performance of student nurse anesthetists during human-based anesthesia simulator training. *AANA Journal*, *78*(4), 301–309.

McNight, P. E., McNight, K. M., Sidani, S., & Figueredo, A. J. (2007). *Missing Data: A Gentle Introduction*. New York, NY: Guildford Press.

Mechanic, D. (1974). Discussion of research programs on relations between stressful life events and episodes of physical illness. In B. S. Dohrenwend, & B. P. Dohrenwend (Eds.). *Stressful Life Events: Their Nature and Effects* (pp. 87-98). New York, NY: Wiley.

Meeusen, V. C. H., Van Dam, K., Brown-Mahoney, C., Van Zundert, A. A. J., & Knape, H. T. A. (2011). Understanding nurse anesthetists' intention to leave their job. *Health Care Management Review*, *36*(2), 155–163. http://doi.org/10.1097/HMR.0b013e3181fb0f41

Melzack, R., Coderre, T. J., Katz, J., & Vaccarino, A. L. (2001). Central neuroplasticity and pathological pain. *Annals of the New York Academy of Sciences*, *933*, 157–174. http://doi.org/10.1111/j.1749-6632.2001.tb05822.x

Mennin, D. S., Fresco, D. M., Ritter, M., & Heimberg, R. G. (2015). An open trial of emotion regulation therapy for generalized anxiety disorder and cooccurring eepression. *Depression and Anxiety, 0*, 1-10. http://doi.org/10.1002/da.22377

Merlo, L. J., Singhakant, S., Cummings, S. M., & Cottler, L. B. (2013). Reasons for misuse of prescription medication among physicians undergoing monitoring by a physician health program. *Journal of Addiction Medicine*, *7*(5), 349–353. http://doi.org/10.1093/ox

Mittleman, M. A., Maclure, M., & Tofler, G. H. (1993). Triggering of acute myocardial infarction by heavy physical exertion--protection against triggering by regular exertion. ... *England Journal of ...*, *329*(23), 1677–1683. http://doi.org/10.1056/NEJM199312023292301

Modinos, G., Ormel, J., & Aleman, A. (2010). Individual differences in dispositional mindfulness and brain activity involved in reappraisal of emotion. *Social Cognitive and Affective Neuroscience*, *5*(4), 369–377. http://doi.org/10.1093/scan/nsq006

Monroe, S. M. (1983). Major and minor life events as predictors of psychological distress: further issues and findings. *Journal of Behavioral Medicine*, *6*(2), 189–205.

Monroe, S. M., & Simons, A. D. (1991). Diathesis-stress theories in the context of life stress research: implications for the depressive disorders. *Psychological Bulletin*, *110*(3), 406–425.

Monroe, S. M. & Kelley, J. M. (1995). Measurement of stress appraisal. In Cohen S, Kessler, RC, Gordon LU (Eds.) *Measuring stress: A guide for health and social scientists.* New York, NY: Oxford University Press

Monroe, S. M. (2008). Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology*, *4*, 33–52.

Monroe, T. B., Kenaga, H., Dietrich, M. S., Carter, M. A., & Cowan, R. L. (2013). The prevalence of employed nurses identified or enrolled in substance use monitoring programs. *Nursing Research*, *62*(1), 10–15. http://doi.org/10.1097/NNR.0b013e31826ba3ca

Moore, R. G., Hayhurst, H., & Teasdale, J. D. (1996). *Measure of aware-ness and coping in autobiographical memory: Instructions for administering and coding*. Unpublished manuscript, Department of Psychiatry, University of Cambridge.

Morledge, T. J., Allexandre, D., Fox, E., Fu, A. Z., Higashi, M. K., Kruzikas, D. T., et al. (2013). Feasibility of an online mindfulness program for stress management—A randomized controlled trial. *Annals of Behavioral Medicine*, *46*(2), 137–148. http://doi.org/10.1007/s12160-013-9490-x

National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA). Summary of NCE and SEE Performance and Clinical Experience: September 1, 2014, through August 31, 2015. Retrieved from https://www.nbcrna.com/certification/Documents/NCE/NCE_SEE_Annual_Rpt_FY2015.pdf

National Institute of Mental Health. (2015). *Suicide: A Major Preventable Mental Health Problem*. Retrieved from http://www.nimh.nih.gov/health/publications/suicide-a-major-preventable-mental-health-problem-fact-sheet/teen-suicide_141731.pdf

Neuser, Ninfa J. (2010). Examining the actors of Mindfulness: A Confirmatory Factor Analysis of the Five Facet Mindfulness Questionnaire (Doctoral dissertation, Pacific University). Retrieved from: http://commons.pacificu.edu/spp/128

Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*, 223-250. http://doi.org/10.1080/15298860390209035

Nyssen, A. S., Hansez, I., Baele, P., Lamy, M., & De Keyser, V. (2003). Occupational stress and burnout in anaesthesia. *British Journal of Anaesthesia*, *90*(3), 333–337. http://doi.org/10.1093/bja/aeg058

Nyssen, A. S., & Hansez, I. (2008). Stress and burnout in anaesthesia. *Current Opinion in Anaesthesiology*, *21*(3), 406–411. http://doi.org/10.1097/ACO.0b013e3282ff85cd

Öhman, A. (1993). Fear and anxiety as emotional phenomena: Clinical phenomenology, evolutionary perspectives, and information processing mechanisms. In L. Lewis & J. M. Haviland (Eds.). *Handbook of Emotions* (pp. 511-536). New York, NY: Guilford Press.

Osman, A., Barrios, F. X., Longnecker, J., & Osman, J. R. (1994). Validation of the Inventory of College Students' Recent Life Experiences in an American college

sample. *Journal of Clinical Psychology*, *50*(6), 856–863.

Ospina, M. B., Bond, K., Karkhaneh, M., Tjosvold, L., Vandermeer, B., Liang, Y., et al. (2007). Meditation practices for health: state of the research. *Evidence Report/Technology Assessment*, (155), 1–263.

Otani, H. (2011). Oxidative stress as pathogenesis of cardiovascular risk associated with metabolic syndrome. *Antioxidants & Redox Signaling*, *15*(7), 1911–1926. http://doi.org/10.1089/ars.2010.3739

Oyeleye, O., Hanson, P., O'Connor, N., & Dunn, D. (2013). Relationship of workplace incivility, stress, and burnout on nurses' turnover intentions and psychological empowerment. *The Journal of Nursing Administration*, *43*(10), 536–542. http://doi.org/10.1097/NNA.0b013e3182a3e8c9

Pagnoni, G., & Cekic, M. (2007). Age effects on gray matter volume and attentional performance in Zen meditation. *Neurobiology of Aging*, *28*(10), 1623–1627. http://doi.org/10.1016/j.neurobiolaging.2007.06.008

Paradies, Y. (2011). A Theoretical Reviw of Psychosocial Stress and Health. In *Psychology Research Progress* (pp. 1–20). New York.

Paul, N. A., Stanton, S. J., Greeson, J. M., Smoski, M. J., & Wang, L. (2013). Psychological and neural mechanisms of trait mindfulness in reducing depression vulnerability. *Social Cognitive and Affective Neuroscience*, *8*(1), 56–64. http://doi.org/10.1093/scan/nss070

Paulson, S., Davidson, R., Jha, A., & Kabat-Zinn, J. (2013). Becoming conscious: the science of mindfulness. *Annals of the New York Academy of Sciences*, *1303*, 87–104. http://doi.org/10.1111/nyas.12203

Paykel, E. S. (1978). Contribution of life events to causation of psychiatric illness. *Psychological Medicine, 8*(2), 245-253.

Pearlin, L. I. (1993). The social contexts of stress. In L. Goldberger & S. Breznitz (Eds.). *Handbook of Stress: Theoretical and Clinical Aspects (2nd ed.)* (pp. 303-315). New York, NY: The Free Press.

Peisah, C., Latif, E., Wilhelm, K., & Williams, B. (2009). Secrets to psychological success: Why older doctors might have lower psychological distress and burnout than younger doctors. *Aging & Mental Health*, *13*(2), 300–307. http://doi.org/10.1080/13607860802459831

Peltzer, K., & Pengpid, S. (2014). Nocturnal sleep problems among university students from 26 countries. *Sleep and Breathing*, *19*(2), 499–508. http://doi.org/10.1007/s11325-014-1036-3

Perez, E. C., & Carroll-Perez, I. (1999). A national study: stress perception by nurse anesthesia students. *AANA Journal*, *67*(1), 79–86.

Perry, T. R. (2005). The certified registered nurse anesthetist: occupational responsibilities, perceived stressors, coping strategies, and work relationships. *AANA Journal*, *73*(5), 351–356.

Pett, M. A., & Johnson, M. J. M. (2005). Development and Psychometric Evaluation of the Revised University Student Hassles Scale. *Educational and Psychological Measurement*, *65*(6), 984–1010. http://doi.org/10.1177/0013164405275661

Pettit, J. W., Lewinsohn, P. M., Roberts, R. E., Seeley, J. R., & Monteith, L. (2008). The long-term course of depression: development of an empirical index and identification of early adult outcomes. *Psychological Medicine*, *39*(03), 403–18. http://doi.org/10.1017/S0033291708003851

Phillips, J. K. (2010). Exploring student nurse anesthetist stressors and coping using grounded theory methodology. *AANA Journal*, *78*(6), 474–482.

Pompili, M., Serafini, G., Innamorati, M., Dominici, G., Ferracuti, S., Kotzalidis, G. D., et al. (2010). Suicidal behavior and alcohol abuse. *International Journal of Environmental Research and Public Health*, *7*(4), 1392–1431. http://doi.org/10.3390/ijerph7041392

Prasad, K., Wahner-Roedler, D. L., Cha, S. S., & Sood, A. (2011). Effect of a single-session meditation training to reduce stress and improve quality of life among health care professionals: a "dose-ranging" feasibility study. *Alternative Therapies in Health and Medicine*, *17*(3), 46–49.

Pugachov, S. G., Maxwell, D., Youmans, J., & Wahnscha, K. *Characteristics of successful nursing students* (2015, June). Paper presented at the Phi Kappa Phi Research Symposium. Retrieved from http://digitalcommons.georgiasouthern.edu/pkp/2015/Undergraduate/3

Quaglia, J. T., Brown, K. W., Lindsay, E. K., Creswell, J. D. & Goodman, R. J. (2015). From conceptualization to operationalization of mindfulness. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 151-170). New York, NY: Guilford Press.

Radzvin, L. C. (2011). Moral distress in certified registered nurse anesthetists: implications for nursing practice. *AANA Journal*, *79*(1), 39–45.

Raichle, M. E., & Mintun, M. A. (2006). Brain work and brain imaging. *Annual Review of Neuroscience*, *29*(1), 449–476. http://doi.org/10.1146/annurev.neuro.29.051605.112819

Rawson, J. V., Thompson, N., Sostre, G., & Deitte, L. (2013). The cost of disruptive and unprofessional behaviors in health care. *Academic Radiology*, *20*(9), 1074-1076. http://dx.doi.org/10.1016/j.acra.2013.05.009

Reason, J. (2005). Safety in the operating theatre - Part 2: Human error and organizational failure. *Quality and Safety in Health Care*, *14*(1), 56–60.

