Radiography Students: Factors Contributing to their Stress and Methods of Coping

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Radiography Students: Factors Contributing to Their Stress and Methods of Coping

A thesis presented to the faculty of the Department of Allied Health Sciences East Tennessee State University

In partial fulfillment of the requirements of the degree Master of Science in Allied Health

by

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August 2016

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Keywords: Stress, Radiography Student, Coping Strategies, Health
ABSTRACT

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by

Kayla A. Rosenbaum

College students experience high levels of stress, especially those in health care programs. The purpose of this study was to determine what factors contribute to Tennessee radiography student stress levels and the methods by which they cope with stress. Additionally, do demographic factors affect radiography student stress levels? The research was conducted February 4 to March 30, 2016. A survey was distributed to students in a radiography program at two and four year colleges in Tennessee. Participants were asked questions on factors that influence their stress levels, coping strategies, and health issues experienced in the past year. Descriptive statistics, independent samples t-test, and Pearson correlations were used to determine what factors influenced student stress levels, the most effective coping strategies, and if demographics affected student stress levels. This analysis revealed that school causes students the most stress, while taking a break was the most used stress coping strategy.
DEDICATION

To my husband and parents, who constantly encouraged me and urged me not to give up. I would not have made it this far without your love and support. To my daughter, I hope this will show you that with hard work and dedication, you can achieve anything you want in life.
ACKNOWLEDGEMENTS

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I also thank Dr. Randy Byington, committee member, for challenging me and helping me to have a better understanding of statistical analysis, to the point of enjoying it.
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CHAPTER 1

INTRODUCTION

Stress is defined as a situation in which internal or environmental demands exceed an individual’s ability to adapt (Keller et al., 2011). Stress levels depend on individual perceptions and circumstances (Pederson, 2012). Researchers discovered that 20% of Americans reported extremely high stress levels at 8, 9, or 10, while the mean rate level was 4.9 on a 10-point scale (American Psychological Association, 2013). Prolonged chronic stress has been linked to many physical and psychological effects, including premature mortality (Keller et al., 2011). Physical health issues may include, but are not limited, to cardiovascular disease, asthma, and migraines while psychological issues may include depression, anxiety, or difficulties concentrating (Innes, 1998).

Brock University (2010) divides stress into two categories: eustress and distress. “Eustress is the good stress that motivates you to continue working” (Brock University, 2010, para 2) and is necessary to motivate and challenge people to be more productive. Stress becomes distress when the amount is no longer tolerable. “Bad stress, or distress, is when the good stress becomes too much to bear or cope with” (Brock University, 2010, para. 3). This is the type of stress that leads to the psychological, physical, and behavioral symptoms.

According to Hudd et al. (2000), there are two types of stressors: life events and chronic strains. Life events are the “extent to which the accumulation of a series of experiences can create a stressful impact” (p. 217). Chronic strain involves stress from “conflicting roles in an individual’s life that produce competing, and potentially conflicting, demands over time” (Hudd et al., 2000, p. 217). Common stressors of college students include academics and financial burdens. Many students often juggle school, outside jobs, family, and financial and emotional
obligations (Klainberg, Ewing, & Ryan, 2010-2011). Health profession students may also experience additional stressors including but not limited to: volume of work, exams, emergencies, fear of making mistakes, and coping with terminally ill patients (Clarke & Rufflin, 1992).

Stress coping strategies vary from person to person. Welle and Graf (2011) found that common coping strategies among college students include social interaction and contact with family on a regular basis. Other strategies they found were getting at least eight hours of sleep, eating a balanced diet, exercising regularly, and participating in extra-curricular activities. These strategies were found to help students cope with stress as well as increase their stress tolerance.

“Although studies are available on the levels of workplace stress and burnout affecting radiographers, little to no research has been conducted to assess the stressors encountered by radiography students” (Mason, 2006, p. 437). While allied health care professionals may experience different levels of stress, Welle and Graf (2011) argue that “stress among college students is a major problem, impacting their overall health” (p. 96). According to the National College Health Assessment (NCHA), 30.5% of students reported that stress affected “their individual academic performance” (American College Health Association, 2012, p. 5). In addition, 42.9% of students rated their “overall level of stress” as “more than average stress” (American College Health Association, 2012, p. 16).

“Stress among college students is on the rise” (Pederson, 2012, p. 620). Previous research by Mendoza and Rocha-Singh indicated that “college students perceive stressors existing along multiple dimensions, including academic, financial, familial, personal, and environmental domains” (as cited in Pederson, 2012, p. 620). According to Klainberg et al. (2010-2011), student stress “can lead to an increased student dropout rate of higher education”
Mason (2006), in a study on student attrition, found that half of the students in a radiography program dropped out due to personal reasons; of note is that attrition was not due to poor academic performance.

Dill and Henley (1998) examined how traditional and nontraditional college students perceived stress within their lives and what stressors were the most prevalent in each group. The traditional students were 18 to 23 years old and began college directly after high school. The nontraditional students were 24 years old or older and had at least one year between high school and college. They found significant differences between the stress perceptions of traditional and nontraditional students. Traditional students attended classes more regularly and worried more about their school performance, whereas nontraditional students had more desire to attend school and do homework however; other responsibilities would sometimes interfere with class attendance. Overall, nontraditional students were found to experience less school related stress than traditional students. (Dill and Henley, 1998).

“Female and male students often differ in how they experience, perceive and handle stressful life events” (Darling, Howard, & Olmstead., 2007, p. 217). Brougham, Zail, Mendoza, and Miller (2009) discovered that in comparison to male students, female college students reported “(1) higher overall levels of stress, (2) greater stress for familial relationships, social relationships, and daily hassles, and (3) greater overall use of self-help and approach to cope with stress” (p. 93). They also found differences in coping strategies between men and women. While women demonstrated the use of emotion-focused coping for stress, men reported the use of self-punishment and adaptive coping strategies (Brougham et al., 2009).

Stress does not end when a student graduates from college. “Occupational stress has been linked to a range of adverse physical and mental effects. Occupational stress can result from the
job itself or the social and organizational context in which the job is done” (Chingarande & Ndlovu, 2013, p. 233). Occupational stress among health care workers has been attributed to job demands, fatigue, understaffing, risk of infection, lack of resources, and a lack of job security. Chingarande and Ndlovu (2013) reported that 50% of the in their study in Zimbabwe experienced high levels of occupational stress. Because the most common causes of the stress in radiographers included a lack of recognition, high level of pressure, inadequate vacation time, and being overworked and underpaid, they recommended a reduction in working hours and the introduction of a work stress intervention program to teach radiographers about occupational stress and the effects stress can have on their health (Chingarande & Ndlovu, 2013).

Health care professionals work in the most stressful occupations (Mason, 2006). Therefore, it is important that educators teach students strategies for coping with stress and promote healthy behaviors prior to students entering the professional workforce (Billingsley, Collins, & Miller, 2007). According to Leblanc (2009), “…approximately 25% to 35% of medical trainees report symptoms of anxiety and/or depression in response to the stressors they encounter” (p. S25). In a study on the implementation of a stress management workshop for nursing students the researchers concluded, “Faculty are aware that their students experience stress and want to help them manage that stress effectively” (Billingsley et al., 2007, p. 51).

**Statement of the Problem**

Stress affects the physical and mental well-being of an individual. While information regarding students enrolled in medical education programs, such as nursing, physical therapy, and medical doctorate programs is readily available, little is available on the stress factors and coping skills of radiography students. Therefore, a greater understanding of factors that
influence students’ stress levels and their coping strategies by faculty, students, and students’ family is necessary to promote healthy lifestyles as students and future professionals.

**Purpose of the Study**

The purpose of this study was to determine what factors contribute to stress for radiography students enrolled in radiography programs in Tennessee and the methods by which students cope with stress. The methods by which the students cope with stress will provide information for radiography educators to help current and future students. Additionally, the study sought to determine if there were differences in responses between and/or among various demographic factors.

**Research Questions**

The following questions provided guidance for this research:

1. What factors cause Tennessee radiography students the most stress?
2. What stress coping skills are most frequently used for Tennessee radiography students?
3. What health factors have Tennessee radiography students experienced in the past year?
4. Do the following demographic factors affect Tennessee radiography students’ stress levels: gender, student type, radiography program status, level of degree, number of work study hours, and number of work hours outside of school?

**Significance of the Study**

This study provided information concerning factors that contribute to stress levels of radiography students, as well as their current methods of coping. Understanding factors influencing stress levels of radiography students and their associated coping mechanisms will provide information that may help radiography educators to assist future students with stress management in school and in their future careers.
Delimitations and Limitations

The study was limited to Tennessee radiography students enrolled in an Associate or Bachelor degree radiography program at a not-for-profit college or university. The study was limited to ten of the sixteen radiography programs in Tennessee due to the exclusion of certificate and hospital-based programs. The study was also limited to the willingness of the first and second year students’ voluntary participation in the study.

Assumptions

I made the following assumptions in conducting this study: 1) that the radiography program directors distributed the surveys to the students without influence and 2) that the students who chose to respond answered the questions honestly.

Operational Definitions

Stress: “…A situation ‘in which environmental demands, internal demands, or both, tax or exceed the adaptive resources of an individual, social system, or tissue system’” (Keller et al., 2011, p. 677).


Nontraditional Student: Students “having multiple roles (e.g., parent, employee, student) and at least 1 year between high school and college” (Dill & Henley, 1998, p. 25).

Traditional Student: Students “enrolled in college directly from high school” (Dill & Henley, 1998, p. 25).
CHAPTER 2

LITERATURE REVIEW

Radiography, or the science of radiologic technology, “involves the use of radiographic and other imaging techniques to see inside the human body for diagnostic, curative, and palliative purposes” (Walker, 2011, para. 1). The birth of radiological science began on November 8, 1895, when Wilhelm Roentgen, a German physicist, discovered x-rays. Roentgen convinced his wife to allow him to experiment and expose her hand to x-rays for 15 minutes. The results of this experiment demonstrated an image of the skeletal bones in her hand. On January 23, 1896, Roentgen orally presented his findings and his discovery was found to be “unimpressive” and frightening (Harris, 1995, p. 4). However, the American Medical Association (AMA) followed the development of x-rays and remained “tastefully impartial to the x-ray and its applications” (Harris, 1995, p. 4).

On February 3, 1896, the first radiograph for clinical purposes in the United States was performed on a patient with a fractured arm. In 1898, the United States Army performed radiographs to find the locations of bullets in wounded patients during the war with Spain. By 1910, many physicians had purchased their own x-ray equipment for diagnostic use. The realization of the amount of time that was consumed in performing radiographs lead to nurses working as x-ray technicians (Harris, 1995).

In 1920, Eddy C. Jerman and 13 technicians met to form the American Association of Radiological Technicians, which would become known as today’s American Society of Radiological Technologists (ASRT) after a name change in 1964 (ASRT, 2013).

