

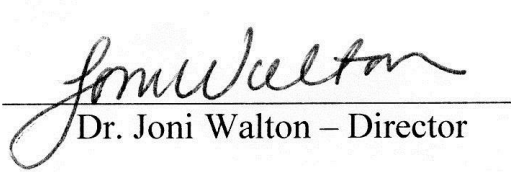
The Effects of Diaphragmatic Breathing on College Student Stress

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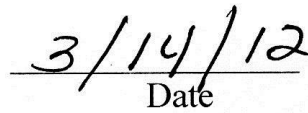
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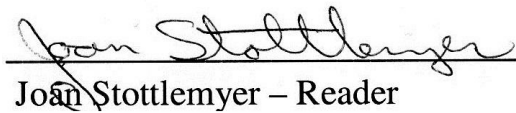
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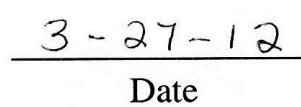

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Abstract

The purpose of this research study was to determine the effect of diaphragmatic breathing on college students' self-perception of life stressors. A pre-test/post-test design was used in this study. Participants rated their stress on a Likert-like scale before and after a five-minute diaphragmatic breathing intervention. ANOVA was used for statistical analysis. Participants were asked to evaluate their stress in the following categories: physical, psychological, socio-cultural, spiritual, and overall stress categories. The findings of this study suggested that diaphragmatic breathing for five minutes is effective in reducing perceived stress with a p-value of $p < 0.00$ for each category. Implications of this study include students' reducing their acute stress by using five minutes of diaphragmatic breathing.

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Dedication

This thesis is dedicated to my grandfather and first 'real' nursing patient, Joseph McKay. I love you, Grandpa!

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CHAPTER I

Background

Nearly one third of the 17.3 million college students in the United States reported stress as the number one factor in poor classroom performance (American College Health Association, 2008) and 94% felt overwhelmed by their responsibilities (Cook, 2007). Stress is a risk factor in many illnesses, including heart disease and depression (National Institutes of Health, 2010). Forty-five percent of college students felt depressed enough that it was difficult to function (Cook). Also, students reported that they felt as if they did not have time to manage their stress, due to scholastic obligations (Shaikh & Deschamps, 2006). What has not been established is the effect of a short-duration intervention on acute stress. The purpose of this thesis is to explore the immediate effectiveness of a short-duration diaphragmatic breathing (DB) exercise on stress levels in college students.

Stress

Hans Selye (1973) defined stress as “the non-specific response of the body to any demand made upon it” (p 692). Stimulus that causes stress is called a *stressor*. Stressors vary on an individual basis and are all different, but produce essentially the same response from the body (Selye). The perception of stress causes psychological and physiologic responses and adaptations by releasing hormones in order to return to homeostasis, or the body's resting state (Seaward, 2006).

Physiological Effects of Stress

Specific causes of stress seem to depend on the individual's perception of the stressor, but the human body generally responds to stress similarly (Selye). Stress activates the “fight-or-flight or freeze” response, as noted by Cannon, Newton, Bright,

Menkin & Moore in 1929, from the sympathetic nervous system (SNS), especially when experiencing fear or pain. Effects of activation of the SNS are the release of hormones into the body that increase heart rate, respiratory rate, and blood pressure, decrease immune response, and divert blood away from the digestive tract to allow that blood to be available to the rest of the body (Boyd, 2008). Common physiologic responses to stress are increased heart rate, respirations, fidgeting, diaphoresis, grinding or gritting teeth, rashes, itching, hives, sighing, palpitations, headaches, tremors, urinary frequency, and impaired sexual function (American Institute of Stress, 2011).

Epinephrine. When the SNS is stimulated and interprets that stimulation as a threat, many hormones are released in response. A key hormone that results from stimulation is adrenocorticotropic hormone, which is released by the adrenal cortex and stimulates the release of epinephrine and cortisol (Nelson & Cox, 2004). Epinephrine binds to all alpha and beta-adrenergic receptors, causing a wide variety of responses in the body, depending on how much epinephrine is released and which receptors bind with epinephrine. Some common physiologic responses to epinephrine are increased heart rate, increased respiration rate, decreased insulin secretion and increased glucagon production in the pancreas, increased glycogenolysis in the liver and muscles, and vasoconstriction or vasodilation systemically, depending on adrenergic response (Sabyasachi, 2007).