Robinson, O. J., Vytal, K., Cornwell, B. R., & Grillon, C. (2013). The impact of anxiety upon cognition: Perspectives from human threat of shock studies. *Frontiers in Human Neuroscience*, *7*, 203. http://doi.org/10.3389/fnhum.2013.00203

Roemer, L., Lee, J. K., Salters-Pedneault, K., Erisman, S. M., Orsillo, S. M., & Mennin, D. S. (2009). Mindfulness and emotion regulation difficulties in generalized anxiety disorder: Preliminary evidence for independent and overlapping contributions. *Behavior Therapy*, *40*(2), 142–154. http://doi.org/10.1016/j.beth.2008.04.001

Rosch, E. (2007). More than mindfulness: When you have a tiger by the tail, let it eat you. *Psychological Inquiry*, *18*(4), 258–264. http://doi.org/10.1080/10478400701598371

Rosen, J. B., & Schulkin, J. (1998). From normal fear to pathological anxiety. *Psychological Review*, *105*(2), 325–350.

Rosenstein, A. H., & O'Daniel, M. (2006). Impact and implications of disruptive behavior in the perioperative arena. *Journal of the American College of Surgeons*, *203*(1), 96–105. http://doi.org/10.1016/j.jamcollsurg.2006.03.027

Rosenstein, A. H., & O'Daniel, M. (2008). A survey of the impact of disruptive behaviors and communication defects on patient safety. *Joint Commission Journal on Quality and Patient Safety*, *34*(8), 464–471.

Rosenzweig, S., Reibel, D. K., Greeson, J. M., Brainard, G. C., & Hojat, M. (2003). Mindfulness-based stress reduction lowers psychological distress in medical students. *Teaching and Learning in Medicine*, *15*(2), 88–92. http://doi.org/10.1207/S15328015TLM1502_03

Rowlinson, R. T., & Feiner, R. D. (1988). Major life events, hassles, and adaptation in adolescence: Confounding in the conceptualization and measurement of life stress and adjustment revisited. *Journal of Personality and Social Psychology, 55*, 432-444.

Rubin, D. B. (1976). Inference and missing data. *Biometrika*, *63*(3), 581–592. http://doi.org/10.1093/biomet/63.3.581

Ruotsalainen, J., Verbeek, J. H., Mariné, A., & Serra, C. (2015). Preventing occupational

stress in healthcare workers. *Cochrane Database of Systematic Reviews, 2015*(4). doi: 10.1002/14651858.CD002892.pub5.

Safran, J. D. & Segal, Z. V. (1990). *Interpersonal Process in Cognitive Therapy*. New York, NY: Basic Books.

Sakellaropoulos, A., Pires, J., Estes, D., & Jasinski, D. (2011). Workplace aggression: assessment of prevalence in the field of nurse anesthesia. *AANA Journal*, *79*(4 Suppl), S51–7.

Sarafino, E. P., & Ewing, M. (1999). The Hassles Assessment Scale for students in college: Measuring the frequency and unpleasantness of and dwelling on stressful events. *Journal of American College Health*, *48*(2), 75-83.

Saravanan, C., & Wilks, R. (2014). Medical students' experience of and reaction to stress: the role of depression and anxiety. *The Scientific World JOURNAL*, *2014*(2), 737382–8. http://doi.org/10.1155/2014/737382

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177. http://doi.org/10.1037//1082-989X.7.2.147

Schirda, B., Nicholas, J. A., & Prakash, R. S. (2015). Examining trait mindfulness, emotion dysregulation, and quality of life in multiple sclerosis. *Health Psychology*, *34*(11), 1107–1115. http://doi.org/10.1037/hea0000215

Schwartz, B. G., French, W. J., Mayeda, G. S., Burstein, S., Economides, C., Bhandari, A. K., et al. (2012). Emotional stressors trigger cardiovascular events. *International Journal of Clinical Practice*, *66*(7), 631–639. http://doi.org/10.1111/j.1742-1241.2012.02920.x

Seaward, B. L. (2014). *Managing Stress: Principles and Strategies for Health and Well-Being (8th ed.).* Burlington, MA: Jones & Bartlett Learning.

Sedgwick, P. (2014). Cross sectional studies: advantages and disadvantages. *BMJ: British Medical Journal*. http://doi.org/10.1136/bmj.g2276

Seeds, P. M., & Dozois, D. J. A. (2010). Prospective evaluation of a cognitive vulnerability-stress model for depression: the interaction of schema self-structures and negative life events. *Journal of Clinical Psychology*, *66*(12), 1307–1323. http://doi.org/10.1002/jclp.20723

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-Based Cognitive Therapy for Depression: A New Approach to Preventing Relapse*. New York, NY: Guilford Press

Segerstrom, S. C., & Miller, G. E. (2004). Psychological stress and the human immune

system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin*, *130*(4), 601–630. http://doi.org/10.1037/0033-2909.130.4.601

Selye, H. (1936). A syndrome produced by diverse nocuous agents. *Nature*. http://doi.org/10.1176/jn

Selye, H. (1950). Stress and the general adaptation syndrome. *BMJ (clinical research ed.)*, *1*(4667), 1383–1392. http://doi.org/10.1136/bmj.1.4667.1383

Selye, H. (1974). *Stress Without Distress*. Philadelphia, NY: J. B. Lippincott

Shanafelt, T. D., Balch, C. M., Bechamps, G. J., Russell, T., Dyrbye, L., Satele, D., et al. (2009). Burnout and career satisfaction among American surgeons. *Annals of Surgery, 250(3), 463-471*. http://doi.org/10.1097/SLA.0b013e3181ac4dfd

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress reduction on medical and premedical students. *Journal of Behavioral Medicine*, *21*(6), 581–599.

Shapiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-based stress reduction for health care professionals: Results from a randomized trial. *International Journal of Stress Management*, *12*(2), 164–176. http://doi.org/10.1037/1072-5245.12.2.164

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*(3), 373–386. http://doi.org/10.1002/jclp.20237

Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training and Education in Professional Psychology*, *1*(2), 105–115. http://doi.org/10.1037/1931-3918.1.2.105

Shapiro, S. L. & Carlson, L. E. (2009). *The Art and Science of Mindfulness: Integrating Mindfulness Into Psychology and the Helping Professions.* Washington D. C.: American Psychological Association.

Shapiro, S. L., Brown, K. W., Thoresen, C., & Plante, T. G. (2011). The moderation of Mindfulness-based stress reduction effects by trait mindfulness: results from a randomized controlled trial. *Journal of Clinical Psychology*, *67*(3), 267–277. http://doi.org/10.1002/jclp.20761

Shapiro, S. L. & Jazaieri, H. (2015). Mindfulness-based stress reduction for healthy stressed adults. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 269-282). New York, NY: Guilford Press.

Sharma, M., & Majumdar, P. K. (2009). Occupational lifestyle diseases: An emerging issue. *Indian Journal of Occupational and Environmental Medicine*, *13*(3), 109–6. http://doi.org/10.4103/0019-5278.58912

Sinclair, S. J., Siefert, C. J., Slavin-Mulford, J. M., Stein, M. B., Renna, M., & Blais, M. A. (2012). Psychometric evaluation and normative data for the depression, anxiety, and stress scales-21 (DASS-21) in a nonclinical sample of U.S. adults. *Evaluation & the Health Professions*, *35*(3), 259–279. http://doi.org/10.1177/0163278711424282

Singh, R., Goyal, M., Tiwari, S., Ghildiyal, A., Nattu, S. M., & Das, S. (2012). Effect of examination stress on mood, performance and cortisol levels in medical students. *Indian Journal of Physiology and Pharmacology*, *56*(1), 48–55.

Sofield, L., & Salmond, S. W. (2003). Workplace violence: A focus on verbal abuse and intent to leave the organization. *Orthopaedic Nursing, 22*(4), 274-283.

Söderström, M., Jeding, K., Ekstedt, M., Perski, A., & Åkerstedt, T. (2012). Insufficient sleep predicts clinical burnout. *Journal of Occupational Health Psychology*, *17*(2), 175–183. http://doi.org/10.1037/a0027518

Song, Y., & Lindquist, R. (2015). Effects of mindfulness-based stress reduction on depression, anxiety, stress and mindfulness in Korean nursing students. *Nurse Education Today*, *35*(1), 86–90. http://doi.org/10.1016/j.nedt.2014.06.010

Soysa, C. K., & Wilcomb, C. J. (2015). Mindfulness, self-compassion, self-efficacy, and gender as predictors of depression, anxiety, stress, and well-being. *Mindfulness*, *6*(2), 217–226. http://doi.org/10.1007/s12671-013-0247-1

Snowden, A., Stenhouse, R., Young, J., Carver, H., Carver, F., & Brown, N. (2015). The relationship between emotional intelligence, previous caring experience and mindfulness in student nurses and midwives: a cross sectional analysis. *Nurse Education Today*, *35*(1), 152–158. http://doi.org/10.1016/j.nedt.2014.09.004

Staner, L. (2003). Sleep and anxiety disorders. *Dialogues in Clinical Neuroscience*, 5(3), 249-258

Starcke, K., & Brand, M. (2012). Decision making under stress: a selective review. *Neuroscience & Biobehavioral Reviews*, *36*(4), 1228–1248. http://doi.org/10.1016/j.neubiorev.2012.02.003

Starr, L. R., & Davila, J. (2012). Responding to anxiety with rumination and hopelessness: mechanism of anxiety-depression symptom co-occurrence? *Cognitive Therapy and Research*, *36*(4), 321–337. http://doi.org/10.1007/s10608-011-9363-1

StataCorp. (2015). *Stata Multiple-Imputation Reference Manual: Release 14*. College

Station, TX: Stata Press.

Stecker, M., & Stecker, M. M. (2014). Disruptive staff interactions: a serious source of inter-provider conflict and stress in health care settings. *Issues in Mental Health Nursing*, *35*(7), 533–541. http://doi.org/10.3109/01612840.2014.891678

Stelter, R. (2010). Experience-based, body-anchored qualitative research interviewing. *Qualitative Health Research*, *20*(6), 859–867. http://doi.org/10.1177/1049732310364624

Stiegler, M. P., & Gaba, D. M. (2015). Decision-making and cognitive strategies. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, *10*(3), 133–138. http://doi.org/10.1097/sih.0000000000000093

Strike, P. C., & Steptoe, A. (2005). Behavioral and emotional triggers of acute coronary syndromes: a systematic review and critique. *Psychosomatic Medicine*, *67*(2), 179–186. http://doi.org/10.1097/01.psy.0000155663.93160.d2

Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings* (NSDUH Series H-48, HHS Publication No. SMA 14-4863). Rockville, MD: Retrieved from http://store.samhsa.gov/product/Results-from-the-2013-National-Survey-on-Drug-Use-and-Health-Summary-of-National-Findings/SMA14-4863

Szabo, T. G., Long, D. M., Villatte, M., & Hayes, S. C. (2015). Mindfulness in contextual cognitive-behavioral models. In K. W. Brown, J. D. Creswell, & R. M. Ryan (Eds.). *Handbook of Mindfulness Theory, Research, and Practice* (pp. 130-147). New York, NY: Guilford Press.