The American Registry of X-Ray Technicians was not an accident. It came into being as the brain-child of a group of wise and far-seeing radiologists who saw in the future the
need for a skill and artistry and fidelity in x-ray that far exceeded Roentgen’s modest dreams (as cited in Harris, 1995, p. 51).

The American Registry of X-Ray Technicians was founded in early 1923; however, the first radiography exam was given on November 17, 1922, to Sister M. Beatrice Merrigan. The exam consisted of 20 essay questions and a required submission of radiographs. She became the United States’ first registered technologist. During the 1960s, the addition of exams and certifications for other radiology modalities influenced a name change. The American Registry of X-Ray Technicians then became known as the American Registry of Radiologic Technologists (ARRT). Currently, there are over 300,000 registered radiologic technologists in the country (ARRT, 2013).

Since the founding of the ARRT, registry candidates must meet certain educational requirements before becoming eligible to sit for the radiography registry exam. These requirements include: the completion of an ARRT accredited radiography educational program, an earned degree (as of January 1, 2015), and demonstration of clinical and didactic competency (ARRT, 2015). In addition, radiography educational programs are required to meet the ASRT Radiography Curriculum guidelines, competencies, and standards. The ARRT (2015) lists the following areas in which students must demonstrate clinical competency to be eligible to take the National Registry Exam:

- Six mandatory general patient care activities
- Thirty-one mandatory imaging procedures
- Fifteen elective imaging procedures to be selected from a list of 35 procedures
- One elective imaging procedure from the head section
Two elective imaging procedures from the fluoroscopy studies section, one of which must be either an Upper GI or a Barium Enema (ARRT, 2015, p. 30).

The current national registry consists of 220 questions: 200 scored items and 20 pilot questions. Students have three and a half hours to complete the exam and must score at least 75% to be registered. The current cost of application is $200 and a re-application fee of $175 if the student does not score high enough on the first attempt. Students are permitted three attempts to pass the registry within a three-year period starting from the first examination date. A student is not eligible to sit for the registry after three failed attempts or the three-year period has expired. However, students may obtain eligibility sit for the registry one additional time by providing documentation demonstrating that the student has completed an accepted remedial activity. Accepted remedial activities include: independent study for a minimum of 40 hours; study with a certified-technologist for a minimum of 20 hours; or study with an educator from an accredited program for a minimum of 10 hours. Students who fail their fourth attempt or wait longer than a year after the third attempt will lose registry eligibility and may re-qualify by meeting the initial requirements (ARRT, 2015).

Each student is tested in the following areas: radiation protection, equipment operation and quality control, image acquisition and evaluation, imaging procedures, and patient care and evaluation. The ARRT breaks down each topic into several areas that each student must know (ARRT, 2015). This exam places a lot of stress on students due to the amount of material they must know and the fact that students must pass the examination to obtain the certification required to practice radiography in many health care facilities. In addition to the ARRT registry, some states require a state licensure for radiography. Tennessee does not require a state licensure
unless the radiology technologist is working in the offices of medical doctors, chiropractors, podiatrists, or osteopathic physicians (TN Department of Health, n.d.).

**Stress and Effects on the Body**

Stress is “defined as a situation in which environmental demands, internal demands, or both, tax or exceed the adaptive resources of an individual, social system, or tissue system” (as cited in Keller et al., 2011, p. 677). Stress is caused by the following: “unrealistic expectations, social pressures, academic achievement, dissatisfaction with your current situation or status, change in sleeping habits, new responsibilities, change in eating habits, stress prone diet, change in environment, and money concerns” (Kirsten, 2012, para. 4). Each person has a different perception of stress. An individual may experience very little stress but still feel it has a great impact on his or her health. The impact of a stressor is determined by an individual’s perception or appraisal of that stress (Keller et al., 2011). “Primary appraisal is mainly determined by perceptions of susceptibility to the event as well as perceptions of the event’s severity” (Keller et al., 2000, p. 678). Keller et al. (2000) found that an individual’s stress appraisal is critical in determining the impact the stress has on that individual’s health.

Stress can have a detrimental effect on a person with prolonged periods of stress leading to “psychological and physical health effects, as well as an increased risk of premature mortality” (Keller et al., 2011, p. 677). According to Edwards and Rothbard (1999), “It has been estimated that stress contributes to 90% of medical disorders and is therefore a major factor in escalating health care costs…” (p. 86). Any stressor evokes the same biological response known as the General Adaptation Syndrome, or GAS (Welle & Graf, 2011).

Physiological responses include the so-called ‘fight or flight’ response, initiated by the secretion of adrenocorticotrophic hormone from the pituitary gland and associated with stimulation of the sympathetic nervous system. This results in the
body’s resources, such as energy, being mobilized ready for immediate action.

The physiological changes occurring under stress conditions include an increase in metabolism, heart and respiration rates, sweating and pallor, as well as a decrease in non-essential functions such as digestion (Innes, 1998, p. 90). The parasympathetic nervous system will return the body to the normal balance once the stressor is no longer present. Major problems emerge when the body does not return to normal due to long lasting stressors (Well & Graf, 2011).

According to Khansari, Murgo, and Faith (1990), stress and distress have been increasingly linked to immunosuppression. “The limbic system of the CNS is the major central system involved in adaptation, and neuroendocrine and emotional responses to stressful signals” (Khansari et al., 1990, p. 170). The body’s adaptation to a stressor stimulates and alters the amount of a variety of neurotransmitters and hormones, such as growth hormone, prolactin and neurohormones, which have a significant impact on the immune response.

Migraines, colds, and infections are common physical symptoms of stress, while cardiovascular disease and asthma are more serious physical illnesses caused by stress. Stress affects the mental health of an individual by causing irritation, anxiety, difficulties concentrating, and in more serious cases clinical depression (Innes, 1998, p. 90). Other responses to stress may include trouble sleeping and weight loss or gain (Kirsten, 2012). The extent of the body’s reaction to stress depends on the type of stress an individual experiences.

**Types of Stress**

According to the American Psychological Association (APA) (2014), there are three types of stress; acute stress, episodic acute stress, and chronic stress. Acute stress, or short-term stress, is the most common type of stress and occurs from recent or future demands and
pressures. According to Mayo Clinic Staff (1998-2014), the response to acute stress is “immediate and intense” but can be exciting and thrilling in certain situations (para. 3). An overload of acute stress can cause “psychological distress, tension headaches, upset stomach and other symptoms” (American Psychological Association, 2014, para. 2). The most common symptoms of acute stress include: emotional distress, such as anxiety, irritability, anger, and/or depression; muscular problems, such as tension headache, jaw pain, muscular tensions that may lead to pulled or strained muscles and tendons; and gastrointestinal problems, such as stomach and bowel issues, heartburn, flatulence, diarrhea, irritable bowel, or constipation. High blood pressure, rapid heartbeat, dizziness, palpitations, shortness of breath, chest pain, and migraines are also common symptoms of acute stress. However, acute stress is treatable and very manageable (American Psychological Association, 2014).

Episodic acute stress is acute stress that occurs on a frequent basis. People who experience episodic acute stress lead chaotic and disorganized lives. These people take on too much, are always in a hurry, and “describe themselves as having ‘a lot of nervous energy’” (American Psychological Association, 2014, para. 5). Another form of episodic acute stress is caused by worrying. These so called worry wort’s see disaster involved with everything and have a pessimistic outlook. Symptoms of episodic acute stress include persistent migraines and tension headaches, hypertension, and heart disease. Most people who experience episodic acute stress are not aware they are suffering and blame their problems on other people or events. This type of stress commonly requires intervention and professional help over an extended period of time (American Psychological Association, 2014).

The third type of stress described by the APA (2014) is chronic stress. Chronic stress wears people down and “destroys bodies, minds, and lives” (para. 12). This type of stress is
caused by long term problems, such as an unhappy marriage, poverty, dysfunctional family, or a despised job. The body’s response to chronic stress is less intense; however, the effects last longer and are more problematic (Mayo Clinic Staff, 1998-2014). “Chronic stress comes when a person never sees a way out of a miserable situation” (American Psychological Association, 2014, para. 13). People experiencing chronic stress often forget about the stress because they get used to it being a part of their everyday lives.

“Chronic stress kills through suicide, violence, heart attack, stroke and, perhaps, even cancer. People wear down to a final, fatal breakdown. Because physical and mental resources are depleted through long-term attrition, the symptoms of chronic stress are difficult to treat and may require extended medical as well as behavioral treatment and stress management” (American Psychological Association, 2014, para. 16).

Regardless of the type of stress, there are several causes of stress including but not limited to financial stress, academic stress, family stress, and occupational stress. “Occupational stress is a major hazard for many workers” (PEF Health and Safety Department, 2006, para. 1).

**Financial Stress**

“Financial stress is perceived to be one of the most important sources of psycho-social stress because so many of the basic activities of daily life are associated with personal financial resources and their management” (Bailey, Woodiel, Turner, & Young, 1998, p. 198). Financial or economic stress can be due to the loss of a job or home resulting in changes in income, budget, or a dwindling retirement fund which can also cause distress. In some cases, the anticipation of these events may cause as much or more stress (Brown University Health Promotion, n.d.). Financial stress results in individuals living pay check to pay check or cutting corners to provide food for their families. Financial worries affect marriages and the strain can
tear families apart. This strain leads to headaches, high blood pressure, and cardiac issues among other medical issues (Institute of Healthmath, 2014). According to Choi (n.d.), financial stress results in feelings of loss of control, anxiety, depression, and other mental and emotional problems.

The debt stress index was developed by Paul J. Lavrakas and his research colleagues at Ohio State University to record the impact of financial debt worry on health. According to an Associated Press-GFK poll, the debt stress index increased from 25 in 2004 to 29.2 in 2011 (GFK Custom Research North America, 2011). In another Associated Press-GFK poll, 20% of the 1,001 people interviewed reported constantly worrying about their debt while 31% stated their debt caused them some stress and 16% revealed that their debt caused them a great deal of stress (Associated Press, 2011).

Financial stress not only affects adults but can have a detrimental impact on children. “School psychologists and guidance counselors have reported an increase in the number of children struggling with stress because of their families’ financial problems” (Choi, n.d., p. 121). Researchers at the Iowa State University Institute of Social and Behavioral Research studied children over a period of 10 years and found that children who experience socioeconomic adversity are at risk for poor mental health as early as their teenage years (Iowa State University, 2008). Aside from financial stress, stress and tension among family members can also result in increased stress levels for children and adults.

College students are not immune to financial stress. College students who are transitioning from high school must learn how to handle their finances including paying bills and staying within their budget (Brougham et al., 2009). Ross, Niebling, and Heckert (1999), revealed that 71% of the college students surveyed experience stress as a result of financial
difficulties. Brougham et al. (2009) reported that college women experience greater stress from finances compared to college men.

Financial burdens may lead college students to reduce coursework or drop out of school in order to get a paying job. With the increasing college tuition and fees, the average student debt in 2014 was $33,000 (Debt.org, 2016). This leads to the majority of college students working to help fund college and living expenses. As a result, many students must decrease their coursework load which increases the amount of time it takes them to complete a degree. On average, college students work 30 hours per week and carry a high credit card debt (Joo, Durband, & Grable, 2008). While financial stress affects college students’ stress levels, family stress may also cause an increase in stress level.