Cortisol. The primary effect of cortisol in the body is to increase metabolism by making sugar rapidly available to the body by regulating fat storage and being involved in gluconeogenesis as well as increasing glycogenesis in the liver (Baynes and Dominiczak, 2009). Long-term exposure to heightened cortisol levels can be damaging

to both mental and physical health. In combination with a compromised immune system, stress often causes sleeping difficulties, further compromising the immune system, increasing the possibility of getting sick (Boyd, 2008). Illness is the second highest cause of poor performance in college students (American College Health Association, 2008).

Norepinephrine. Norepinephrine is another major hormone and neurotransmitter released in response to stress. Norepinephrine is primarily responsible for increasing contractility of the heart, as well as increasing the heart rate. In the brain, norepinephrine stimulates attentiveness and increases vasodilation and brain oxygenation (Sabyasachi, 2007).

Psychological Effects of Stress

Generally, stress stimulates the nervous system, causing the individual to become more alert, preparing one's body for “fight, flight, or freeze” mostly due to the hormones epinephrine and norepinephrine. Unmanaged stress for long periods of time typically can cause physiologic problems and is a risk factor in many health problems, such as hypertension, weight gain, depression, heightened anxiety, and insomnia (Boyd, 2008). Chronic stress has also been linked with increased drug use and vulnerability to addiction (Sinha, 2008).

Distress. Distress is a negative response to a stressor (Selye, 1973). In this context, distress is often shortened to “stress.” Distress is usually described in one of two ways: acute stress and chronic stress. Acute stress is having a brief, negative stress response to a stressor. Acute stress is usually intense, but is relieved within a few hours. For college students, major projects, exams, finances, poor grades on a test, or relationship troubles could be examples of acute stress. Chronic stress is experiencing a

negative stress response over a longer period of time. Chronic stress is usually not as intense as acute stress, but has a much longer duration, from hours to years, depending on the stressor (Seaward, 2006).

Anxiety. *Taber's Medical Encyclopedia* defines anxiety as a specific form of distress in which an individual feels discomfort, dread, or general uneasiness and is anticipating danger. Sources of anxiety are often unknown to the anxious individual. Traumatic experiences can be a source of later anxiety in an individual when put in similar situations as the experienced trauma. Recurrence of anxiety responses that disrupt life when there is no danger present could imply an anxiety disorder (Venes, 2010).

Post-traumatic stress disorder. Post-traumatic stress disorder (PTSD) is an anxiety disorder that can occur after a traumatic event. Events like combat or military exposure, car accidents, child or sexual abuse, and natural disasters can all be triggers for PTSD. Common symptoms of PTSD include: reliving the traumatic event, avoiding situations that remind the traumatized individual of the event, anhedonia, and hyperarousal are all common symptoms of PTSD. The development of PTSD depends on many factors, such as duration and proximity of exposure to the traumatic event, the level of control the traumatized individual felt or lost during the event, whether or not someone close to the individual was lost during the event, how strong the reaction to the event was, and how much help and support was received after the event. PTSD can be treated with therapy and some pharmaceutical intervention (National Center for PTSD, 2011).

Coping. Coping is a term used to define how someone resolves stress caused by specific stressors (Lazarus & Folkman, 1984). The act of coping can be problem-focused or emotion-focused and is generally referred to as a coping mechanism or skill. Problem-focused coping is a method in which the source of the stress is avoided or eliminated. An example of problem-focused coping happens if a room is too noisy, and a student can relieve the stress by eliminating the source of the noise, or moving to a place with less noise. Emotion-focused coping happens when reason or thought is used to eliminate the stress. A student stressed about a missing book remembers that the book was loaned to a friend for the evening is an example of emotion-focused coping (Boyd, 2008).