Tamres, L. K., Janicki, D., & Helgeson, V. S. (2002). Sex Differences in Coping Behavior: A Meta-Analytic Review and an Examination of Relative Coping. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, 6*(1), 2–30. http://doi.org/10.1207/S15327957PSPR0601_1

Taylor, J. M. (2015). Psychometric analysis of the ten-item Perceived Stress Scale. *Psychological Assessment*, *27*(1), 90–101. http://doi.org/10.1037/a0038100

Taylor, V. A., Grant, J., Daneault, V., Scavone, G., Breton, E., Roffe-Vidal, S., et al. (2011). Impact of meditation training on the default mode network during a restful state. *Social Cognitive and Affective Neuroscience, 8*(1), 4-14

Teasdale, J. D., Moore, R. G., & Hayhurst, H. (2002). Metacognitive awareness and prevention of relapse in depression: empirical evidence. *Journal of Consulting and Clinical Psychology, 70*(2), 275–287. http://doi.org/10.1037//0022-006X.70.2.275

Thera, Nyanaponika (1969). *The Heart of Buddhist Meditation: A Handbook of Mental Training Based on the Buddha's Way of Mindfulness*. New York, NY: Citadel Press.

Thoits, P. A. (2010). Stress and health: major findings and policy implications. *Journal of Health and Social Behavior*, *51 Suppl*, S41–53. http://doi.org/10.1177/0022146510383499

Thompson, B. L., & Waltz, J. (2007). Everyday mindfulness and mindfulness meditation: Overlapping constructs or not? *Personality and Individual Differences*, *43*(7), 1875–1885. http://doi.org/10.1016/j.paid.2007.06.017

Turner, R. J. & Wheaton, B. (1995). Checklist measurement of stressful life events. In S. Cohen, R. C. Kessler & L. Underwood Gordon (Eds.). *Measuring Stress: A Guide for Health and Social Scientists* (pp. 29-53). New York, NY: Oxford University Press.

Vahey, D. C., Aiken, L. H., Sloane, D. M., Clarke, S. P., & Vargas, D. (2004). Nurse burnout and patient satisfaction. *Medical Care*, *42*(Suppl), II–57–II–66. http://doi.org/10.1097/01.mlr.0000109126.50398.5a

Van Dam, N. T., Hobkirk, A. L., Danoff-Burg, S., & Earleywine, M. (2012). Mind your words: Positive and negative items create method effects on the Five Facet Mindfulness Questionnaire. *Assessment*, *19*(2), 198–204. http://doi.org/10.1177/1073191112438743

Van der Riet, P., Rossiter, R., Kirby, D., Dluzewska, T., & Harmon, C. (2015). Piloting a stress management and mindfulness program for undergraduate nursing students: Student feedback and lessons learned. *Nurse Education Today*, *35*(1), 44–49. http://doi.org/10.1016/j.nedt.2014.05.003

Van Dijk, I., Lucassen, P. L., & Speckens, A. E. (2015). Mindfulness training for medical students in their clinical clerkships: two cross-sectional studies exploring interest and participation. *BMC Medical Education*, *15*(1), 24. http://doi.org/10.1186/s12909-015-0302-9

Virani, S. S., Khan, A. N., & Mendoza, C. E. (2007). Takotsubo cardiomyopathy, or broken-heart syndrome. *Texas Heart Institute Journal, 34*(1), 76-79

Vitaliano, P. P., Maiuro, R. D., Mitchell, E., & Russo, J. (1989). Perceived stress in medical school: resistors, persistors, adaptors and maladaptors. *Social Science & Medicine (1982)*, *28*(12), 1321–1329.

Voltmer, E., Kötter, T., & Spahn, C. (2012). Perceived medical school stress and the development of behavior and experience patterns in German medical students. *Medical Teacher*, *34*(10), 840–847. http://doi.org/10.3109/0142159X.2012.706339

Wallace, B. A. (2008). A Mindful Balance. *Tricycle*, (Spring). 60–63, 109–111.

Wallace, J. E., Lemaire, J. B., & Ghali, W. A. (2009). Physician wellness: a missing quality indicator. *Lancet*, *374*(9702), 1714–1721. http://doi.org/10.1016/S0140-6736(09)61424-0

Warbah, L., Sathiyaseelan, M., VijayaKumar, C., Vasantharaj, B., Russell, S., & Jacob, K. S. (2007). Psychological distress, personality, and adjustment among nursing students. *Nurse Education Today*, *27*(6), 597–601. http://doi.org/10.1016/j.nedt.2006.09.002

Warnecke, E., Quinn, S., Ogden, K., Towle, N., & Nelson, M. R. (2011). A randomized controlled trial of the effects of mindfulness practice on medical student stress levels. *Medical Education*, *45*(4), 381–388. http://doi.org/10.1111/j.1365-2923.2010.03877.x

Warner, D. O., Berge, K., Sun, H., Harman, A., Hanson, A., & Schroeder, D. R. (2013). Substance use disorder among anesthesiology residents, 1975-2009. *JAMA*, *310*(21), 2289–2296. http://doi.org/10.1001/jama.2013.281954

Waszczuk, M. A., Zavos, H. M. S., Antonova, E., Haworth, C. M., Plomin, R., & Eley, T. C. (2015). Multivariate twin study of trait mindfulness, depressive symptoms, and anxiety sensitivity. *Depression and Anxiety*. http://doi.org/10.1002/da.22326

Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology*, *97*(3), 346–353.

Way, B. M., Creswell, J. D., Eisenberger, N. I., & Lieberman, M. D. (2010). Dispositional mindfulness and depressive symptomatology: correlations with limbic and self-referential neural activity during rest. *Emotion*, *10*(1), 12–24. http://doi.org/10.1037/a0018312

Webster Marketon, J. I., & Glaser, R. (2008). Stress hormones and immune function. *Cellular Immunology*, *252*(1-2), 16–26. http://doi.org/10.1016/j.cellimm.2007.09.006

Weinstein, N., Brown, K. W., & Ryan, R. M. (2009). A multi-method examination of the effects of mindfulness on stress attribution, coping, and emotional well-being. *Journal of Research in Personality*, *43*(3), 374–385. http://doi.org/10.1016/j.jrp.2008.12.008

Weitzman, E. R. (2004). Poor mental health, depression, and associations with alcohol consumption, harm, and abuse in a national sample of young adults in college. *The Journal of Nervous and Mental Disease*, *192*(4), 269–277. http://doi.org/10.1097/01.nmd.0000120885.17362.94

Wenzel, M., Versen, von, C., & Hirschmüller, S. (2015). Curb your neuroticism–

mindfulness mediates the link between neuroticism and subjective well-being. *Personality and Individual Differences, 80,* 68-75. http://doi.org/10.1016/j.paid.2015.02.020

Wheaton, B. (1999). Social Stress. In *Handbook of the Sociology of Mental Health* (pp. 277–300). Boston, MA: Springer US. http://doi.org/10.1007/0-387-36223-1_14

White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, *30*(4), 377–399. http://doi.org/10.1002/sim.4067

Wilcox, R. R., & Keselman, H. J. (2003). Modern robust data analysis methods: measures of central tendency. *Psychological Methods*, *8*(3), 254–274. http://doi.org/10.1037/1082-989X.8.3.254

Wilcox, R. R. & Keselman, H. J. (2012). Modern regression methods that can substantially increase power and provide a more accurate understanding of associations. *European Journal of Personality, 26*(3), 165-174. http://doi.org/10.1002/per.860

Wildgust, B. M. (1986). Stress in the anesthesia student. *AANA Journal*, 272–278.

Williams, J. M.G. & Kabat-Zinn, J. (2010). Mindfulness: Diverse perspectives on its meaning, origins, and multiple applications at the intersection of science and dharma. *Contemporary Buddhism, 12*(1), 1-18. http://dx.doi.org/10.1080/14639947.2011.564811

Wilson, H., & Compton, M. (2009). Reentry of the addicted certified registered nurse anesthetist. *Journal of Addictions Nursing*, *20*(4), 177–184.

Wilson, K. T., Bohnert, A. E., Ambrose, A., Davis, D. Y., Jones, D. M., & Magee, M. J. (2014). Social, behavioral, and sleep characteristics associated with depression symptoms among undergraduate students at a women's college: a cross-sectional depression survey, 2012. *BMC Women's Health*, *14*(1), 1. http://doi.org/10.1186/1472-6874-14-8

Wolff, H. G. (1953). *Stress and Disease.* Springfield, IL: Charles C. Thomas.

Woollard, K. J. (2013). Immunological aspects of atherosclerosis. *Clinical Science (London, England: 1979)*, *125*(5), 221–235. http://doi.org/10.1042/CS20120576

World Health Organization. (2009). *Human Factors in Patient Safety: Review of Topics and Tools* (WHO Publication WHO/IER/PSP/2009.05). Retrieved from http://www.who.int/patientsafety/research/methods_measures/human_factors/human_factors_review.pdf

Wright, L. E., McGuinness, T., Schumacher, J. E., Zwerling, A., & Moneyham, L. D. (2014). Protective factors against relapse for practicing nurse anesthetists in recovery from anesthetic opiate dependency. *Journal of Addictions Nursing*, *25*(2), 66–73. http://doi.org/10.1097/JAN.0000000000000026

Wright, S. M., & Fallacaro, M. D. (2011). Predictors of situation awareness in student registered nurse anesthetists. *AANA Journal*, *79*(6), 484–490.

Young, E. A., Abelson, J. L., & Liberzon, I. (2008). Stress hormones and anxiety disorders. In *Handbook of Anxiety and Fear* (Vol. 17, pp. 455–473). Elsevier. http://doi.org/10.1016/S1569-7339(07)00021-5

Yusoff, M. S. B., Abdul Rahim, A. F., Baba, A. A., Ismail, S. B., Mat Pa, M. N., & Esa, A. R. (2013). The impact of medical education on psychological health of students: a cohort study. *Psychology, Health & Medicine*, *18*(4), 420–430. http://doi.org/10.1080/13548506.2012.740162

Appendix A

Dear Student Registered Nurse Anesthetists,

Hello, my name is Kaori Donohue. I am a Ph.D. candidate at the Oregon Health & Science University. You are invited to participate in our research study, titled *"SRNA Stress Survey"* by completing a short one-time electronic survey. We are interested in the role of everyday stressors and selected psychological stress symptoms among SRNAs.

This anonymous electronic survey will take approximately 15 minutes to complete. We collect no identifying information of any respondent. You are not compensated for responding, nor are there any known risks for taking this survey. You may or may not benefit directly from taking this survey. You may feel uncomfortable answering questions about your stress and mood. If you feel negatively affected by taking this survey, please visit the AANA Student Wellness webpage at http://www.aana.com/resources2/health-wellness/Pages/Student-Wellness.aspx for the web links to helpful advice. Your research participation will help us design future stress intervention studies among our profession, especially you, the SRNAs.