**Family Stress**

While financial stress plays a role in family stress, other family problems or situations can lead to a distress. “The rise of dual-earner couples has intensified the struggle to manage family responsibilities and family relations have weakened due to the breakdown of traditional family structures” (Edwards & Rothbard, 1999, p. 86). Becoming a parent drastically changes the lives of single and married individuals. Parenting and the responsibilities of raising a child can be overwhelming at times with a healthy child and even more so with a child who has a lifelong illness (Bouma & Schweitzer, 1990; Collingwood, 2007).

As the population ages, parent care has become a normal and stressful circumstance for adults. When a parent’s dependency needs increase, the family balance is changed which has the potential to cause stress among family members. Changes in the family balance can result in conflicts between husbands and wives, siblings, and across different generations. In addition to financial hardship, adult children experience physical health issues when they have the
responsibility of caring for disabled or elderly parents (Brody, 1985). According to Brody (1985), the most severe consequences involve the emotional stress experienced by adult children resulting in depression, anxiety, frustration, helplessness, and sleeplessness. “The family is affected by interference with its life-style, privacy, socialization, vacations, future plans, and income and by the diversion of the caregiver’s time from other family members and the negative effects on her health” (Brody, 1985).

While college students’ families can help students cope with stress, families can also be a source of stress. Fifty-three percent of college students experience family stress (College Parents of America, 1997-2013). Changes in family structure such as divorce or moving out of a parent’s home can place stress on college students. Moving out of a parent’s home and being away from family and pets can cause the feeling of loss of familiarity. Other sources of family stress for college students may include the death of a family member or close friend (Center for Academic Stress, n.d.).

**Occupational Stress**

While stressful family situations can take a toll on an individual’s health, occupational stress is just as much to blame for health issues due to stress. An occupational stressor is any physical or psychological demand experienced during working. These stressors can be caused by personalities, values, health, perceptions, education background, and job situations (Raj, 2006). “Occupational stress is caused by workplace individual and social factors, and it is recognized as one of the most pervasive and potent health hazards in the work environment” (Raj, 2006, p. 113). “Occupational stress has been linked to a range of adverse physical and mental effects, including insomnia, depression, cardiovascular disease and anxiety” (Chingarande & Ndlovu, 2013, p. 233).
Raj (2006) separates work stressors into the following categories: organizational stress, work overload, boundary extensions, career developments, leadership style, and role ambiguity and role conflict. Organizational stress is the “general and often unconscious mobilization of the individual’s energy when confronted with any organizational or work demand” (Raj, 2006, p. 113). Work overload is divided into qualitative stressors, when an employee feels he or she does not have the knowledge to perform a task, and quantitative stressors, when an employee is given more work than he or she can complete. Boundary extension stressors occur when employees must work with other departments. As one tries to elevate his/her career or to change job positions, he/she may experience stress. A lack of career development can also lead to stress and boredom. The management’s leadership style can cause stress for an employee. For example, a manager who demonstrates an authoritarian style of leadership may cause stress for an employee who is more independent. Role ambiguity and role conflict causes stress when an employee is unsure of what is expected of him or her (Raj, 2006). Health care workers may experience one or more of the occupational stressors due to their type of work and the environment.

Health care occupations have been identified “as some of the most stressful in the United States” (Mason, 2006, p. 437). Stress among health care workers has been credited to the following issues: “increased risk of infection, high job demands, compassion fatigue, understaffing, inadequate resources, a lack of control and/or participation in planning, and a lack of work security” (Chingarande & Ndlovu, 2013, p. 233). Health care careers involve taking care of other people and a mistake or error can be costly and sometimes permanent (Kakunje, 2011).

According to Innes (1998), Health care workers “have been shown to be susceptible to depression and to the state known as burnout” (p. 90). Burnout is defined as “negative emotional, psychological and physical reactions to work-related stress” (Raj, 2006, p. 114). Burnout can
cause health care workers to become depersonalized from their patients and less focused on their work (Lin, 2013). According to Brown, Goske, and Johnson (2009), stress and job burnout can cause depression, anxiety, anger, irritability, substance abuse, and psychological morbidity. According the Centers for Disease Control (CDC) (2008), health care workers have higher rates of substance abuse and suicide than any other profession.

Radiographers are no exception in their experience of occupational stress. “Sechrist and Frazier found that the top 6 stressors for radiographers were disrespectful physicians, inadequate pay, unnecessary exams, lack of staff, lack of respect and uncooperative or unsupportive radiologists” (Mason, 2006, p. 438). Polworth (as cited by Innes, 1998) found the cramped workspace, the poor lighting and ventilation, the shift work, the personal safety, and the conflicts with supervision as physical stressors experienced by those working in radiography occupation. In addition, radiographers also deal with stress in their home environment that can affect their work performance (Innes, 1998).

While there is limited research on occupational stress related to radiographers, there is considerable research on other various health care professions. Happell et al. (2013) found that nurses experience much of the same occupational stressors as radiographers. Some additional stressors found by Happell et al. (2013) include: unavailability of doctors, unsupportive management, shift working, car parking, handover procedures, human resources issues, no upward career mobility, and patient mental health. Hamaideh (2012) found the same occupational stressors with the addition of lack of resources in study of mental health nurses.

Occupational stress not only affects the employee, it affects the organization as well. Organizations with stressed-out employees are at a higher risk for accidents, lower productivity, tardiness, and absenteeism. Behavioral issues such as sleep disorders, substance abuse, smoking,
eating disorders, and burnout are often experienced by employees under stress (Raj, 2006). Ultimately, behavioral changes in employees can also affect the organization. According to Edwards and Rothbard (1999), “The New York Business Group on Health estimates that stress costs employers $75-80 billion annually in absenteeism, turnover, lost productivity, and health and disability claims” (p. 86)

**Student Stress**

College students are not immune to stress. “Stress among college students is a major problem, impacting their overall health” (Welle & Graf, 2011, p. 96). College students tend to experience stress because they “often juggle outside jobs, family, emotional and financial role responsibilities, and the challenges of attaining an education” (Klainberg et al., 2010-2011, p. 5). Students have identified the following two areas as very stressful: “examinations and course workload and social stressors such as financial hardship and lack of time for family and friends” (Innes, 1998, p. 91). Hamaideh (2010) and Misra, McKean, and West (2000) found that females reported higher stress levels than males. Welle and Graf (2011) conducted a study to determine if lifestyle and coping strategies had an effect on college student stress tolerance. They found that the most common stressors in college students were “beginning college, change in living conditions, decreased number of family get-togethers, losing a friendship or friend, and new boyfriend/girlfriend” (Welle & Graf, 2011, p. 102). Other stressors included academic stress and social pressures. Students who got at least eight hours of sleep, exercised, ate healthy, and participated in extra-curricular activities had a higher stress tolerance level (Welle & Graf, 2011).

Welle and Graf (2011) found that “[s]tress can lead to suicidal ideation and depression” (p. 97). According to the National College Health Assessment (NCHA), 31% of college students
reported being so depressed that they found it hard to function. Seven percent of students had seriously considered suicide, while 1% had actually attempted suicide (American College Health Association, 2012).

Collegiate stress has also been linked to poor health habits. Students with higher levels of stress reported eating more junk food, exercised less, and did not get an adequate amount of sleep (Brougham, 2009). Stress can affect academic performance as well as physical and mental health (Misra et al., 2000). Sawatzky et al. (2012) found that higher stress management was linked to lower depression scores for students in which stress negatively affected their academic performance. According to Klainberg et al. (2010-2011), “Social pressures, learning challenges, new study methods, a change in peer relationships, and, particularly, examinations, cause stress that can lead to an increased student dropout rate from institutions of higher education” (p. 5). In contrast, Schulz, Dowd, and Fischback (as cited by Mason, 2006) “determined that 50% of student attrition was due to personal reasons rather than academic or clinical performance problems” (p. 439).

However, traditional and nontraditional students differ in their personal and academic experiences. Dill and Henley (1998) found that nontraditional students have more responsibilities at home. Traditional students were more affected by peer and social events and reported more vacations and trips than nontraditional students. Nontraditional students enjoyed going to class and had a higher desire to learn. They also reported having responsibilities that interfered with attending class however; they “experienced less school-related stress” (Dill & Henley, 1998, p. 30).

Although little research is available on radiography students and stress, several studies have involved an evaluation of nursing students’ stress and coping strategies. Billingsley et al.
(2007) stated, “Nursing students experience stress from several sources: fear of failing, long study hours, academic work, lack of clinical experience, relationships with faculty, new roles and responsibilities, theory-practice gaps, and poor relationships with clinical staff” (p. 49). Clarke and Rufflin (1992) found the major stressors of student nurses to be “in five areas relating to study, the emotional demands of nursing, the use of technical equipment, interpersonal interaction, and finding time for family and personal activities (p. 39). Clarke and Rufflin (1992) and Jones and Johnston (1997) found similar common sources of stress among nursing students including long study hours, lack of free time, fear of failure, and interactions with teachers and other professionals. Fortunately, there is evidence that problem-focused coping strategies contribute to lower stress levels.

“Although studies are available on the levels of workplace stress and burnout affecting radiographers, little to no research has been conducted to assess the stressors encountered by radiography students…” (Mason, 2006, p. 437). Mason (2006) completed a study to determine the “sources of stress for radiography students” and “the most effective measures to alleviate the stress that students experience in the clinical environment” (p. 437) and found that “fear of making a mistake/repeat, feeling unprepared/inexperienced, intimidation by staff and instructors, difficult/critical patients, hurtful criticism, too much supervision, and negative responses to questions/requests for help” to be the top seven clinical stressors for radiography students (p. 440). The first three clinical stressors were due to students’ lack of experience, abilities, and skills. Mason (2006) linked the other four clinical stressors to radiographer stress and the department environment. The top four “clinical practices claimed to ease stress were: more frequent feedback, personnel and clinical instructor availability, assurance that mistakes happen, and the opportunity to make mistakes” (Mason, 2006, p. 440).
Ramanaidu (1991) compared the stresses experienced by radiography students in London and the stresses experienced by radiography students overseas; the sources of stress reported by student radiographers were:

- academic concerns (grades, examinations, study, inadequate academic guidance);
- time management (lack of time for study, relaxation, and recreation);
- interpersonal relationships (being treated as immature or irresponsible, lack of support from senior staff, or being powerless);
- aspects of clinical training (doing unnecessary work, dealing with death and the seriously ill);
- career choice (uncertainty of future goals and career choice);
- motivation (lack of motivation or recognition for good work). (p. 24).

Academic pressures caused the most stress for radiography students in London and overseas; however, radiography students overseas felt a greater amount of unhappiness with the quality of their education when compared to radiography students in London (Ramanaidu, 1991).