Demographics of Stress

Stress itself is an individual response. There do not appear to be gender, race, or age differences in response to stress. How an individual copes with stress does vary, depending on some demographic information. Gender is believed to affect aspects of coping, possibly due to concentrations of different hormones between men and women. Women may experience more stress, but tend to cope better with stress in their lives (American College Health Association, 2008). Research reported that stress was negatively correlated with grade-point average (GPA) in students. In competitive fields, stress could prevent a student from continuing through the curriculum if the student was unable to maintain a sufficient GPA to progress (Silverstein & Kritz-Silverstein, 2010). Culture and ethnicity may influence what an individual student perceives as stressful, as well as potentially being a source of stress if the student's culture and ethnicity are different from those around the student. Also, if an individual student's culture conflicts

with a coping measure that is effective, the student's stress may be exaggerated (Boyd, 2008).

Stress across generations. The American Psychological Association has performed an annual survey throughout the United States since 2007 tracking stress and its impact on health. This survey has revealed some notable differences among Millennials, persons born between 1979 and 1993, and the preceding generations. Millennials have had a 52% increase in stress levels since the beginning of the survey. Common sources of stress for Millennials are work, money, housing, and relationships. Millennials reported being less flexible, less willing to compromise, and less able to adjust their expectations than other adults. Millennials are also more likely to keep their feelings bottled up as opposed to expressing their feelings and are almost twice as likely as older adults to rely on commonly reported stress management techniques to deal with their stress. Millennials are more likely to report feeling depressed as a result of stress than other adults, and report feeling more irritable, angry, anxious, or worried as a result of stress than other adults (American Psychological Association, 2011).

Stressors for College Students

The college environment involves first-time stressors for many students. Often, college is the first place a student would experience a stressor like having a roommate. Other common stressors in the college environment include the following: increasing academic deadlines, financial aid, budgeting of money, lifestyle changes, and development of new friendships/relationships, exploring one's sexuality, and choosing a career path. All of these stressors come in addition to other stressors already in a student's life. Some students choose to work along with taking classes full time. Finding

the balance between work, school, and social demands can be additionally stressing (Seaward, 2006; Shaikh & Deschamps, 2006).

The Costs of College Stress

The price of unmanaged stress in college students on society comes mostly in the form of poor health and an increase in health costs, as well as decreased productivity by the stressed individual. This could lead to lower scores, affecting scholarships, and possibly the ability to attend school if a student's grades are too low. It is nearly impossible to put a fixed number on the amount of damage that stress deals to society, because of its variability among individuals. Generally speaking, a student living with unmanaged stress is at risk for a wide range of health issues, and each issue is a risk factor for further health problems (Silverstein & Kritz-Silverstein, 2010). For example, stress could be a source of a weakened immune system, which could lead to an illness, resulting in time away from class, possibly resulting in increased stress due to missed class work.

Diaphragmatic Breathing

DB is the focused use of the diaphragm to engage in breathing. The diaphragm is the muscle that separates the lungs from the abdomen. Normally, the diaphragm does 80% of the work of breathing. Using the diaphragm as a primary source of breathing work is more efficient than using the accessory muscles in the neck and ribs. DB is also used in clinical settings to help strengthen the muscles of the diaphragm in those with lung diseases (Pulmonary Rehabilitation Program - Ohio State University Medical Center, 2007).

DB is taught and used as a cornerstone in many forms of relaxation techniques. DB plays an important role in Hatha yoga, Tai Ch'i, Qi Gong, and many forms of meditation and guided imagery. In meditative practices, focusing on the pace and depth of a person's breathing is used as a way to calm the mind in preparation for the meditation. Many of these practices believe that DB calms the central nervous system. DB is also a suggested starting place to aid in calming anxiety in many meditation practices (Chang, 1984; Fuerstein, 1997; Chen, 2002).

CHAPTER II

Literature Review

Stress in college

Just over one in three college students, 33.7%, reported “stress” as the primary source of decreased academic performance. Also, 36.7% of students reported feeling overwhelmed nine times or more in the past year. Over 93% reported feeling overwhelmed at least once in the past year (American College Health Association, 2008).