Your participation in this research study is completely voluntary. If you choose to participate, you may withdraw from the survey at any time without affecting you in any way. Please answer all questions as honestly as possible by clicking the URL link below no later than 12/17/15.

By completing and submitting this electronic survey, you are indicating your consent to participate in the study. If you have any question about this survey, please contact Kaori Donohue by email at donohue@ohsu.edu or her advisor, Dr. Kim Jones at joneskim@ohsu.edu. This research study has been approved by the OHSU institutional review board (STUDY00015191). You may contact the IRB at (503) 494-7887 or irb@ohsu.edu, if your questions, concerns, or complaints are not being answered by the research team. This research study is funded by the 2015 AANA Foundation doctoral fellowship.

This invitation does not imply any endorsement of the survey research and/or its findings by the AANA. The survey contents and findings are our sole responsibility. Thank you for taking your time to take our electronic survey during your busy study schedule. Your participation is very appreciated.

Electronic Survey Link (Survey open till 12/17/2015)
https://www.surveymonkey.com/r/N3M275D

Sincerely,

Kaori Donohue, CRNA, MSN
Ph.D. candidate
Oregon Health & Science University, School of Nursing

Kim Dupree Jones, Ph.D. FNP, FAAN
Dissertation Committee Chair
Oregon Health & Science University, School of Nursing

Appendix B

IRB MEMO

Research Integrity Office
3181 SW Sam Jackson Park Road - L106RI
Portland, OR 97239-3098
(503)494-7887 irb@ohsu.edu

APPROVAL OF SUBMISSION

November 4, 2015

Kim Jones

503-494-3837
Fax: 503-418-0903
joneskim@ohsu.edu

Dear Kim Jones:

On 11/4/2015, the IRB reviewed the following submission:

Type of Review:	**Error! Hyperlink reference not valid.**
Title of Study:	Daily Hassles, Mental Health Outcomes, and Dispositional Mindfulness in Student Registered Nurse Anesthetists
Principal Investigator:	Kim Jones
IRB ID:	STUDY00015191
Funding:	Name: American Association of Nurse Anesthetists, PPQ #: N/A, Funding Source: 2015-F-1
IND, IDE, or HDE:	None

Documents Reviewed:	• protocol • Donohue AANA Electronic Survey Application not submitted yet • SurveyMonkey_SRNA Stress Survey.pdf • Doctoral fellowship approved budget • AANA Foundation Funded Award Recipient Agreement.pdf • Doctoral fellowship application • .pdf • Approval letter for 5000 sample size • Memorandum Oct 6.docx • Revised email invitation letter • AANA Electronic Survey Application and its Policy and Fee.pdf

The IRB granted final approval on 11/4/2015. The study is approved until 11/2/2018.

Review Category: Exempt Category #2

Copies of all approved documents are available in the study's **Final** Documents (far right column under the documents tab) list in the eIRB.

Ongoing IRB submission requirements:

- Six to ten weeks before the expiration date, you are to submit a continuing review to request continuing approval.
- Any changes to the project must be submitted for IRB approval prior to implementation.
- Reportable New Information must be submitted per OHSU policy.
- You must submit a continuing review to close the study when your research is completed.

Guidelines for Study Conduct

In conducting this study, you are required to follow the guidelines in the document entitled, "Roles and Responsibilities in the Conduct of Research and Administration of Sponsored Projects," as well as all other applicable OHSU IRB Policies and Procedures.

Requirements under HIPAA

If your study involves the collection, use, or disclosure of Protected Health Information (PHI), you must comply with all applicable requirements under HIPAA. See the HIPAA and Research website and the Information Privacy and Security website for more information.

IRB Compliance

The OHSU IRB (FWA00000161; IRB00000471) complies with 45 CFR Part 46, 21 CFR Parts 50 and 56, and other federal and Oregon laws and regulations, as applicable, as well as ICH-GCP codes 3.1-3.4, which outline Responsibilities, Composition, Functions, and Operations, Procedures, and Records of the IRB.

Sincerely,

The OHSU IRB Office

Appendix C

School of Nursing
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Kim Dupree Jones, Ph.D.. F.N.P., F.A.A.N.
Associate Professor
OHSU Schools of Nursing & Medicine

October 6, 2015

Dear Dr. Liao,

It is with great pleasure that I write to endorse Kaori Donohue's electronic survey study. I am Ms. Donohue's advisor and dissertation committee chair. The requested electronic survey provides the data for her dissertation research. Ms. Donohue has successfully defended her dissertation research proposal on September 14, 2015. The OHSU institutional review board has granted the current survey study an exemption from the Federal regulations for the protection of human subjects.

Ms. Donohue has been named the 2015 AANA Foundation Doctoral Fellow. I acknowledge that the AANA Foundation plays a critical role in supporting her doctoral study. Also, I thank you for authorizing her electronic survey to 5000 SRNAs. The study results will be shared among the nurse anesthesia community through the publication in a peer-reviewed journal as well as scientific conference presentations.

In summary, Ms. Donohue has a passion for research that will help her patients as well as future generations of CRNAs. Thank you for forwarding her program of research by distributing this electronic survey study.

Sincerely,

Kim Dupree Jones PhD

Kim Dupree Jones PhD, RN, FNP-BC, FAAN
Associate Professor of Nursing
Assistant Professor of Medicine
Oregon Health & Science University

Appendix D

Study Title: SRNA Stress Survey

Objectives:

The purpose of this cross-sectional online survey in 5,000 randomly selected student registered nurse anesthetists (SRNA) is to better understand the relationship between five key variables—daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness. The proposed study will explore the moderating role that dispositional mindfulness may play as a stress buffer in SRNAs by addressing the following specific aims.

Aim 1: Examine the relationships between daily hassles, perceived stress, depression, anxiety, and dispositional mindfulness in SRNAs.

Hypothesis 1.1: Daily hassles, perceived stress, depression, and anxiety will be positively correlated.

Hypothesis 1.2: Daily hassles, perceived stress, depression, and anxiety will be negatively correlated with dispositional mindfulness.

Aim 2: Characterize the relationship between daily hassles, perceived stress, depression, anxiety, dispositional mindfulness and SRNA characteristics (demographic and curriculum information).

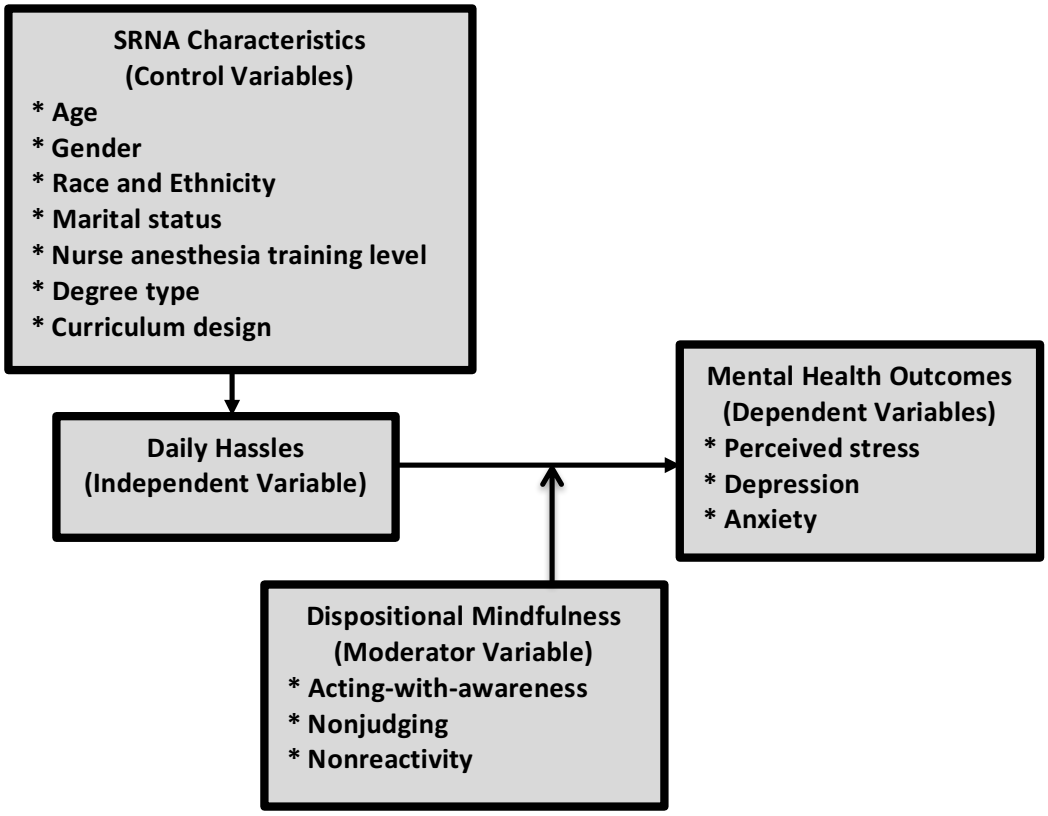
Hypothesis 2.1: Comparing within the respected categories, female, minority, divorced, and 2nd-year SRNAs, and those who are in the programs with integrated curriculum will report higher perceived stress, depression and anxiety.

Hypothesis 2.2: Daily hassles and dispositional mindfulness are different across SRNAs based on demographic and curricular information.

Aim 3: Determine whether dispositional mindfulness moderates the relationship between daily hassles and three negative mental health outcomes (1) perceived stress, (2) depression, and (3) anxiety, controlling for the effects of demographic and curricular information.

Hypothesis 3: Dispositional mindfulness will moderate the relationship between daily hassles and perceived stress, depression, and anxiety such that daily hassles will be more strongly related to perceived stress, depression and anxiety when dispositional mindfulness is low than when dispositional mindfulness is high.

Study Conceptual Model
(The transactional model of stress and stress coping by Lazarus & Folkman modified for SRNAs)



Background:

Inadequate stress coping and resultant negative mental health outcomes in SRNA have been documented in the literature.[1-3] In addition, subgroups of SRNAs, such as female, minority (Black and Hispanic), divorced, and second-year students as well as those who study in the nurse anesthesia educational programs with integrated curriculum—didactic and clinical instructions are given concurrently from the beginning of the program—have been identified as more stressed than their peers.[1] The critical deficit in adaptive stress coping in SRNAs prompted the Council on Accreditation of Nurse Anesthesia Education Programs (COA) in 2014 to mandate the instruction in wellness and chemical dependency in the anesthesia profession.[4] Nurse anesthesia program educational materials are recommended to include evidence-based content on adaptive and maladaptive stress coping. However, there are major knowledge deficits related to *modifiable* individual factors that influence the mental health outcomes of stress maladaptation, such as perceived stress, depression and anxiety among SRNAs. Identifying such dynamic individual stress risk factors among SRNAs could be of great diagnostic *and* therapeutic value for nurse anesthesia educators. Determining key person-level variables that drive individual responses to everyday stressors among SRNAs might provide deeper understanding of individual differences that result in variable stress vulnerability.[5] This new knowledge could help us develop future innovative student stress interventions within nurse anesthesia curriculum, with particular attention to SRNAs at greatest risk for maladaptive stress coping.