Misra et al. (2000) found that faculty perceived that students experienced higher stress levels and displayed stress reactions more frequently than the students did. According to Billingsley et al. (2007), faculty are aware that their students experience stress and want to help the students deal with that stress. The understanding of stress by faculty members “will help them to practice techniques and adopt attitudes essential to assist and mentor them to cope/deal” more effectively (Misra et al., 2000, p. 5).

**Coping Strategies**

Individuals respond to stress in different ways. There are two types of strategies than can be used to cope with stress: “problem-focused coping and emotion-focused coping” (Hamaideh, 2010, p. 27). Problem-focused coping involves dealing with the stressful situation directly to
change the situation. Emotion-focused coping involves changing the individual’s assessment of the stressful situation and is the less effective coping strategy (Hamaideh, 2010).

Problem-solving strategies are associated with positive results including better health, whereas emotion-focused strategies are associated with negative results. Brougham, et al. (2009) determined, through a review of literature, that “college women in comparison to college men reported the use of self-punishment as an overall coping response” and a “greater use of emotion-focused [coping] strategies” (p. 93). In addition, college men reported the use of self-punishment to cope with family stress, “accommodation to cope with financial stress, and self-help to cope with social stress” (Brougham et al., 2009, p. 93). Overall, both men and women used emotion-focused coping more than problem-focused coping.

According to the CDC (2014), “Engaging in healthy activities and getting the right care and support can put problems in perspective and help stressful feelings subside” (para. 4). Healthy activities include eating well-balanced meals, exercising on a regular basis, getting adequate amounts of sleep, taking a break when feeling stressed out, and avoiding drugs and alcohol. Drugs and alcohol will create more problems and stress in the long run. Talking to someone such as a counselor, teacher, or parent can also be beneficial in relieve stress symptoms (CDC, 2014).

The University of Minnesota provides a list of 101 strategies for coping with stress for their students. Many of these strategies include engaging in healthy activities such as exercising, taking a break, social interactions, and meditation. Other strategies involve expressing oneself by talking to someone or writing in a journal. Coping strategies such as learning to accept things that cannot be changed and letting other people take care of themselves can also reduce the amount of stress an individual incurs. This entire list of strategies advises students to take care of
themselves, take time out for themselves, and analyze and think through stressful issues (University of Minnesota, 2003).

Summary

Stress can have a detrimental effect on a person whether it is acute, episodic, or chronic. No one is immune and in fact, students may experience greater levels of stress due to balancing academic, financial, and family responsibilities. Stress among college students is on the rise. Stress can be caused by a variety of issues including social pressures, academics, financial issues, family issues, dissatisfaction, changes in environment, and pressures related to outside jobs. However, coping strategies such as getting enough sleep, eating a healthy diet, and exercising can have a positive effect on relieving stress.
CHAPTER 3

METHODS

In order to determine what factors contribute to stress for radiography students enrolled in radiography programs in Tennessee, I conducted a non-experimental quantitative study using a locally developed survey instrument since I found no preexisting survey that worked for my purposes.

Research Questions

The following research questions guided the research methodology:

1. What factors cause Tennessee radiography students the most stress?
2. What stress coping skills are most frequently used for Tennessee radiography students?
3. What health factors have Tennessee radiography students experienced in the past year?
4. Do the following demographic factors affect Tennessee radiography students’ stress levels: gender, student type, radiography program status, level of degree, number of work study hours, and number of work hours outside of school?

Research Design

A non-experimental research design is used when the research does not require any manipulation of an independent variable (Cottrell & McKenzie, 2011). Survey research “gather[s] specific information from a targeted group of people” and “involves the administration of a questionnaire to a sample or to an entire population of people to determine the attitudes, opinions, beliefs, values, behaviors, or characteristics of the group being studied” (Cottrell & McKenzie, 2011, p. 195). This design was appropriate for this study since I was gathering data on student experiences. In addition, this study was cross-sectional, involving the collection of “data at one specific point in time” (Cottrell & McKenzie, 2011, p. 196).
“Survey research is an excellent way to gain information about a particular group of people…” (Cottrell & McKenzie, 2011, p. 195). Survey research “produces data based on real-world observations” and “can produce a large amount of data in a short time for a fairly low cost” (Kelley, Clark, Brown, & Sitzia, 2003, p. 262). A locally developed survey was being used because the researcher believes modified Likert scale surveys measure attitudes and “allow for degrees of opinion” (McLeod, 2008, para. 9). Survey research can be limited due to the “lack of details or depth on the topic being investigated” (Kelley et al., 2003, p. 262). The researcher used a five point modified Likert scale when designing the survey instrument to allow a greater distinction between each answer option. A disadvantage of this type of survey is that participants are not provided with the opportunity to elaborate on any survey question.

**Population**

The population for this study included first and second year radiography students enrolled in a Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited radiography program at two and four year colleges or universities in Tennessee (See Appendix A). These radiography programs are 22 to 48-months in length. The population included male, female, traditional, and nontraditional students.

**Instrument Development**

I developed the cross-sectional survey instrument using information the literature review and a modified Likert scale. In 1932, “Likert developed the principle of measuring attitudes by asking people to respond to a series of statements about a topic, in terms of the extent to which they agree with them, and so tapping into the cognitive and affective components of attitudes” (McLeod, 2008, para. 2). “A Likert-type scale assumes that the strength/intensity of experience is linear, i.e. on a continuum from strongly agree to strongly disagree, and makes the assumption
that attitudes can be measured” (McLeod, 2008, para. 3). The Likert scale, developed by Rensis Likert, is the most widely used measurement in health education research (Cottrell & McKenzie, 2011).

The survey questionnaire (See Appendix B) was standardized and each participant answered the same survey questions. The survey instrument was divided into six sections. The first section asked the participants to rate their overall stress level on a scale of 1 to 5 with 1 being very low and 5 being very high. In the second section participants rated the level at which each topic affected their stress. This section addressed academic, clinical, social, familial issues, and economic aspects that may influence stress. Participants ranked each item as strongly affects, moderately affects, slightly affects, rarely affects, or does not affect their stress levels. In section three, students indicated whether they had experienced any of the following health issues: decrease in energy level, increase in heart rate, headaches or migraines, high blood pressure, gastrointestinal issues, difficulty sleeping and depression, within the past year that could be related to stress. In section four participants reported on how often they practiced each listed coping strategy. In the fifth section, participants chose which of the common coping strategies have proven to be most effective in relieving his or her stress. Participants answered basic demographic questions in section 6 to allow for comparisons between demographic groups.

**Instrument Validity**

To determine instrument validity, I conducted a pilot study with radiography students enrolled in a two-year radiography program in southwest Virginia. I sent a cover letter to the radiography program direct (Appendix B), with a letter for the radiography students (Appendix C), and the survey instrument (Appendix D) asking that they distribute the letter and survey to their students. I asked for feedback on the survey, as well as how long it took to complete the
survey. The program directors then returned the surveys to me in the self-addressed stamped envelope I provided to them. Upon receipt of the pilot surveys, I reviewed all the recommendations and made changes to the survey as warranted.

**Recommendations from the Pilot Study**

The conduction of the pilot study led to the discovery that the response choices on question four in the section on taking a break or vacation needed revision to allow more accurate responses. The pilot study also led to an addition to question three asking participants if he or she had been diagnosed with a medical condition that could cause or contribute to the symptoms listed in question three.

The pilot study was mailed to the radiography program director at a college in Southwest Virginia on November 12, 2015. There were 45 students enrolled in this radiography program at this time, and 16 students chose to participate. The pilot study participants completed the survey and gave the surveys back to the director in a sealed envelope. The director then mailed the surveys back to the researcher.

After reviewing the completed surveys, the revisions were made to questions three and four of the survey. A suggestion from the pilot study that did not result in changes to the survey suggested an additional question asking if any of the symptoms listed in question three had been experienced prior to the past year. All other comments on the pilot surveys were about that particular participant’s current situation.

**Data Collection**

A four-page survey instrument [Appendix E] was administered to the participants and consists of 36 modified Likert responses, 13 yes or no responses, 1 multiple choice response, and 6 demographic responses. I mailed a total of 238 packets to the radiography program directors at
two and four year colleges and universities in the state of Tennessee. Each packet included a letter to the program director [Appendix F], a letter to each participate [Appendix G], copies of the survey, and a self-addressed, postage-paid return envelope for each radiography program director to mail the completed questionnaires back to me. According to Cottrell and McKenzie (2011), the advantages of mailed questionnaires include that they are inexpensive, easy to distribute, participants feel more anonymous, and participants may respond at their convenience. A follow-up letter [Appendix H] was mailed to each program director on February 25, 2016, in which no responses were received after the initial questionnaire mailing on February 4, 2016.

**Informed Consent**

In order to ensure that all participants voluntarily participated in the research study without coercion or undue influence, I included a cover letter with the survey. The letter explained that participation was completely voluntary and participants could refuse to take part in the study at any point during the research. The completion of the survey provided implied consent. Implied consent is the assumption that by completing the questionnaire, the participant is consenting to participate in the study without actually signing a consent form (Cottrell & McKenzie, 2011).

**Data Analysis**

I analyzed quantitative data using the statistical software SPSS version 23. I entered and double-checked all data to verify accuracy. According to The Pell Institute (2015), the first step in analysis is data tabulation which includes frequency distribution, “a method of tallying and representing how often certain scores occur” (Salkind, 2011, p. 52). The next step of analyzing quantitative data was to obtain the descriptive statistics including measures of central tendency and variability. “Descriptive statistics are used to organize and describe the characteristics of a
collection of data” (Salkind, 2011, p. 8). I calculated the mean, mode, median, and standard deviation using SPSS. I used these descriptive statistics to answer research questions one, two, and three.

I used an independent sample t-test to determine if any differences existed between male and female stress levels, traditional and nontraditional students’ stress levels, two year and four year program students, and first and second year radiography students. I used an independent sample t-test because “the two groups were not related in any way,” (Salkind, 2011, p. 190). In addition, I used the t value (converted by SPSS to a p value labeled Sig.) to determine if any significance existed between the independent variables at the 95% confidence level (alpha=.05).

I used a Pearson correlation to determine if the number of work study hours in a week and the number of work hours outside of school in a week affected student stress levels. “The Pearson coefficient examines the relationship between two variables, but both of those variables are continuous in nature” (Salkind, 2011, p. 78). The Pearson correlation (r) can range from -1 to 1. A positive correlation is present if variables change in the same directions, while a negative correlation is present if variables change in opposite directions (Salkind, 2011).

Summary

For this non-experimental quantitative study, I used a modified Likert-type survey instrument I developed. After gathering data from two and four year colleges and universities in Tennessee with radiography programs, I analyzed it and will use the results to formulate the conclusions in the next chapter.

Background of the Researcher

A graduate of J. J. Kelly High School in Southwest Virginia, the researcher attended Mountain Empire Community College while in high school and one year afterwards. The
researcher then transferred to East Tennessee State University (ETSU) and completed a Bachelor’s of Science with a concentration in radiography in 2005. After working as a radiological technologist for six years, the researcher enrolled at ETSU to earn a graduate degree. Currently, the researcher anticipates completing a Master’s of Science in Allied Health in August 2016.