With such a large percentage of students reporting stress affecting their grades, as well as feeling overwhelmed, effective and valid assessments of an individual's stress level and coping skills are justified. Educating students on signs and symptoms of stress, as well as providing resources for students on how to cope with school-related stress, are areas that may need to be addressed further. One area of education provided by schools that was not included in the questionnaire used by the American College Health Association (ACHA) was anything dealing with stress directly. Some students reported receiving information on depression, but no data were gathered on whether or not students were receiving information on stress or coping (American College Health Association, 2008).

This study was performed by the ACHA in 106 self-selected schools across the country with a final sample size of 80,121 randomly selected students. The survey was provided to ACHA member schools without charge, but fees were charged to non-member schools, affecting the random nature of the schools that chose to participate. Further, students in some institutions were offered incentives to participate. Students

filled out an approximately 300-item questionnaire either online or in a paper scan form. Demographic data were collected, as well as responses relating to finances, mental and physical health, activity, and drug use. The data are reported to have a .05 contingency co-efficient and a .33 mean variance among the 45 t-tests conducted in this study. No other validity or reliability data were available to the reader (American College Health Association, 2008).

Measuring Stress

Stress tests have been developed for the specific use in healthcare schools. Many varieties of healthcare training have a stress scale developed for that specific area of healthcare. Dentistry, medical schools, and nursing schools all have their own inventories to measure stress, tailored specifically for each area of study.

The University of Bergen in Norway used the Perceived Medical School Stress (PMSS) test to show that self-development groups for medical students reduced stress in those groups. Participation in self-development groups showed significant reduction in stress, using the PMSS, and further showed that perceived stress stayed lower than the control for three months after the intervention (Holm, Tyssen, Stordol, & Haver, 2010).

The study used a quasi-experimental design using a test group and a control, measuring stress levels primarily with the PMSS, as well as a generalized stress indicator test called SP-5. There was a pre-test and post-test for both groups. The intervention lasted 12 weeks. Software was used to calculate t-variables for both tests. The intervention group showed a 20% decline in stress over the control group (Holm et al., 2010).

The implications of this study are that participation in self-development groups reduces stress in medical school. This could be further applied to other areas of healthcare, based on the topics covered in the study's self-development group. The group discussed trans-disciplinary issues like breaking bad news to patients, how to communicate with difficult patients, handling stress at work, and other topics that many other medical professionals can experience (Holm et al., 2010).

Stress Reduction Techniques

Dan tien breathing One avenue for promoting relaxation that has had increasing focus in recent years is in the area of meditative breathing. Of particular interest is the correlation between meditative breathing practices and increased signs of relaxation and attentiveness in the body. A quantitative Chinese university study observed the effectiveness of a particular meditative breathing practice in relation to relaxed and attentive mind states on participants. This particular method of meditative breathing is called Dan Tien Breathing (DTB). The study occurred over four weeks and involved 42 volunteers who were recruited after a presentation on mental health awareness (Chan, Cheung, Sze, Leuang, & Shi, 2010).

Participants were recruited from a public presentation on mental health awareness and volunteered to participate in the study. Fifty people were recruited and ranged in age from 25-64. Eight participants were excluded for low participation in training, leaving 20 in the control group and 22 in the experimental group. Participants were screened for history of neurological damage, trauma, and overall mental health before being accepted into the study. Participants were evenly distributed between the control group and the experimental group using block randomization, and were evenly distributed by age,

gender, and education. A breakdown of specific demographic information was not available to the reader. Members in the control group were taught progressive muscle relaxation (PMR) while members of the experimental group were taught two variants of Shaolin Dan Tien Breathing (DTB), an active and a passive version of DTB. The active and passive variants were used to see if there were any differences between the two forms of DTB, as well as against the control. Participants were taught their technique over six weeks and data were collected through use of electroencephalogram (EEG), heart monitor measuring heart rate, respiratory rate, and skin conductance. Data were collected prior to the beginning of the experiment as a baseline for both groups and at the end of a six week training course. Participants logged practice times daily and met once a week for further training. The control group had data collected prior to performing PMR and after performing PMR. The DTB group had data collected prior to beginning, after five minutes of passive DTB, after five minutes of rest, and again after five minutes of active DTB (Chan et al., 2010).