Mounting clinical data support mindfulness—heightened attention and awareness of the present moment while suspending judgment[6]—as an influential factor on mental health.[7] Originating in the contemplative traditions, mindfulness can be cultivated through meditation/mindfulness training,[6] such as Mindfulness-Based Stress Reduction program (MBSR) which are available in many larger cities in the Untied States as well as overseas. Cultivating mindfulness is not only known to reduce perceived stress, anxiety, and depression, but also to promote mental clarity and purposeful focus on the present task at hand.[8] Moreover, a small body of research has investigated the critical role of mindfulness that exists naturally in people, namely dispositional mindfulness, on mental health outcomes.[9-11] Dispositional mindfulness—individual differences in the propensity to be mindful[12]—has been shown to attenuate the negative impacts of daily hassles in adolescents' mental health.[11] However, to our knowledge, this protective role of dispositional mindfulness on mental health in SRNAs has never been investigated. This is important, because demonstrating that dispositional mindfulness is a significant moderating factor in SRNAs' stress could provide the nurse anesthesia educators with critical support for utilizing mindfulness-based stress interventions to improve adaptive stress coping in SRNAs.

Study Design:

This study is a cross-sectional descriptive survey study using a dedicated survey webpage.

Study Population:

Number of Subjects:

Randomly selected 5,000 SRNAs across the country. We have obtained the prior approval for distributing our electronic survey invitations to 5,000 email addresses from Dr. Jason Liao at the Research Division of The American Association of Nurse Anesthetists (AANA). According to the AANA, approximately 5,900 SRNAs are enrolled in nurse anesthesia educational programs.

Inclusion and Exclusion Criteria:

The AANA is the national professional organization for certified and student registered nurse anesthetists. All SRNAs who are enrolled in one of 115 accredited entry-level graduate nurse anesthesia education programs are required to be AANA associate members. All current associate members who are age between 21 and 55 at the time of data collection are eligible to participate in the current study. All SRNAs fit within this age range.

Setting:

The electronic survey will use a dedicated webpage hosted by the SurveyMonkey. The dedicated online SurveyMonkey account has been set up specifically to host this survey study.

Recruitment Method:

We will use the AANA electronic survey instrument deployment only service for sample selection and survey distribution. The service is subject to approval by the AANA. The AANA maintains up-to-date member contact information including the email addresses of all associate (SRNA) members. The AANA will conduct random sample selection based on computer-generated numbers with a uniform distribution.

We will not offer incentives to study participants. The AANA policy for electronic survey instrument deployment only service strictly prohibits the collection of *any* identifiable information such as IP addresses.

Consent Process:

The invitation email message describes the pertinent information about the study. It also clearly states that completing and submitting the electronic survey indicates the consent to participate in the study. The email addresses of the researchers are also provided in the invitation message, should study participants have any question about the survey. Reading the e-mail invitation and completing the survey will act as consent.

Procedures:

After the AANA approval, the AANA Foundation staff will conduct random sample selection (*n*=5,000) and electronic survey distribution by email for us. According to the NBCRNA, the total number of enrollment in nurse anesthesia education programs is highest in the months of October through December. Therefore, we will deploy the electronic survey as soon as possible to ensure that we have large enough number of associate members to select our study sample from.

The AANA will send total two email messages to randomly selected 5,000 email addresses of current AANA associate members on the specified date. The electronic survey invitation email will have the subject title, "You are invited to a research survey—SRNA Stress Survey", and displays the invitation cover message with the survey web link https://www.surveymonkey.com/r/N3M275D. The AANA will send a second "reminder" email message to all 5,000 addresses seven days before the end of the survey period. The electronic survey will be open for four weeks.

The electronic survey questionnaire consists of four validated and reliable psychological measures, a published mediation practice measure, as well as demographic and nurse anesthesia educational program information. See Table 2 for psychometric information of PSS-10, DASS-21, ICSRLE, and FFMQ in page 5.

Perceived Stress Scale (PSS-10)

- Sample item: "In the past month, how often have you been upset because of something that happened unexpectedly?"

Depression Anxiety Stress Scale (DASS-21)

We will only use depression and anxiety subscales.

- Sample depression item: "I felt that I had nothing to look forward to."
- Sample anxiety item: "I felt I was close to panic."

Inventory of College Student Recent Life Experiences (ICSRLE)

- Sample item: "Lower grades than you hoped for."

Five Facet Mindfulness Questionnaire (FFMQ)

We will only use three facets (acting-with-awareness, nonjudging, nonreactivity).

- Sample acting-with-awareness item: "I am easily distracted"
- Sample nonjudging item: "I disapprove of myself when I have irrational ideas"

- Sample nonreactivity item: "I watch my feelings without getting lost in them"

Demographic and curriculum information

- Age (in years)
- Gender (Female, Male, Transgender, Prefer not to answer)
- Marital status (Married; Widowed; Divorced; Separated; In a domestic partnership or civil union; Single, but cohabiting with a significant other; Single, never married; Prefer not to answer)
- Race/ethnicity (American Indian or Alaska Native; Asian; Black or African American; Hispanic or Latino; Native Hawaiian or Other Pacific Islander; White; Mixed; Prefer not to answer)
- Level of training (1^{st} year, 2^{nd} year, 3^{rd} year, 4^{th} year)
- Degree program (Master's degree program; Practice doctorate degree program)
- Curriculum design (Front-loaded didactic; Integrated (Didactic and clinical instructions are given concurrently throughout)

Meditation Practice Scale

Meditation experience will be used in ad hoc analysis for aim 3 significant result(s). The Meditation Practice Scale is a published scale to assess individuals' meditation practice.[12] It includes skip logic to reduce response burden for non-meditators. The first item asks whether respondents currently meditate. Those who endorsed current meditation practice will see additional five questions, including a write-in item for the type of meditation they regularly practice.

The AANA region in which the school locates (1 to 7). See Table 1.

This information is only used to assess the sample distribution and will not be used in main data analysis.

Table 1. AANA Regions and the Number of Programs in Each Regions and Member States	
AANA Region (Number of Program)	Member States (Number of Program; national total 115)
Region 1 (17)	CT(4), ME(1), MA(2), NH, NJ(2), NY(4), PR(2), RI(2), VT
Region 2 (19)	GA(1), KY(1), NC(6), SC(2), TN(6), VA(2), WV(1)
Region 3 (11)	IL(5), IN, MI(5), WI(1)
Region 4 (16)	AR(1), IA(1), KS(2), MN(4), MO(4), NE(2), ND(1), OK, SD(1)
Region 5 (10)	AK, AZ(2), CA(5), CO, HI, ID, MT, NV, NM, OR(1), UT(1), WA(1), WY
Region 6 (23)	DE, DC(1), MD(2), OH(7), PA(13)
Region 7 (19)	AL(2), FL(9), LA(2), MS(1), TX(5)

Data and Specimens:

Handling of Data:

The data will include the survey results as described above. There will be no 18 HIPPA identifiers in the dataset. The study data will be downloaded to Microsoft Excel spreadsheet in a password-protected OHSU School of Nursing computer. The downloaded raw data will be stored on the OSHU share drive and shared among Dr. Jones (PI/dissertation committee chair), Dr. Mist (committee member who will oversee study methodology), and Ms Donohue (PhD candidate). Ms Donohue is the primary data handler under Dr. Mist's supervision.

Sharing of Results with Subjects:

The study results will not be shared directly with the study participants. However, the copy of the completed dissertation will be available at the OSHU library. Also, the completed study will be submitted for an oral poster (podium) presentation by Ms Donohue during the AANA Annual Congress in September 2016. In addition, the manuscript(s) of the competed study will be submitted for publication in indexed peer-reviewed journal(s)

Data Analysis:

Ms Donohue will conduct all statistical analysis using the STATA 14 statistical software in her password-protected desktop computer under the supervision by Dr. Mist.

Analysis of Aim 1:

To test our hypotheses, we will perform standard descriptive statistics of frequency, central tendency and dispersion to describe ICSRLE, PSS-10, depression and anxiety subscales of the DASS-21, and three facets (acting-with-awareness, nonjudging, nonreactivity) of the FFMQ, as well as demographic and curriculum information. We will also conduct Student t-test to assess the sample distribution against the actual member distribution across seven AANA regions. Outliers will be handled by 90% Winsorising, and residual non-normality due to significant skewness and kurtosis will be handled by standard data transformation techniques. Missing-at-not-random data will be handled by multiple imputation. Next, zero-order correlation will be calculated for the ICSRLE, PSS-10, the depression and anxiety subscales of the DASS-21 and three facets of the FFMQ.

Analysis of Aim 2:

We will use one-way ANOVA and post hoc Tukey-Kramer method to analyze the differences among subgroups of SRNAs. Alternatively, in case for violated normality assumption(s), Kruskal-Wallis test will be used. If the data demonstrates severe

heteroscedasticity but normal distribution, Welch ANOVA will be used to analyze the subgroup differences. Generalized linear modeling may also be a good alternative for one-way ANOVA in case of severe parametric assumption violation.

Analysis of Aim 3:

Hierarchical multiple linear regressions will be used to test whether (1) the main effects of ICSRLE and three facets of FFMQ explain significant variance in the prediction of PSS-10, depression, and anxiety, over and above that accounted for by demographic and curriculum information; and (2) whether adding three interaction terms "ICSRLE x FFMQ facet" (separate term for each three FFMQ facets) significantly increases the variance explained in the final model, which indicates a significant moderation effect. See Table 3 for hierarchical multiple linear regressions model building steps.

If a significant moderation effect is found, a post hoc analysis will be conducted by adding meditation practice to the final regression model. This post hoc analysis will provide additional information whether there is any common variance explained by the interaction terms and meditation practice. Following a hierarchical multiple linear regression analysis, a simple slope test will be performed to create a graphical representation of the regression equations to assess the directionality of the interaction, and to test the statistical significance by conducting *ad hoc* slope comparison.

Finally, in order to minimize an inflated Type-1 error inherent in the test of multiple null hypotheses, Holm's sequential Bonferroni procedure will be used in aim 3 analyses.

Table 3. Hierarchical Multiple Linear Regression Model Building

Step	Independent Variables	Note
Preliminary analysis	All demographic and curricular information variables.	Only significant variables ($p>0.05$) will be retained for the following steps.
Step 1	* Significant variables in the preliminary analysis	These are control variables.
Step 2	* Daily hassles	Main effect
Step 3	* Dispositional mindfulness "acting-with-awareness" * Dispositional mindfulness "nonjudging" * Dispositional mindfulness "nonreactivity"	Main effect
Step 4	* Daily hassles X "acting-with-awareness" * Daily hassles X "nonjudging" * Daily hassles X "nonreactivity"	Interaction terms for moderation analysis.
Ad hoc	* Meditation practice	Conducted only if Step 4 analysis yields significant results

Privacy, Confidentiality and Data Security:

We will not collect any of 18 HIPPA identifiers. The data will not contain any identifiable information of each participant. Only Dr. Jones and Ms Donohue will have access to the study online account and survey webpage. Only non-identifiable data will be downloaded to the OSHU School of Nursing computer and stored in the OSHU network share drive. Only Ms Donohue and Drs. Jones and Mist will have access to the stored data in the share drive. We plan to store the study data indefinitely.