Currently, the researcher works as a radiology supervisor and PACS (Picture Archive and Communication System) administrator at a local Veteran’s Administration (VA) hospital. Prior to obtaining that position, the researcher worked as an x-ray technologist for two years and a MRI (Magnetic Resonance Imaging) technologist for seven years. In addition to this position, the researcher has also taught CT (Computed Tomography) patient care and physics for the certificate program at ETSU for 4 years [Appendix J].

The researcher’s experience as a student, technologist, supervisor, and teacher has given the researcher the experience and observations of radiography student stress levels. The researcher’s hope for this study is to highlight the factors that cause radiography students the most stress as well as healthy coping strategies. By researching this topic, the researcher hopes this will help radiography faculty to assist students in coping with stress in a healthy way and that these healthy coping strategies will be used throughout their careers.
CHAPTER 4

DATA ANALYSIS

The purpose of this study was to determine what factors contribute to stress for radiography students enrolled in radiography programs in Tennessee and the methods by which students cope with stress. Additionally, the study sought to determine if there were differences in responses between and/or among various demographic factors.

The following questions guided this study:

Question 1: What factors cause Tennessee radiography students the most stress?

Question 2: What stress coping skills are most frequently used for Tennessee radiography students?

Question 3: What health factors have Tennessee radiography students experienced in the past year?

Question 4: Do the following demographic factors affect Tennessee radiography students’ stress levels: gender, student type, radiography program status, level of degree, number of work study hours, and number of work hours outside of school?

Participants

I collected data from February 4 to March 30, 2016 using the procedure described in Chapter 3. Radiography program directors from the following three community colleges and two universities in Tennessee agreed to distribute surveys to their radiography students who were at least 18 years of age: Chattanooga State Community College, Columbia State Community College, Volunteer State Community College, Austin Peay State University, and East Tennessee State University. I mailed two hundred thirty-eight surveys to participating colleges and universities on February 4, 2016 and received 174 (73%) responses. The demographic variable
distribution percentages are as follows: 17.8% males and 82.2% females; 69.9% traditional students and 30.1% nontraditional students; 50.9% first year students and 49.1% second year students; 54.3% working toward an Associate degree and 45.7% working toward a Baccalaureate degree (Figures 1-4)

**Figure 1. Gender**

**Figure 2. Student Type**
Figure 3. Radiography Program Status

Figure 4. Level of Degree

Survey Question 1 requested that students rate their current stress level on a 5-point modified Likert scale. The scale ranged from very low (1) to very high (5). As shown in Figure 5, 43.2% of the students reported that they were currently experiencing a high stress level, 26%
were experiencing a moderate level of stress, and 23.3% were experiencing a very high stress level.

![Pie chart showing stress levels of radiography students]

*Figure 5. Current Radiography Student Stress Level*

**Research Question 1: Student Stress Factors**

Research Question 1 asked: What factors cause Tennessee radiography students the most stress? Statements in survey question two were scaled items, specifically a 5-point modified Likert scale. The scale ranged from does not affect (1) to strongly affects (5).

Students reported that examinations ($\mu = 4.57$), overall grades ($\mu = 4.34$), and lack of study time ($\mu = 4.28$) impact their stress level. Furthermore, fear of making a mistake ($\mu = 4.18$) and the amount of study material ($\mu = 4.14$) also affect their stress level (See Table 1).
Table 1

*Descriptive Statistics for Tennessee Radiography Student Stress Factors*

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>µ</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a. Quality of education</td>
<td>174</td>
<td>3.44</td>
<td>1.18</td>
</tr>
<tr>
<td>2b. Examinations</td>
<td>174</td>
<td>4.57</td>
<td>.70</td>
</tr>
<tr>
<td>2c. Overall grades</td>
<td>174</td>
<td>4.34</td>
<td>.86</td>
</tr>
<tr>
<td>2d. Lack of study time</td>
<td>174</td>
<td>4.28</td>
<td>.93</td>
</tr>
<tr>
<td>2e. Amount of study material</td>
<td>174</td>
<td>4.14</td>
<td>1.01</td>
</tr>
<tr>
<td>2f. Difficulty with study material</td>
<td>174</td>
<td>3.74</td>
<td>1.09</td>
</tr>
<tr>
<td>2g. Teacher/student relationship</td>
<td>174</td>
<td>2.57</td>
<td>1.26</td>
</tr>
<tr>
<td>2h. Peer relationships</td>
<td>172</td>
<td>2.26</td>
<td>1.18</td>
</tr>
<tr>
<td>2i. Lack of education funds (tuition, books, housing, etc.)</td>
<td>174</td>
<td>3.12</td>
<td>1.45</td>
</tr>
<tr>
<td>2j. Career choices</td>
<td>173</td>
<td>2.78</td>
<td>1.44</td>
</tr>
<tr>
<td>2k. Fear of making a mistake</td>
<td>174</td>
<td>4.18</td>
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<tr>
<td>2l. Feelings of inexperience or being unprepared.</td>
<td>174</td>
<td>4.01</td>
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<td>2m. Clinical staff intimidation</td>
<td>174</td>
<td>3.39</td>
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<td>2n. Caring for difficult or critical patients</td>
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<td>2o. Lack of positive feedback</td>
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<td>2p. Lack of staff help</td>
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<td>2q. Lack of family support</td>
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<td>2s. Lack of time for relaxation</td>
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<td>2t. Lack of time for recreation</td>
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<td>2u. Lack of time with family/friends</td>
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<td>2v. Family demands</td>
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<td>2w. Number of work hours</td>
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</tr>
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</table>

**Research Question 2: Stress Coping Skills**

Research Question 2 asked: What stress coping skills are most frequently used for Tennessee radiography students? Responses to survey question four answered this research
question. Statements in question four were scaled items, specifically a 5-point modified Likert scale. The scale for questions, with the exception of 4d, ranged from never (1) to everyday (5). The scale for question 4d ranges from never (1) to monthly (5).

Table 2 provides participant responses to items in question four. Taking a break ($\mu = 3.43$), spending time with family or friends ($\mu = 2.65$), and taking a vacation ($\mu = 2.44$).

Furthermore, overeating ($\mu = 2.19$) and exercise ($\mu = 2.16$) are also ways students cope. Students reported that smoking ($\mu = 1.14$) and drugs ($\mu = 1.04$) are the least used stress coping skills.

Table 2

<table>
<thead>
<tr>
<th>Item</th>
<th>$N$</th>
<th>$\mu$</th>
<th>$SD$</th>
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<tbody>
<tr>
<td>4a. Exercise</td>
<td>174</td>
<td>2.16</td>
<td>1.10</td>
</tr>
<tr>
<td>4b. Meditation</td>
<td>174</td>
<td>1.35</td>
<td>.88</td>
</tr>
<tr>
<td>4c. Take a break</td>
<td>174</td>
<td>3.43</td>
<td>1.40</td>
</tr>
<tr>
<td>4d. Take a vacation</td>
<td>174</td>
<td>2.44</td>
<td>.97</td>
</tr>
<tr>
<td>4e. Spending time with family or friends</td>
<td>174</td>
<td>2.65</td>
<td>1.02</td>
</tr>
<tr>
<td>4f. Alcohol use</td>
<td>174</td>
<td>1.58</td>
<td>.81</td>
</tr>
<tr>
<td>4g. Drugs</td>
<td>174</td>
<td>1.04</td>
<td>.35</td>
</tr>
<tr>
<td>4h. Prescription medication use</td>
<td>174</td>
<td>1.56</td>
<td>1.33</td>
</tr>
<tr>
<td>4i. Overeating</td>
<td>174</td>
<td>2.19</td>
<td>1.12</td>
</tr>
<tr>
<td>4j. Smoking</td>
<td>174</td>
<td>1.14</td>
<td>.61</td>
</tr>
</tbody>
</table>

When asked to choose the most effective strategy for coping with stress, 27.5% reported that spending time with family or friends was most effective. Furthermore, 22.3% take a break or vacation to relieve stress.

**Research Question 3: Health Factors Experienced**

Research Question 3 asked: What health factors have Tennessee radiography students experienced in the past year? I used responses to Question 5 on the survey to answer this research question.
Participant responses to items in research question three are located in Table 3. The most common health factors the participants reported experiencing in the past year were a decrease in energy ($\mu = .88$) and anxiety ($\mu = .81$). Furthermore, difficulty concentrating ($\mu = .69$), increased irritability ($\mu = .68$), difficulty sleeping ($\mu = .63$), and headaches/migraines ($\mu = .61$) were also among the common health factors experienced. The mean of students that reported having a diagnosis of a chronic medical condition in the past year was .109.

Table 3

Descriptive Statistics for Tennessee Radiography Health Factors in the Past Year

<table>
<thead>
<tr>
<th>Item</th>
<th>$N$</th>
<th>$\mu$</th>
<th>$SD$</th>
</tr>
</thead>
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<tr>
<td>3a. Decrease in energy level</td>
<td>174</td>
<td>.88</td>
<td>.33</td>
</tr>
<tr>
<td>3b. Increase in heart rate</td>
<td>174</td>
<td>.40</td>
<td>.49</td>
</tr>
<tr>
<td>3c. Headaches/migraines</td>
<td>174</td>
<td>.61</td>
<td>.50</td>
</tr>
<tr>
<td>3d. Increase in sickness</td>
<td>174</td>
<td>.28</td>
<td>.46</td>
</tr>
<tr>
<td>3e. High blood pressure</td>
<td>174</td>
<td>.17</td>
<td>.37</td>
</tr>
<tr>
<td>3f. Gastrointestinal problems</td>
<td>174</td>
<td>.25</td>
<td>.43</td>
</tr>
<tr>
<td>3g. Difficulty Sleeping</td>
<td>174</td>
<td>.63</td>
<td>.48</td>
</tr>
<tr>
<td>3h. Anxiety</td>
<td>174</td>
<td>.81</td>
<td>.39</td>
</tr>
<tr>
<td>3i. Difficulty Concentration</td>
<td>174</td>
<td>.69</td>
<td>.46</td>
</tr>
<tr>
<td>3j. Depression</td>
<td>174</td>
<td>.34</td>
<td>.48</td>
</tr>
<tr>
<td>3k. Anger</td>
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<td>.37</td>
<td>.49</td>
</tr>
<tr>
<td>3l. Increased Irritability</td>
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<td>.68</td>
<td>.47</td>
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<tr>
<td>3m. Increased Irritability</td>
<td>174</td>
<td>.11</td>
<td>.31</td>
</tr>
</tbody>
</table>

Research Question 4: Effect of Demographic Variables on Stress

Research question number four was stated: Do the following demographic factors affect Tennessee radiography students’ stress levels: gender, student type, time in radiography program, level of degree, number of work study hours, and number of work hours per week outside of school?
4a. Do stress levels differ between male and female students?