We do not have any means to identify participants based on the responses to demographic and curriculum information items. For a racial subgroup historically known to have a very small number of SRNAs, such as American Indian and Alaska Natives (≤1% of the total number of SRNAs), we may collapse the responses to the race/ethnicity item between American Indian and Alaska Natives and those who chose "Not prefer to answer".

Risks and Benefits:

Risks to Subjects:

We do not anticipate any risk for taking this electronic survey. However, if the participants feel negatively affected by taking the survey, the invitation cover letter encourages the affected participants to visit the AANA Student Wellness webpage for the links to helpful advice at http://www.aana.com/resources2/health-wellness/Pages/Student-Wellness.aspx.

Potential Benefits to Subjects:

SRNAs who complete the survey may have no personal benefit. However, completing the questionnaires may increase awareness about stress among the participants. Another potential benefit is that the study results may inform the design of the future instructional interventions that aim at increasing stress adaptive coping in SRNAs.

Appendix E

SRNA Stress Survey

Demographic and Program Information

* 1. What is the current level of your nurse anesthesia training?

* 2. Which degree program are you currently enrolled?

3. Please select the curriculum type that BEST matches your nurse anesthesia education program.

* 4. What is your gender?

* 5. What is your age? (Please write down in a whole year).

* 6. Which of the following best describes your racial/ethnic heritage?

* 7. Which of the following best describes your current relationship status?

* 8. In which AANA region does your program locate?

SRNA Stress Survey

Everyday Stress and Stress Symptoms

* 9. The following questions ask you about your feelings and thoughtsDURING THE LAST MONTH. Please choose your response indicating how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
How often have you been upset because of something that happened unexpectedly?	◯	◯	◯	◯	◯
How often have you felt that you were unable to control the important things in your life?	◯	◯	◯	◯	◯
How often have you felt nervous and “stressed”?	◯	◯	◯	◯	◯
How often have you felt confident about your ability to handle your personal problems?	◯	◯	◯	◯	◯
How often have you felt that things were going your way?	◯	◯	◯	◯	◯
How often have you found that you could not cope with all the things that you had to do?	◯	◯	◯	◯	◯
How often have you been able to control irritations in your life?	◯	◯	◯	◯	◯
How often have you felt that you were on top of things?	◯	◯	◯	◯	◯
How often have you been angered because of things that were outside of your control?	◯	◯	◯	◯	◯
How often have you felt difficulties were piling up so high that you could not overcome them?	◯	◯	◯	◯	◯

SRNA Stress Survey

Everyday Stress and Stress Symptoms

* 10. Please read each statement and choose your response which indicates how much the statement applied to you OVER THE PAST WEEK. There are no right or wrong answers. Do not spend too much time on any statement.

	Never	Sometimes	Often	Almost Always
I was aware of dryness of my mouth.	◯	◯	◯	◯
I couldn't seem to experience any positive feeling at all.	◯	◯	◯	◯
I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).	◯	◯	◯	◯
I found it difficult to work up the initiative to do things.	◯	◯	◯	◯
I experienced trembling (e.g., in the hands).	◯	◯	◯	◯
I was worried about situations in which I might panic and make a fool of myself.	◯	◯	◯	◯
I felt that I had nothing to look forward to.	◯	◯	◯	◯
I felt down-hearted and blue.	◯	◯	◯	◯
I felt I was close to panic.	◯	◯	◯	◯
I was unable to become enthusiastic about anything.	◯	◯	◯	◯
I felt I wasn't worth much as a person.	◯	◯	◯	◯
I was aware of the action of my heart in the absence of physical exertion. (e.g., sense of heart rate increase, heart missing a beat).	◯	◯	◯	◯
I felt scared without any good reason.	◯	◯	◯	◯
I felt that life was meaningless.	◯	◯	◯	◯

SRNA Stress Survey

Everyday Stress and Stress Symptoms

* 11. Following is a list of experiences which many students have some time or other. Please indicate for each experience how much it has been a part of your life OVER THE PAST MONTH.

	Not At All	Only Slightly	Distinctly	Very Much
Conflicts with boyfriend's/girlfriend's/spouse's family.	○	○	○	○
Being let down or disappointed by friends.	○	○	○	○
Conflicts with friends.	○	○	○	○
Conflict with professor(s).	○	○	○	○
Social rejection.	○	○	○	○
Too many things to do at once.	○	○	○	○
Being taken for granted.	○	○	○	○
Financial conflicts with family members.	○	○	○	○
Having your trust betrayed by a friend.	○	○	○	○
Separation from people you care about.	○	○	○	○
Having your contributions overlooked.	○	○	○	○
Struggling to meet your own academic standards.	○	○	○	○
Being taken advantage of.	○	○	○	○
Not enough leisure time.	○	○	○	○
Struggling to meet the academic standards of others.	○	○	○	○
A lot of responsibilities.	○	○	○	○
Dissatisfaction with school.	○	○	○	○
Decisions about intimate relationship(s).	○	○	○	○
Not enough time to meet your obligations.	○	○	○	○
Dissatisfaction with your mathematical ability.	○	○	○	○
Important decisions about your future career.	○	○	○	○
Financial burdens.	○	○	○	○
Dissatisfaction with your reading ability.	○	○	○	○
Important decisions about your education.	○	○	○	○
Loneliness.	○	○	○	○

	Not At All	Only Slightly	Distinctly	Very Much
Lower grades than you hoped for.	○	○	○	○
Conflict with teaching assistant(s).	○	○	○	○
Not enough time for sleep.	○	○	○	○
Conflicts with your family.	○	○	○	○
Heavy demands from extracurricular activities.	○	○	○	○
Finding courses too demanding.	○	○	○	○
Conflicts with friends.	○	○	○	○
Hard effort to get ahead.	○	○	○	○
Poor health of a friend	○	○	○	○
Disliking your studies.	○	○	○	○
Getting “ripped off” or cheated in the purchase of services.	○	○	○	○
Social conflicts over smoking.	○	○	○	○
Difficulties with transportation.	○	○	○	○
Disliking fellow student(s).	○	○	○	○
Conflicts with boyfriend/girlfriend/spouse.	○	○	○	○
Dissatisfaction with your ability at written expression.	○	○	○	○
Interruptions of your school work.	○	○	○	○
Social isolation.	○	○	○	○
Long waits to get service (e.g., at banks, stores, etc.).	○	○	○	○
Being ignored.	○	○	○	○
Dissatisfaction with your physical appearance.	○	○	○	○
Finding course(s) uninteresting.	○	○	○	○
Gossip concerning someone your care about.	○	○	○	○
Failing to get expected job	○	○	○	○
Dissatisfaction with your athletic skills.	○	○	○	○

SRNA Stress Survey

Mindfulness

* 12. Please rate each of the following statements with the response that best describes your own opinion of what is generally true for you.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
I criticize myself for having irrational or inappropriate emotions.	◯	◯	◯	◯	◯
I perceive my feelings and emotions without having to react to them.	◯	◯	◯	◯	◯
When I do things, my mind wanders off and I'm easily distracted.	◯	◯	◯	◯	◯
I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	◯	◯	◯	◯	◯
I watch my feelings without getting lost in them.	◯	◯	◯	◯	◯
I tell myself I shouldn't be feeling the way I'm feeling.	◯	◯	◯	◯	◯
I am easily distracted.	◯	◯	◯	◯	◯
I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	◯	◯	◯	◯	◯
I make judgments about whether my thoughts are good or bad.	◯	◯	◯	◯	◯
I find it difficult to stay focused on what's happening in the present.	◯	◯	◯	◯	◯
When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	◯	◯	◯	◯	◯
In difficult situations, I can pause without immediately reacting.	◯	◯	◯	◯	◯
It seems I am "running on automatic" without much awareness of what I'm doing.	◯	◯	◯	◯	◯
When I have distressing thoughts or images, I feel calm soon after.	◯	◯	◯	◯	◯
I tell myself that I shouldn't be thinking the way I'm thinking.	◯	◯	◯	◯	◯
I rush through activities without being really attentive to them.	◯	◯	◯	◯	◯
When I have distressing thoughts or images, I am able just to notice them without reacting.	◯	◯	◯	◯	◯
I think some of my emotions are bad or inappropriate and I shouldn't feel them.	◯	◯	◯	◯	◯
When I have distressing thoughts or images, I just notice them and let them go.	◯	◯	◯	◯	◯

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
I do jobs or tasks automatically without being aware of what I'm doing.	○	○	○	○	○
When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about.	○	○	○	○	○
I find myself doing things without paying attention.	○	○	○	○	○
I disapprove of myself when I have irrational ideas.	○	○	○	○	○

SRNA Stress Survey

Meditation Experience

If you are currently practicing meditation, we will ask you additional questions about your meditation practice.

* 13. Do you currently meditate? Meditation practice may include various sitting meditation, mantra repetition, or body movement-oriented practices such as yoga and Qigong.

SRNA Stress Survey

Meditation Experience

* 14. How long have you been meditating? Please write down in MONTHS.

* 15. How often do you meditate?

* 16. On average how long do you meditate in a single session? Please write down in MINUTES.

17. Please write down the type of your primary meditation practice (e.g., various Buddhist meditation, Transcendental meditation, Qigong, yoga)

* 18. To what extent do you carry your meditation practice into your daily life?

SRNA Stress Survey

Meditation Experience

* 14. How long have you been meditating? Please write down in MONTHS.

* 15. How often do you meditate?

* 16. On average how long do you meditate in a single session? Please write down in MINUTES.

17. Please write down the type of your primary meditation practice (e.g., various Buddhist meditation, Transcendental meditation, Qigong, yoga)

* 18. To what extent do you carry your meditation practice into your daily life?

Appendix F

Missing Data Management

Missingness

The missingness diagnostic test ("misstable pattern by frequency" in Stata) indicated that three missing values in age and curriculum type each belonged to six different respondents, and appeared to be random and unrelated to the completeness of their survey response. Three people only skipped "age" and completed the questionnaire; two people skipped only "curriculum type" and also completed the survey; one person skipped only the "meditation" question, and one person skipped "curriculum type" and all dispositional mindfulness items.

For daily hassles, perceived stress, depression/anxiety, and mindfulness, the missing pattern clearly followed the sequence of the online questionnaire, which was placed in the following order: demographic and curriculum information → perceived stress → depression/anxiety→ daily hassles → mindfulness → meditation questions. Study scales presented earlier in the online questionnaire contained less missing data than those presented later. Specifically, a total of 25 respondents stopped the questionnaire after demographic and curriculum information; another 25 stopped after perceived stress; an additional 45 stopped after depression/anxiety, and 58 more respondents stopped after daily hassles. Only one person skipped the last item on meditation after answering all other questions. Therefore, the overall pattern of missingness among the four study scales appeared as monotone.

The logit test for the probability of missing data among the four study scales given the observed covariates (demographic and curricular information data) was conducted to examine the ignorability of missingness. The results for the dependent

variables, perceived stress and depression/anxiety, were all significant ($p < .05$) at $\alpha = .05$. For the independent variables (daily hassles and mindfulness), there were several non-significant results. For example, the probability of missing daily hassles was not significantly related to the effect of marital status. Likewise, the likelihood of missing mindfulness facets due to the effects of training level, degree type, and marital status was not significant. The logit test suggested the evidence that missingness was at least partially associated with the observed covariates. However, the MAR assumption is not testable because the distribution of unobserved values cannot be examined statistically (Eddings & Marchenko, 2012). Accordingly, MAR was provisionally assumed for this study data, which provided the justification for using multiple imputation to handle missing data in the present study.

Multiple imputation model specification

Model variables included all independent and dependent variables, as well as all covariates and interaction terms that were used to build multiple linear regression models in Aim 3 data analysis. To accommodate the numerous variable types and distribution patterns among the missing data, multiple imputations using chained equations were used, which allowed specifying a series of univariate models for the conditional distribution of each partially observed variables, given the other variables in the data (Bartlett & Morris, 2015). Chained equations allowed choice of individualized imputation method for each variable's distribution characteristic. Additional reason for choosing chained equations included the arbitrary missingness in demographic variables (curriculum type and age), which rendered monotone imputation impossible.

Appendix G

Stata Syntax

1. Winsorizing Parameters

Variables	Winsorizing Parameters	
	Complete Case	Multiply Imputed Dataset
Perceived Stress	1 99	1 99
Depression	0 95	0 95
Anxiety	0 94	0 94
Daily Hassles	0 95	0 95
Mindfulness-AA	1 100	None done
Mindfulness-NJ	3 98	None done
Mindfulness-NR	None done	2 99

2. Descriptive statistics

- by genderc, sort: ci means win_PSS win_DH win_NJ win_NR win_AA win_anxiety win_depression

- by genderc, sort: misum win_PSS win_DH win_NJ win_NR win_AA win_anxiety win_depression

3. Aim 1

- spearman win_PSS win_anxiety win_depression win_DH win_NJ win_NR win_AA, stats(rho p) sidak matrix

- micorr: retrieved from http://www.stata.com/statalist/archive/2013-10/msg00730.html).

```
cap program drop ecorr
        program ecorr, eclass
                version 12
                syntax [varlist] [if] [in] [aw fw] [, * ]
                if (`"`weight'"'!="") {
                        local wgt `weight'`exp'
                }
                marksample touse
                correlate `varlist' `if' `in' `wgt', `options'
                tempname b V
                mata: st_matrix("`b'", vech(st_matrix("r(C)"))')
                local p = colsof(`b')
                mat `V' = J(`p',`p',0)
                local cols: colnames `b'
```

```
        mat rownames `V' = `cols'
        eret post `b' `V' [`wgt'] , obs(`=r(N)') esample(`touse')
        eret local cmd ecorr
        eret local title "Lower-diagonal correlation matrix"
        eret local vars "`varlist'"

end

cap program drop micorr
program micorr, rclass
        tempname esthold
        _estimates hold `esthold', nullok restore
        qui mi estimate, cmdok: ecorr `0'
        tempname C_mi
        mata: st_matrix("`C_mi'", invvech(st_matrix("e(b_mi)")'))
        mat colnames `C_mi' = `e(vars)'
        mat rownames `C_mi' = `e(vars)'
        di
        di as txt "Multiple-imputation estimate of the correlation matrix"
        di as txt "(obs=" string(e(N_mi),"%9.0g") ")"
        matlist `C_mi'
        return clear
        ret matrix C_mi = `C_mi'

end
```

4. **Aim 2**

- oneway win_PSS genderc, t sidak
- anova win_PSS genderc
- contrast{genderc 1 -2 1 }
- dunntest win_DH, by (maritalstatus) ma (hs)
- dunntest win_anxiety, by (race) ma (hs)
- dunntest win_depression, by (trainingc) ma (hs)
- dunntest win_AA, by (race) ma (hs)
- dunntest win_NJ, by (genderc) ma (hs)
- dunntest win_NR, by (trainingc) ma (hs)
-

5. **Aim 3**

Perceived Stress

- reg win_PSS Degree Curriculum c_win_Age Race Maritalstatus genderc trainingc
- hireg win_PSS (genderc trainingc Meditate) (c_win_DH) (c_win_NJ c_win_AA c_win_NR)(DHNRc)

- mi estimate: reg win_PSS trainingc genderc c_win_DH c_win_AA c_win_NJ c_win_NR c_DHAA Meditate

Depression

- glm win_depression Degree Curriculum c_win_Age Race Maritalstatus genderc trainingc, family(gamma) link(log)
- glm win_depression Maritalstatus trainingc c_win_DH c_win_NJ c_win_AA c_win_NR DHNJc Meditate, family(gamma) link(log)
- mi estimate: glm win_depression trainingc Maritalstatus c_win_DH c_win_AA c_win_NJ c_win_NR c_DHNR Meditate, family(gamma) link(log)
-

Anxiety

- glm win_anxiety Degree Curriculum c_win_Age Race Maritalstatus genderc trainingc, family(gamma) link(log)
- glm win_anxiety genderc c_win_DH c_win_NJ c_win_AAc_win_NR DHAAc Meditate, family(gamma) link(log)
- mi estimate: glm win_anxiety genderc c_win_DH c_win_AA c_win_NJ c_win_NR c_DHNR Meditate, family(gamma) link(log)

Multilple Imputation

- mi impute chained (truncreg, ll(0) ul(40)) PSStotal (pmm, knn(60)) Anxietytotal (pmm, knn(40))Depressiontotal DHtotal Age NJtotal NRtotal AAtota (mlogit, augment) Curriculum (logit, augment) Meditate = i.Traininglevel i.Degree i.Gender i.Race i.Maritalstatus, add(10) force rseed (11321)

```
mi describe

  Style:  flong
          last mi update 06mar2016 07:49:59, 30 days ago

  Obs.:   complete          722
          incomplete        159  (M = 50 imputations)
          ---------------------
          total             881

  Vars.:  imputed:  15; PSStotal(25) Anxietytotal(50)
                    Depressiontotal(50) DHtotal(95) NJtotal(153)
                    NRtotal(153) AAtotal(153)
                    DHNR(153) DHNJ(153) DHAA(153) Curriculum(3) Age(3)
                    Meditate(154) fullanxiety(50) fulldepression(50)

          passive:  11; win_anxiety(50) win_PSS(25) win_depression(50)
                    c_win_AA(153) c_win_NJ(153)
                    c_win_DH(95)c_win_NR(153) c_DHNR(153) c_DHNJ(153)
                    c_DHAA(153) c_Age(3)
```

```
                    regular:  7; Traininglevel Degree Gender
          Race Maritalstatus genderc trainingc

 system:   3; _mi_m _mi_id _mi_miss

(there are 151 unregistered variables)
```

Appendix H

Secondary Tables

Table 4.8. Subgroup Estimates of Perceived Stress for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	18.9	.25	18.41, 19.39	18.9	6.0
Male	16.5	.39	15.69, 17.23	16.4	6.4
Prefer not to answer	20.8	3.0	13.22, 28.44	21.17	7.9
Race					
American Indian Alaska Natives	13.8	1.9	8.50, 19.10	13.8	4.3
Asian	19.8	.94	17.85, 21.67	19.8	5.8
Black	20.3	1.8	16.50, 24.13	20.3	7.9
Hispanic	17.0	.94	15.09, 18.91	17.0	5.5
Native Hawaiian Pacific Islander	24.5	1.5	5.44, 43.56	24.5	2.1
White	18.1	.23	17.61, 18.53	18.1	6.2
Mixed	18.4	1.30	15.69, 21.06	18.1	6.3
Prefer not to answer	15.7	1.87	11.55 19.79	15.6	6.2
Marital Status					
Married	17.8	.31	17.19, 18.41	17.8	6.4
Widowed	21.5	2.5	-10.27, 53.27	21.5	3.5
Divorced	16.6	1.23	14.06, 19.12	16.4	6.2
Separated	21.7	5.21	-.737, 44.07	21.7	9.0
In a domestic relationship	20.3	1.58	16.87, 23.70	20.0	5.9
Single, co-habiting	18.1	.55	17.01, 19.18	18.1	6.0
Single, never married	18.6	.39	17.84, 19.38	18.6	6.2
Prefer not to answer	18.7	.78	16.81, 20.62	18.7	
Training level					
1st year	17.5	.33	16.82, 18.12	17.5	6.3
2nd year	18.4	.33	17.72, 19.02	18.3	6.1
3rd year	19.1	.53	18.08, 20.16	19.1	6.5
Curriculum Type					
Front-loaded didactic	18.0	.28	17.49, 18.58	18.0	6.3
Integrated	18.3	.34	17.59, 18.93	18.2	6.2
Degree Program					
Master's	18.3	.25	17.78, 18.75	18.3	6.1
Practice Doctorate	17.7	.43	16.86, 18.56	17.7	6.6

Table 4.9. Subgroup Estimates of Depression for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	8.2	.30	7.61, 8.83	8.2	7.3
Male	7.3	.44	6.41, 8.17	7.2	7.2
Prefer not to answer	12.0	4.65	. 05, 23.95	12.0	11.4
Race					
American Indian Alaska Natives	7.2	4.4	–5.04, 19.44	7.2	9.9
Asian	7.7	1.27	5.08, 10.24	7.9	7.5
Black	9.1	2.18	4.52, 13.70	9.0	9.0
Hispanic	6.0	1.19	3.58, 8.42	6.1	6.9
Native Hawaiian Pacific Islander	20	6.0	-56.24, 96.24	20.0	8.5
White	8.0	.27	7.45, 8.52	7.9	7.2
Mixed	8.58	1.60	5.27, 11.90	8.3	7.7
Prefer not to answer	7.5	2.39	2.24, 12.76	7.6	8.2
Marital Status					
Married	7.4	.35	6.73, 8.08	7.4	1.4
Widowed	5.0	1.0	–7.71, 17.71	5.0	1.4
Divorced	9.0	1.67	5.59, 12.49	8.8	8.2
Separated	6.7	2.91	–5.84, 19.17	6.7	5.0
In a domestic relationship	11.86	2.31	6.87, 16.85	11.6	8.5
Single, co-habiting	8.0	.68	6.63, 9.31	7.9	7.3
Single, never married	8.5	.49	7.57, 9.48	8.4	7.6
Prefer not to answer	9.14	3.20	1.31, 16.98	9.1	8.5
Training level					
1st year	7.3	.36	6.56, 7.98	7.2	6.8
2nd year	8.2	.41	7.39, 9.00	8.1	7.3
3rd year	9.1	.69	7.71, 10.44	8.9	8.3
Curriculum Type					
Front-loaded didactic	7.8	.32	7.18, 8.45	7.8	7.3
Integrated	8.2	.42	7.35, 9.01	8.0	7.4
Degree Program					
Master's	8.0	.30	7.39, 8.55	7.9	7.2
Practice Doctorate	7.9	.51	6.91, 8.90	7.9	7.6