I used an independent samples t-test to determine if there was a relationship between gender and stress levels. The factor variable, gender, had two options: male and female. The dependent variable was current stress level. The results were significant, \( t(30) = -5.259, p < .01 \), indicating that females’ mean stress levels (\( \mu = 4.00 \)) were significantly greater than the males’ mean stress levels (\( \mu =2.810 \)). The 95% confidence interval for the difference in the means ranged from -1.655 to -1.730. The results indicated that a statistically significant difference exists between student stress levels and gender.

4b. Do stress levels differ between traditional and nontraditional students?

I used an independent samples t-test to determine if there was a relationship between student type and stress levels. The factor variable, student, had two options: traditional and nontraditional. The dependent variable was current stress level. The test was not significant at the 95% confidence interval (alpha = .05), \( t(91) = -0.70, p =.49 \). The results indicated that there was no statistically significant difference between the stress levels of traditional and nontraditional, therefore it is reasonable to assume there is no relationship between student stress levels and student type.

4c. Do stress levels differ between first and second year students?

I conducted an independent samples t-test to determine if there was a relationship between radiography program status and stress level. The factor variable, radiography program status, had two options: first year student and second year student. The dependent variable was current stress level. The test was not significant at the 95% confidence interval (alpha = .05), \( t(142) = -0.94, p =.35 \). There was no statistically significant difference between stress level and status in the program.
4d. Is there a relationship between the student’s level of degree and his/her stress level?

I used an independent samples t-test to determine if there was a relationship between the level of degree and stress level. The factor variable, degree level, had two options: Associate degree and baccalaureate degree. The dependent variable was current stress level. The test was not significant at the 95% confidence interval (alpha = .05), \( t(142) = -.70, p = .49 \) therefore, there is no relationship between degree level and stress level.

4e. Is there a relationship between work study hours per week and stress level?

I used a Pearson correlation to determine whether there was a relationship between the stress level and the student’s number of work study hours per week. While the relationship of the variables was in a positive direction, no statistically significant correlation existed \([r(143) = .05, p = .54]\) therefore, there was no relationship between the number of work study hours and stress level (see Table 4).

4f. Is there a relationship between the number of hours worked per week outside of school and stress level?

I used a Pearson correlation to determine whether there was a relationship between the stress level and the student’s number of work hours per week outside of school. While the relationship of the variables was in a negative direction, no statistically significant correlation existed \([r(142) = -.07, p = .44]\), therefore there is no relationship between number of hours worked outside of school and stress level (see Table 4).
Table 4

*Pearson Correlations Between Stress Levels and Work Hours*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Stress Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td>Work Study Hours per Week</td>
<td>.05</td>
</tr>
<tr>
<td>Hours Worked per Week Outside of School</td>
<td>-.07</td>
</tr>
</tbody>
</table>

**Comments**

While the survey instrument provided space for comments, only 21 of 174 (12%) respondents made comments regarding the research [Appendix I]. Six students commented on other stress coping skills that were not listed on the survey instrument including; sleeping, dancing, taking a shower, screaming and crying, playing and writing music, and not procrastinating. The majority of the other comments concerned the students’ work schedules and/or job positions.

**Summary**

I found that Tennessee radiography students experience the most stress from examinations, overall grades, and lack of study time. The stress coping they used the most included taking a break, spending time with family or friends, and taking a vacation. Additionally, students responded that spending time with family or friends and taking a break were the most effective stress coping skills. While females experienced higher stress levels than males, no other demographic variables influenced student stress levels.
CHAPTER 5

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

The purpose of this study was to determine what factors contribute to stress for radiography students enrolled in radiography programs in Tennessee and the methods by which students cope with stress. Additionally, the study sought to determine if there were differences in responses between and/or among various demographic factors.

I developed the Stress and Coping Skills Among Radiography Students survey [Appendix E] as described in Chapter 3 as the instrument for data. I distributed the survey to radiography programs with a total of 238 students at three community colleges and two universities in Tennessee. I received 174 (73%) responses.

Conclusions

The limitations of this study must be considered when compiling conclusions. This study was limited to first and second year students enrolled in a JRCERT accredited radiography program at a community college or university in Tennessee in February and March of 2016. Based on the results of the study, I drew the following conclusions regarding factors contributing to radiography student stress and the coping methods they use:

1. Radiography students experienced a high level of stress.
2. Examinations, overall grades, and lack of study time were the greatest stressors.
3. The most common stress coping strategies they use were taking a break, spending time with family or friends, and taking a vacation.
4. Radiography students reported that spending time with family or friends and taking a break or vacation were the most effective stress coping strategies.
5. Smoking and the use of drugs were the stress coping strategies used the least by radiography students.

6. Radiography students commonly experienced anxiety and a decrease in energy in the past year. In addition, they reported they experienced difficulty concentrating and increased irritability.

7. Female radiography students experienced higher stress levels than male radiography students.

8. Student type, radiography program status, level of degree, number of work study hours, and number of work hours outside of school had no relationship to radiography student stress levels.

**Discussion**

Radiography students experience a high level of stress which can be caused by many factors. The students reported that the factors involving school influence their stress levels the most. These factors included examinations ($\mu = 4.57$), overall grades ($\mu = 4.34$), and lack of study time ($\mu = 4.28$), followed by fear of making a mistake ($\mu = 4.18$) and the amount of study material ($\mu = 4.14$). It is not surprising that examinations and overall grades have the greatest impact on radiography student stress levels. These findings were supported by the literature review. Innes (1998) and Klainberg et al. (2010-2011) found that examinations and workload were very stressful for students while Ramanaidu (1991) found that examinations and lack of study time were sources of stress.

Radiography students experience a lack of study time which may explain why examinations and overall grades have the greatest influence on stress levels. One student commented that he/she spent at least 80 to 90 hours per week” on academics and clinicals and
found this amount of time to be “very stressful.” Time management skills could be used to help students balance time between classes, clinics, studying, and responsibilities outside the education environment. Taking brief breaks while studying improve the ability to focus, therefore making study time more efficient. Students may also waste time being stressed over an assignment and procrastinate instead of completing the assignment in a timely manner. If most students have jobs and/or family responsibilities, they may have difficulty balancing work, school, and family.

Because radiography students are dealing with sick and injured patients during clinical hours it would make sense that fear of making a mistake was related to their stress level. Mason (2006) reported that the fear of making a mistake is among the top seven clinical stressors for radiography students. In radiography, a mistake may be the need to repeat an image which, in turn, results in more radiation exposure to the patient. The fear of accidentally harming a patient or causing a patient any discomfort can be very stressful. I expected to see that caring for critically ill patients would rank high in the factors affecting student stress, however it was only moderately ($\mu = 3.33$) related to their stress levels. One student commented that caring for critical patients has a strong effect on stress level but “in a positive way.”

While teacher/student relationships ($\mu = 2.57$) ranked lower in the stress factors, a strained relationship can have a negative impact on a student’s education and stress level. One student summed up the influence an instructor can have with, “Teachers make the biggest impact in stress/experience. Especially a bad clinical instructor can make or break you.” This comment suggests that how students are treated by didactic instructors and clinical instructors can influence their stress levels. Therefore, instructors are in a position to help decrease student stress levels by understanding what factors influence their stress.
Students cope with stress in many different ways. Tennessee radiography students reported taking a break ($\mu = 3.43$) and spending time with family and friends ($\mu = 2.65$) as the most effective stress coping strategies. Few students used stress coping strategies that could have a negative effect on their health, i.e. smoking ($\mu = 1.14$), drugs ($\mu = 1.04$), and alcohol ($\mu = 1.58$). The lack of smoking and alcohol use was surprising leading me to wonder if the students answered these questions honestly and if I would find the same results with a larger study sample. Although exercise can be a great stress reliever, as noted in the literature, few students reported that they exercise ($\mu = 2.16$) regularly. Meditation can also be a great stress coping strategy, but even fewer students used this strategy. Meditation ($\mu = 1.35$) provides time to sit, relax, and clear one’s mind from all stressful factors thus reducing stress levels. Some students used the comment section of the survey to add hobbies that help them cope with stress such as dancing, writing music, and playing music. Taking the time to participate in an activity that is enjoyable can decrease a student’s stress level.

Stress can have a negative effect on an individual’s health. A decrease in energy level ($\mu = 0.88$), anxiety ($\mu = 0.81$), and decreased concentration ($\mu = 0.69$) were among the most common health factors that radiography students experienced in the past year, with increased irritability ($\mu = 0.68$), difficulty sleeping ($\mu = .63$), and headaches/migraines ($\mu = 0.61$) closely following. These findings were consistent with previous research noted in the literature review. The body’s physiological response to stress results in the use of energy, creating an overall decrease in one’s energy level. Anxiety, increased irritability, and difficulty concentrating are ways that stress impacts students’ mental health. According to the American Psychological Association (2014), anxiety, irritability, headaches, and migraines are some of the most common symptoms of acute stress. Persistent headaches and migraines are symptoms of episodic acute
stress commonly requiring professional help (American Psychological Association, 2014). High levels of stress can lead to more serious health problems for students if these factors continue for long periods of time.

When examining the demographic distribution, it is not surprising that the majority of the responses were from female students (82%). While the female to male ratio in the radiography field is changing, it is still a female dominated profession. Consistent with the literature, I found that females ($\mu = 4.00$) experience significantly higher stress levels than males ($\mu = 2.810$). The researcher believes that females may have more responsibilities in the home. Therefore, higher stress levels could be related to factors outside the radiography program.

Because students in radiography programs are full time students due to the didactic and clinical components of the program, it is not remarkable that there were more traditional (70%) than nontraditional students (30%). Nontraditional students usually have families or other responsibilities that can prevent them from being able to dedicate the time needed for didactic and clinical requirements of a radiography program. Despite nontraditional students potentially having additional responsibilities, in this study, I found no significant difference in stress level between traditional and nontraditional students. However, due to the greater amount of stressors outside of school, it was expected that nontraditional students would report a significant difference in stress levels.

The percentage of students working towards an Associate degree (54%) and Baccalaureate degree (46%) only differed by 8%. I found no significant difference in the stress levels of students seeking the different degrees. This was consistent with my expectations since all JRCERT accredited radiography programs must meet the same guidelines. The difference lies within the core classes that are required for the Baccalaureate degree.
The percentage of first year (51%) and second year (49%) student participants were almost equal and I found that no relationship existed between the time in the radiography program and student stress levels. Both first and second year students have the stress of academics, clinicals, and responsibilities outside of school. While first year students experience more stress from being new to the radiography program and encountering new terminology, second year students have the stress of completing all degree requirements and studying for the ARRT registry.

I found it surprising that the majority of the students did not work or worked less than five hours a week. While the time commitment to a radiography program is high, I thought that more students would at least have part-time jobs due to financial responsibilities and the high cost of a college education.