Table 4.10. Subgroup Estimates of Anxiety for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	9.1	.30	8.51, 9.71	9.1	7.2
Male	7.0	.40	6.16, 7.75	6.9	6.6
Prefer not to answer	11.7	3.56	2.53, 20.81	11.7	8.7
Race					
American Indian Alaska Natives	8.0	2.76	.35, 15.66	8.0	6.2
Asian	9.3	1.23	6.76, 11.76	9.5	7.4
Black	8.4	2.15	3.91, 12.98	8.4	8.8
Hispanic	7.7	1.29	5.09, 10.32	7.7	7.5
Native Hawaiian Pacific Islander	14.0	2.0	–11.4, 39.41	14.0	2.8
White	8.4	.26	7.89, 8.93	8.3	7.0
Mixed	9.5	1.55	6.3, 12.7	9.2	7.5
Prefer not to answer	6.8	2.22	1.94, 1.72	6.7	7.5
Marital Status					
Married	8.1	.34	7.46, 8.79	8.1	6.9
Widowed	4.0	2.0	–21.41, 29.41	4.0	2.8
Divorced	6.2	1.5	3.15, 9.33	6.1	7.3
Separated	2.7	1.76	–4.92, 10.26	2.7	3.1
In a domestic relationship	12.3	2.38	7.14, 17.43	12.3	8.9
Single, co-habiting	9.1	.62	7.87, 10.33	9.0	6.8
Single, never married	8.7	.47	7.81, 9.65	8.7	7.3
Prefer not to answer	9.7	3.5	1.14, 18.29	9.7	9.3
Training level					
1st year	8.3	.38	7.64, 9.15	8.3	7.0
2nd year	8.8	.38	7.64, 9.15	8.3	6.9
3rd year	8.8	.65	7.55, 10.11	8.7	7.8
Curriculum Type					
Front-loaded didactic	8.5	.39	7.86, 9.1	8.4	7.2
Integrated	8.4	.39	7.59, 9.12	8.2	6.9
Degree Program					
Master's	8.5	.29	7.98, 9.11	8.5	7.0
Practice Doctorate	8.2	.48	7.23, 9.11	8.2	7.2

Table 4.11. Subgroup Estimates of Daily Hassles for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	93.9	.99	91.98, 95.87	92.9	21.2
Male	88.6	1.40	85.86, 91.36	87.7	20.0
Prefer not to answer	94.25	16.46	41.85, 146.65	98.5	30.3
Race/Ethnicity					
American Indian Alaska Natives	88.8	11.57	56.67, 120.93	88.8	25.9
Asian	98.1	4.53	88.86, 107.4	97.5	21.9
Black	94.4	7.9	77.61, 107.4	93.3	28.0
Hispanic	91.2	4.24	82.55, 99.94	90.6	20.5
Native Hawaiian Pacific Islander	112.5	18.5	-122.56, 347.56	112.5	26.2
White	92.0	.86	90.3, 93.67	90.9	20.6
Mixed	92.2	5.19	81.4, 102.95	90.3	20.6
Prefer not to answer	90.8	8.88	71.04, 110.6	89.0	27.2
Marital Status					
Married	91.4	1.11	89.25, 93.62	90.4	20.4
Widowed	79.0	12	-73.47, 231.47	79.0	17.0
Divorced	87.8	4.54	78.42, 97.23	87.4	21.2
Separated	93.3	9.77	51.30, 135.37	93.3	16.9
In a domestic relationship	99.5	5.83	86.9, 112.1	98.2	22.1
Single, co-habiting	91.4	2.07	87.33, 95.52	90.4	20.7
Single, never married	94.0	1.6	90.89, 97.18	93.1	21.8
Prefer not to answer	97.5	11.75	67.29, 127.71	94.4	27.0
Training level					
1st year	89.4	1.14	87.12, 91.6	88.8	20.0
2nd year	93.6	1.38	90.88, 96.3	92.5	21.7
3rd year	96.5	1.96	92.61, 100.36	94.6	21.1
Curriculum Type					
Front-loaded didactic	92.7	1.03	90.63, 94.7	91.8	21.0
Integrated	91.7	1.31	89.15, 94.32	90.0	21.0
Degree Program					
Master's	92.0	.95	90.13, 93.85	90.8	20.7
Practice Doctorate	93.0	1.57	89.88, 96.06	92.4	21.8

Table 4.12. Subgroup Estimates of Mindfulness-Nonreactivity for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	21.6	.22	21.18, 22.03	21.4	4.7
Male	22.7	.33	22.04 23.36	22.4	5.0
Prefer not to answer	21.8	4.23	8.29, 35.21	20.3	7.7
Race					
American Indian Alaska Natives	24.4	1.44	20.42, 28.38	24.4	3.2
Asian	21.5	.74	20.02, 23.05	21.3	4.1
Black	18.6	1.11	16.29, 21.0	18.3	4.7
Hispanic	22.0	1.0	19.91, 24.09	21.3	4.8
Native Hawaiian Pacific Islander	20.5	1.5	1.44, 39.56	20.5	2.1
White	22.0	.2	21.63, 22.41	21.8	4.9
Mixed	23.4	1.1	21.07, 25.67	22.7	5.0
Prefer not to answer	21.5	1.93	17.14, 25.86	21.2	5.7
Marital Status					
Married	22.2	.25	21.69, 22.69	22.0	4.8
Widowed	11.5	.5	5.15, 17.85	11.5	.71
Divorced	24.2	.8	22.57, 25.91	23.7	3.9
Separated	20.3	1.20	15.16, 25.5	20.3	2.1
In a domestic relationship	21.3	1.44	18.17, 24.5	21.0	4.9
Single, co-habiting	21.7	.47	20.77, 22.64	21.4	4.6
Single, never married	21.6	.35	20.95, 22.31	21.3	5.0
Prefer not to answer	21.3	2.53	14.84, 27.83	21.1	6.1
Training level					
1st year	22.3	.28	21.72, 22.83	22.0	5.0
2nd year	21.6	.29	21.04, 22.17	21.4	4.8
3rd year	21.9	.42	21.12, 22.78	21.7	4.7
Curriculum Type					
Front-loaded didactic	21.8	.23	21.33, 22.25	21.5	4.9
Integrated	22.2	.29	21.67, 22.82	22.9	4.8
Degree Program					
Master's	21.8	.22	21.41, 22.25	21.5	4.8
Practice Doctorate	22.3	.34	21.60, 22.95	22.1	4.9

Table 4.13. Subgroup Estimates of Mindfullness-Nonjudging for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	27.8	.35	27.12, 28.48	27.8	7.6
Male	28.8	.49	27.80, 29.74	28.4	7.5
Prefer not to answer	31.3	4.31	17.54, 44.96	30.3	8.2
Race					
American Indian Alaska Natives	27.8	2.63	20.49, 35.11	27.8	5.9
Asian	25.5	1.59	22.24, 28.76	25.2	7.9
Black	29.2	2.40	24.09, 34.26	28.7	9.5
Hispanic	27.9	1.39	25.01, 30.74	27.5	6.7
Native Hawaiian Pacific Islander	25.5	6.5	-57.09, 108.09	25.5	9.2
White	28.2	.30	27.64, 28.83	28.2	7.5
Mixed	27.5	1.96	23.41, 31.65	27.3	8.0
Prefer not to answer	29.3	2.50	23.66, 34.94	28.3	8.1
Marital Status					
Married	28.3	.39	27.49, 29.03	28.2	7.4
Widowed	38.0	2.0	12.59, 63.41	38.0	2.8
Divorced	28.1	1.86	24.26, 32.02	28.1	8.1
Separated	30.0	6.0	4.18, 55.82	30.0	10.4
In a domestic relationship	29.5	1.97	25.16, 33.84	28.9	6.8
Single, co-habiting	28.9	.79	27.33, 30.45	28.8	7.8
Single, never married	27.3	.52	26.31, 28.37	27.1	7.5
Prefer not to answer	28.0	3.62	18.68, 37.32	28.5	8.9
Training level					
1st year	28.5	.42	27.65, 29.32	28.4	7.6
2nd year	27.9	.45	27.06, 28.83	27.9	7.4
3rd year	27.6	.70	26.25, 28.83	27.5	7.8
Curriculum Type					
Front-loaded didactic	27.7	.37	27.02, 28.48	27.7	7.8
Integrated	28.7	.43	27.88, 29.58	28.6	7.3
Degree Program					
Master's	28.4	.335	27.71, 29.02	28.2	7.5
Practice Doctorate	27.6	.528	26.51, 28.59	27.4	7.6

Table 4.14. Subgroup Estimates of Mindfulness-Acting-With-Awareness for Complete Case Analysis and Multiple Imputation

	Complete Case Analysis			Multiple Imputation (*M*=50)	
Variable	**Mean**	**S.E.**	**95% CI**	**Mean**	**S.D.**
Gender					
Female	26.4	.30	25.79, 26.99	26.2	6.7
Male	28.3	.42	27.51, 29.16	27.9	6.5
Prefer not to answer	33.5	3.71	21.7, 45.3	31.5	8.7
Race					
American Indian Alaska Natives	29.0	2.07	23.24, 34.76	29/0	4.6
Asian	25.8	1.57	22.53, 28.97	25.4	7.9
Black	30.7	2.14	26.12, 35.17	30.0	8.8
Hispanic	27.8	1.54	24.61, 30.97	26.9	7.0
Native Hawaiian Pacific Islander	27.0	2	1.59, 52.41	27.0	2.8
White	26.9	.26	26.40, 27.42	26.8	6.6
Mixed	27.0	1.07	24.75, 29.25	26.0	5.2
Prefer not to answer	30.7	2.13	25.87, 35.53	29.5	7.0
Marital Status					
Married	27.3	.35	26.63, 28.0	27.1	6.8
Widowed	37.0	0	37.0	37.0	0
Divorced	27.8	1.25	25.19, 30.43	27.5	6.0
Separated	22.3	2.73	10.59, 34.07	22.3	4.7
In a domestic relationship	28.8	1.48	25.57, 32.09	28.1	5.6
Single, co-habiting	26.3	.73	24.84, 27.73	26.1	7.2
Single, never married	26.8	.44	25.95, 27.67	26.5	6.5
Prefer not to answer	25.0	3.21	16.74, 33.26	25.3	7.5
Training level					
1st year	26.7	.36	26.0, 27.42	26.5	6.4
2nd year	27.4	.41	26.62, 28.22	27.2	6.8
3rd year	27.1	.64	25.85, 28.37	26.9	7.1
Curriculum Type					
Front-loaded didactic	26.9	.31	26.29, 27.52	26.7	6.7
Integrated	27.3	.41	26.49, 28.11	27.1	6.8
Degree Program					
Master's	27.1	.29	26.56, 27.71	26.9	6.6
Practice Doctorate	26.9	.47	25.93, 27.79	26.8	6.9