**Recommendations for Further Study**

While the results of this study add to the literature on stress and the radiography student, additional research could answer the following questions:

1. Is there a relationship between marital status, having children, or one’s age a student’s stress level?
2. Are the same study results found throughout the nation?
3. Are the results of this study specific to radiography students or are similar results found in other academic programs?
4. Do students enrolled in hospital-based radiography programs report the same results?
5. Do students at colleges that have stress coping practices in place report lower stress levels?
6. Does the number of work hours affect student stress level if a larger population is surveyed?

Summary

Understanding the factors that affect student stress levels is important in promoting healthier lifestyles. Prolonged stress causes physical and mental health issues which can even lead to premature mortality. Assisting students in developing healthy coping strategies could help them physically, mentally, academically, and in their future careers.
REFERENCES


Iowa State University (2008). *ISU study finds early family depression has lasting effects on teens, young adults*. Retrieved from


## APPENDICES

### Appendix A

List of Colleges and Program Directors

<table>
<thead>
<tr>
<th>College</th>
<th>Program Director</th>
<th>Address</th>
<th>Phone Number</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austin Peay State University</td>
<td>Rex A. Ameigh</td>
<td>601 College St. #4668 Clarksville, TN, 37044</td>
<td>(931) 221-7791</td>
<td><a href="mailto:ameighr@apsu.edu">ameighr@apsu.edu</a></td>
</tr>
<tr>
<td>Baptist College of Health Sciences</td>
<td>Julia L. Lasley</td>
<td>1003 Monroe Ave Memphis, TN 38104</td>
<td>(901) 572-2644</td>
<td><a href="mailto:julie.lasley@bchs.edu">julie.lasley@bchs.edu</a></td>
</tr>
<tr>
<td>Chattanooga State Community College</td>
<td>Margery K. Sanders</td>
<td>4501 Amnicola Hwy Chattanooga, TN 37406</td>
<td>(423) 697-3297</td>
<td><a href="mailto:margery.sanders@chattanoogastate.edu">margery.sanders@chattanoogastate.edu</a></td>
</tr>
<tr>
<td>Columbia State Community College</td>
<td>Nancy C. Hopper</td>
<td>1665 Hampshire Pike Columbia, TN 38401</td>
<td>(931) 540-2740</td>
<td><a href="mailto:nhopper@ColumbiaState.edu">nhopper@ColumbiaState.edu</a></td>
</tr>
<tr>
<td>Concorde Career College</td>
<td>Jennifer Sorrell Daniels</td>
<td>6100 Polplar Ave Ste 132 Memphis, TN 38137</td>
<td>(901) 761-9494</td>
<td></td>
</tr>
<tr>
<td>East Tennessee State University</td>
<td>Shirley J. Cherry</td>
<td>1000 Jason Witten Way Elizabethton, TN 37643</td>
<td>(423) 547-4912</td>
<td><a href="mailto:cherrys@etsu.edu">cherrys@etsu.edu</a></td>
</tr>
<tr>
<td>Jackson State Community College</td>
<td>Kimberly R. Todd</td>
<td>2046 N Parkway Jackson, TN 38301</td>
<td>(731) 424-3520</td>
<td><a href="mailto:ktodd@jscc.edu">ktodd@jscc.edu</a></td>
</tr>
<tr>
<td>Southwest Tn Community College</td>
<td>Thomas H. Wolfe</td>
<td>PO Box 780 Memphis, TN 38101</td>
<td>(901) 333-5417</td>
<td><a href="mailto:thwolfe@southwest.tn.edu">thwolfe@southwest.tn.edu</a></td>
</tr>
<tr>
<td>Roane State Community College</td>
<td>Julie Hall</td>
<td>701 Briarcliff Ave Oak Ridge, TN 37830</td>
<td>(865) 481-2015</td>
<td><a href="mailto:hallja3@roanestate.edu">hallja3@roanestate.edu</a></td>
</tr>
<tr>
<td>Volunteer State Community College</td>
<td>Terry Seals (Interim Director)</td>
<td>1480 Nashville Pike Gallatin, TN 37066</td>
<td>(615) 230-3651</td>
<td><a href="mailto:Terry.Seals@volstate.edu">Terry.Seals@volstate.edu</a></td>
</tr>
</tbody>
</table>
Dear Radiography Program Director:

My name is Kayla Rosenbaum and I am a graduate student in the Department of Allied Health Sciences at East Tennessee State University, a doctoral research university located in Johnson City, Tennessee. As part of the requirements for my graduate degree, I must complete a thesis and I have chosen to study: Radiography student stress: Factors contributing to student stress and methods of coping.

The purpose of this study is to identify the sources of radiography students’ stress, as well as their coping strategies. Understanding sources causing the greatest stress can help faculty assist students during difficult times. Knowledge of the coping strategies students currently use will also provide ideas for effective strategies. By completing this survey, your students are helping the development of the survey instrument that will be used for the final research study. The students will have the opportunity at the end of the survey to make any comments or questions they have that may benefit the research study.

I would like for you to administer a survey questionnaire to all of your radiography students enrolled in two-year and four-year radiography programs, including both first and second-year students. The questionnaire contains questions on student stress levels, sources of stress, coping strategies, and basic demographic information. You may administer these surveys during a time that is convenient for you and your students during class. Each survey packet includes a letter to the student and an envelope. After the student completes the survey, he or she will need to place the survey in the envelope and seal it. This will ensure that all responses are completely anonymous. I have also included a self-addressed, postage paid envelope for you to place all of the sealed envelopes in to mail back. All responses are completely anonymous.

Participation is completely voluntary. Completing the survey implies that your students are voluntarily participating in the research study. They may choose not to participate in the study without any repercussions. Your students may choose to quit the study at any time.

Thank you for your time and attention. Your help with this study is greatly appreciated. If you have any questions or concerns, you may contact me at (423) 292-2572.

Sincerely,

Kayla Rosenbaum, RT(R)(MR)
Appendix C
Pilot Study Cover Letter

Dear Radiography Student:

My name is Kayla Rosenbaum and I am a graduate student in the Department of Allied Health Sciences at East Tennessee State University, a doctoral research university located in Johnson City, Tennessee. As part of the requirements for my graduate degree, I must complete a thesis and I have chosen to study: Radiography student stress: Factors contributing to student stress and methods of coping.

This study seeks to determine the factors that cause radiography students stress and their coping strategies. By completing this survey, you are helping the development of the survey that will be used for the research study. Please make any comments or questions you have that may benefit the survey study.

Your help is greatly appreciated and very important. The goal of this research study is to provide information that may help students deal with stress during the radiography program and as future professionals. Thank you for your time.

Sincerely,

Kayla Rosenbaum, RT(R)(MR)
Appendix D
Pilot Survey Instrument

Stress and Coping Skills Among Radiography Students

The *Stress and Coping Skills Among Radiography Students* survey examines the sources and stress levels for radiography students in Tennessee. This survey instrument is divided into six questions to determine stress level, causes of stress, health issues experienced, coping strategies, and demographics. The total time for completing the survey is approximately 10 minutes. Thank you for taking the time to complete this survey.

Please choose the one answer that best answers the question presented by placing a check in the box. If an answer is marked incorrectly, please mark an “X” through the checkmark and check the correct answer.

1. Please rate your current stress level.

   (Very Low) 1…..2…..3…..4…..5 (Very High)

2. Please indicate at which level you believe the following aspects affect your stress level.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Strongly Affects</th>
<th>Moderately Affects</th>
<th>Slightly Affects</th>
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<td>Quality of education</td>
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<td>Examinations</td>
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<td>Overall grades</td>
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<td>Lack of study time</td>
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<td>Amount of study material</td>
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<tr>
<td>Difficulty with study material</td>
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<td>Peer relationships</td>
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<td>Career choice uncertainty</td>
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<td>Caring for difficult or critical patients</td>
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<td>Lack of family support</td>
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<td>Moderately Affects</td>
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<td>Rarely Affects</td>
<td>Does not Affect</td>
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<td>Lack of peer support</td>
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<td>Lack of time for relaxation</td>
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<td>Lack of time with family/friends</td>
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<td>Financial demands</td>
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<td>Health problems</td>
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3. Have you experienced any of the following in the past year?
   - Decrease in energy level ○ Yes ○ No
   - Increase in heart rate ○ Yes ○ No
   - Headaches/migraines ○ Yes ○ No
   - Increase in Sickness ○ Yes ○ No
   - High Blood Pressure ○ Yes ○ No
   - Gastrointestinal Problems ○ Yes ○ No
   - Difficulty Sleeping ○ Yes ○ No
   - Anxiety ○ Yes ○ No
   - Difficulty Concentrating ○ Yes ○ No
   - Depression ○ Yes ○ No
   - Anger ○ Yes ○ No
   - Increased Irritability ○ Yes ○ No

4. Which of the following strategies do you use to deal with stress? If used, how often?
   - Exercise
     ○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday
   - Meditation
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Take a break or vacation
○ Never ○ Every Semester ○ Every Month ○ Every week

Spending time with family or friends
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Alcohol use
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Drugs
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Prescription Medication Use
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Overeating (Comfort Food)
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday

Smoking
○ Never ○ 1-2 times a day ○ 3-4 times a day ○ 5-6 times a day ○ More than 6

5. Again choosing only one best answer, which of the following has proven to be most effective for you in relieving your stress?
○ Exercise
○ Meditation
○ Taking a break or vacation
○ Spending time with family or friends
○ Alcohol Use
○ Drugs
○ Prescription Medication
○ Overeating
○ Smoking
○ Other __________________________________________________________

6. Gender
□ Male
□ Female

7. Student Type
□ Traditional Student (Enrolled directly after high school)
□ Nontraditional Student (Enrolled at least 1 year after high school)

8. Radiography Year
□ First year radiography student
☐ Second year radiography student

9. Please select the degree program in which you are currently enrolled.
   ☐ Associate Degree Radiography Program
   ☐ Baccalaureate Degree Radiography Program

10. How many hours do you work for work study per week (i.e. federal work study or APA scholarship)?
    ☐ I do not do work study.
    ☐ Less than 5
    ☐ 5-10
    ☐ 11-15
    ☐ 16-20
    ☐ 21-25
    ☐ 26-30
    ☐ 31-35
    ☐ 26-40

11. Outside of school, how many hours do you work each week (i.e. restaurant, convenient store, department store, etc.)?
    ☐ Less than 5
    ☐ 5-10
    ☐ 11-15
    ☐ 16-20
    ☐ 21-25
    ☐ 26-30
    ☐ 31-35
    ☐ 36-40
    ☐ More than 40

12. Do you have any suggestions on the wording of the survey questions?
    ________________________________________________________________
    ________________________________________________________________
    ________________________________________________________________

13. Do you have any suggestions for additional questions or questions that should be deleted from the survey?
    ________________________________________________________________
    ________________________________________________________________
    ________________________________________________________________

14. How long did this survey take for completion? __________________________
Additional Comments:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you for taking the time to complete this research survey.
Appendix E
Survey Instrument

The *Stress and Coping Skills Among Radiography Students* survey examines the sources and stress levels for radiography students in Tennessee. This survey instrument is divided into six questions to determine stress level, causes of stress, health issues experienced, coping strategies, and demographics. The total time for completing the survey is approximately 10 minutes. Thank you for taking the time to complete this survey.

Please choose the **one** answer that best answers the question presented by placing a check in the box. If an answer is marked incorrectly, please mark an “X” through the checkmark and check the correct answer.

1. Please rate your current stress level.

   (Very Low) 1.....2.....3.....4.....5 (Very High)

2. Please indicate at which level you believe the following aspects affect your stress level.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Strongly Affects</th>
<th>Moderately Affects</th>
<th>Slightly Affects</th>
<th>Rarely Affects</th>
<th>Does not Affect</th>
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</thead>
<tbody>
<tr>
<td>Quality of education</td>
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<tr>
<td>Examinations</td>
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<td>Overall grades</td>
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<tr>
<td>Lack of study time</td>
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<tr>
<td>Amount of study material</td>
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<td>Difficulty with study material</td>
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<tr>
<td>Teacher/student relationship</td>
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<td>Peer relationships</td>
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<tr>
<td>Lack of education funds (tuition, books, housing, etc.)</td>
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<tr>
<td>Career choice uncertainty</td>
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<thead>
<tr>
<th>Factors</th>
<th>Strongly Affects</th>
<th>Moderately Affects</th>
<th>Slightly Affects</th>
<th>Rarely Affects</th>
<th>Does not Affect</th>
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<tbody>
<tr>
<td>Fear of making a mistake</td>
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<tr>
<td>Feelings of inexperience or being unprepared</td>
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<td>Clinical staff intimidation</td>
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<tr>
<td>Caring for difficult or critical patients</td>
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<td>Lack of positive feedback</td>
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<tr>
<td>Lack of staff help</td>
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<td>Lack of family support</td>
<td>Strongly Affects</td>
<td>Moderately Affects</td>
<td>Slightly Affects</td>
<td>Rarely Affects</td>
<td>Does not Affect</td>
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<td>Lack of peer support</td>
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<td>Lack of time for recreation</td>
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<td>Lack of time with family/friends</td>
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<td>Family demands</td>
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<td>Health problems</td>
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</tbody>
</table>

3. Have you experienced any of the following in the past year?

- Decrease in energy level ○ Yes ○ No
- Increase in heart rate ○ Yes ○ No
- Headaches/migraines ○ Yes ○ No
- Increase in Sickness ○ Yes ○ No
- High Blood Pressure ○ Yes ○ No
- Gastrointestinal Problems ○ Yes ○ No
- Difficulty Sleeping ○ Yes ○ No
- Anxiety ○ Yes ○ No
- Difficulty Concentrating ○ Yes ○ No
- Depression ○ Yes ○ No
- Anger ○ Yes ○ No
- Increased Irritability ○ Yes ○ No

Have you been diagnosed with a chronic medical condition in the past year? ○ Yes ○ No

4. Which of the following strategies do you use to deal with stress? If used, how often?

Exercise
○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday
<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meditation</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
</tr>
<tr>
<td>Take a break</td>
<td>○ Never ○ Every Semester ○ Every Month ○ Every week ○ Everyday</td>
</tr>
<tr>
<td>Take a vacation</td>
<td>○ Never ○ Bi-yearly ○ Yearly ○ Every Semester ○ Monthly</td>
</tr>
<tr>
<td>Spending time with family or friends</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
</tr>
<tr>
<td>Drugs</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
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<tr>
<td>Prescription Medication Use</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
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<tr>
<td>Overeating (Comfort Food)</td>
<td>○ Never ○ 1-2 times a week ○ 3-4 times a week ○ 5-6 times a week ○ Everyday</td>
</tr>
<tr>
<td>Smoking</td>
<td>○ Never ○ 1-2 times a day ○ 3-4 times a day ○ 5-6 times a day ○ More than 6</td>
</tr>
</tbody>
</table>

5. Again choosing only one best answer, which of the following has proven to be most effective for you in relieving your stress?
   ○ Exercise
   ○ Meditation
   ○ Taking a break or vacation
   ○ Spending time with family or friends
   ○ Alcohol Use
   ○ Drugs
   ○ Prescription Medication
   ○ Overeating
   ○ Smoking
   ○ Other ____________________________________________________________________________________

6. **Gender**
   - □ Male
   - □ Female
7. **Student Type**
   - □ Traditional Student (Enrolled directly after high school)
   - □ Nontraditional Student (Enrolled at least 1 year after high school)

8. **Radiography Year**
   - □ First year radiography student
   - □ Second year radiography student

9. Please select the degree program in which you are currently enrolled.
   - □ Associate Degree Radiography Program
   - □ Baccalaureate Degree Radiography Program

10. How many hours do you work for **work study** per week (i.e. federal work study or APA scholarship)?
    - □ I do not do work study.
    - □ Less than 5
    - □ 5-10
    - □ 11-15
    - □ 16-20
    - □ 21-25
    - □ 26-30
    - □ 31-35
    - □ 36-40

11. Outside of school, how many hours do you work each week (i.e. restaurant, convenient store, department store, etc.)?
    - □ Less than 5
    - □ 5-10
    - □ 11-15
    - □ 16-20
    - □ 21-25
    - □ 26-30
    - □ 31-35
    - □ 36-40
    - □ More than 40

Comments: ________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you for taking the time to complete this research survey.
Appendix F
Radiography Program Director Letter

Dear Radiography Program Director:

My name is Kayla Rosenbaum and I am a graduate student in the Department of Allied Health Sciences at East Tennessee State University, a doctoral research university located in Johnson City, Tennessee. As part of the requirements for my graduate degree, I must complete a thesis and I have chosen to study: Radiography student stress: Factors contributing to student stress and methods of coping.

The purpose of this study is to identify the sources of radiography students’ stress, as well as their coping strategies. Understanding sources causing the greatest stress can help faculty assist students during difficult times. Knowledge of the coping strategies students currently use will also provide ideas for effective strategies.

I would like for you to administer a survey questionnaire to all of your radiography students enrolled in two-year and four-year radiography programs, including both first and second-year students. The questionnaire contains questions on student stress levels, sources of stress, coping strategies, and basic demographic information. The survey should take about 10 minutes to complete. You may administer these surveys during a time that is convenient for you and your students during class. Each survey packet includes a letter to the student and an envelope. After the student completes the survey, he or she will need to place the survey in the envelope and seal it. This will ensure that all responses are completely anonymous. I have also included a self-addressed, postage paid envelope for you to place all of the sealed envelopes in to mail back. All responses are completely anonymous.

Participation is completely voluntary. Completing the survey implies that your students are voluntarily participating in the research study. They may choose not to participate in the study without any repercussions. Your students may choose to quit the study at any time.

Thank you for your time and attention. Your help with this study is greatly appreciated. If you have any questions or concerns, you may contact me at (423) 292-2572.

Sincerely,

Kayla Rosenbaum, RT(R)(MR)
Appendix G
Survey Cover Letter

04-03-15

Dear Participant:

My name is Kayla Rosenbaum and I am a graduate student in the Department of Allied Health Sciences at East Tennessee State University, a doctoral research university located in Johnson City, Tennessee. As part of the requirements for my graduate degree, I must complete a thesis and I have chosen to study: Radiography student stress: Factors contributing to student stress and methods of coping.

The purpose of this study is to identify the sources of radiography students’ stress, as well as their coping strategies. Understanding sources causing the greatest stress can help faculty assist students during stressful times. Knowledge of the coping strategies students currently use will also provide ideas for enhancing effective strategies.

I am administering a survey questionnaire to first and second year radiography students enrolled in two-year and four-year radiography programs in Tennessee. The survey should take about 10 minutes to complete. The questionnaire contains questions about student stress level, sources of stress, coping strategies, and collects basic demographic information. All responses are completely anonymous.

Participation is completely voluntary and there are no known risks associated with your participation. Completing the survey implies that you are voluntarily participating in the research study. You may choose not to participate in the study without any repercussions. You may choose to quit the study at any time.

If you have any questions or concerns, you may contact me at (423) 292-2572.

Sincerely,

Kayla Rosenbaum, RT(R)(MR)
Dear Radiography Program Director:

I have not received responses from your radiography students to the survey previously mailed to your attention. The participation of your students is of great importance to understand the factors affecting student stress and the students’ coping strategies.

I am currently enrolled in the Master of Science in Allied Health and I am conducting this research as part of my requirements for graduation. If your students would like to participate in the study, please have them complete the enclosed survey.

If this letter has passed any completed surveys in the mail, thank you for taking the time and allowing your students to participate in this study. If you have any questions, please contact me at (423) 292-2572 or zkar10@goldmail.etsu.edu.

Sincerely,

Kayla Rosenbaum, RT(R)(MR)
Appendix I

Comments

“Only taking 12 credit hours but at least 80 to 90 hours per week inclusive of school, study, assignments, and work. Yes! Very stressful!”

“However I enjoy working with critical pts although it’s a strong affect it’s in a positive way.”

“I had to quit my job because I was failing my tests.”

“64 hours/week if you count clinical time.”

“Teachers make the biggest impact in stress/experience. Especially a bad clinical instructor can make or break you.”

“Radiology student tech.”

“Full-time student, mother, and wife.”

“Very difficult to just “take a break” though.”

“Not procrastinating; getting stuff done early.”

“Sleeping”

“Dancing”

“The smallness of our class is an anxiety factor. Every move you make, every grade you get, and basically everything about you is up for discussion when there are so few in your program. I miss being able to blend in like you can with larger classes. It was nice to not have every element of your school experience being “observed”.”

“Songwriting/playing music”

“ER admissions.”

“I am currently being tested for cyclic Cushing’s disease.”

“Regular scream/cry sessions on the drive home.”

“No time to go to the doctor.”

“Restaurant, weekends only, average 33 hours in 2½ days.”
“I’m a mom. I don’t have a paying job, but by-golly it’s a full-time job! There are several parents in my program. I can bet they would say a lot of stress comes from being less available to their child and spouse.”

“Shower/nap”

“Being treated like a personal flunky makes my stress level sky rocket. I am still a human being even if I am a student.”
VITA

KAYLA A. ROSENBAUM

Personal Data: Birthplace Wise, VA

Education: East Tennessee State University, Johnson City, TN
Master of Science in Allied Health, 2016
Bachelor of Science in Radiography 2005
Mountain Empire Community College

Professional: 2004-2008 Critical Care Technologist
Johnson City Medical Center, Johnson City, TN
2005-2007 Diagnostic Radiologic Technologist
James H. Quillen VA Medical Center, Mountain Home, TN
2007-2014 MRI Technologist
James H. Quillen VA Medical Center, Mountain Home, TN
2014-Present Radiology Supervisor/ PACS Administrator
James H. Quillen VA Medical Center, Mountain Home, TN

Professional Affiliations: 2005 - Present American Registry of Radiologic Technologists
2013 - Present American Society of Radiologic Technologists

Honors: Magna Cum Laude