Results of this study indicated that of the two forms of DTB, each promotes states within the brain that PMR does not. Passive DTB promotes a state of relaxation and Active DTB promotes focus. Relaxation and focus were determined by EEG measurements. The parts of the brain that activate in relaxed and focused states were activated during the DTB exercises. Previous DTB studies suggest that both states can be activated simultaneously by experienced practitioners. All EEG measurements were analyzed using ANOVA, and the changes in active and passive DTB measurements had p-values of $>.05$ indicating high significance of those findings (Chan et al., 2010).

Nursing implications of this study could be a non-invasive intervention for stress reduction, relaxation, and increased focus that is easy to implement and can be performed in as little as five minutes. Participants in the experiment group of this study practiced for an average of 15 minutes a day, and the experiment was measured in five-minute intervals. No data were collected for long-term effects on the breathing technique, but were collected in real time by use of electroencephalogram (EEG) measurements. (Chan et al., 2010).

Stress reduction as part of the curriculum. One method of providing a means of reducing stress for students could be making a stress reduction technique available to students on a regular basis. In a recent medical school study, students who participated regularly in a deep breathing meditation exercise on a regular basis over a six-week period reported a reduction in test anxiety, stress during a test, and felt that using the technique would help them academically. This was a descriptive study involving 64 students enrolled in a university's medical/dental preparatory program. Students enrolled in the program were required to participate, as a part of the offered curriculum (Paul, Elam, & Verhulst, 2007).

The nursing implications of this study would be offering a deep-breathing meditation class or instructions to students. The meditative prompt used in the study was reading instructions off a page. The method performed could be implemented with no additional cost, if the institution desired, or could include the method as a course. A training tool called *Hearth Math* © was used as a training device, but the authors report it as being optional (Paul et al., 2007).

The tool used to monitor changes in stress was a variant Likert-scale that rated six questions 1-10, rating “never” to “all the time.” The questions were directed at experiencing of anxiety during a test, being nervous, having self-doubt, losing concentration during a test, use of the intervention (deep breathing meditation) to change the previous feelings, and practical use of the intervention in their practice. Scores were averaged and standard deviations were calculated. The test was offered three times: a pre-test, a post-test, and a follow-up. Differences in mean and standard deviation were calculated using a paired t-test. No data were available to the reader as far as the reliability of the tool used to measure the study. There were references to previous studies that the use of meditation was helpful in reducing stress, but tools used in those tests were also unavailable to the reader. Reliability data of this study were also not available. Further, validity data for this and previous studies were unavailable to the reader. Data collection was described as a pre-test, post-test, and follow-up for students enrolled in the program, followed over two years. Survey data, including questions, are available in the “Results” section of the study (Paul et al., 2007).

Additional surveys were used in the study and referenced, but not made available to the reader. Due to the lack of availability of the validity and reliability data, the results of the study are difficult to validate externally. Also, due to the mandatory nature of the study, it is difficult to generalize the findings (Paul et al., 2007).

Discussion groups for stress reduction. A different medical school study found that having profession-related discussion groups could aid in reducing area-of-study-specific forms of stress. Medical students in Norway were offered classes in self-development led by psychotherapists or discussion groups focused on profession-themed

topics, led by experienced general practitioners. Both classes ran for twelve weeks. Both groups had stress measured by the Perceived Medical School Stress (PMSS) and Symptom Check List-5 (SCL-5) tests. The self-development group showed a reduction in medical-school-related stress, whereas the special topic group showed no change. The intervention groups did not affect overall perception of stress (Holm, Tyssen, Stordol, & Haver, 2010).

Referring students to or aiding in the development of area-of-study-related support or professional development groups could help a student reduce stress. Individual majors may have different stressors that do not apply to the general student population. This could lead to the reduction in stress about one's major, although no correlation was found on the effects on overall experienced stress levels (Holm et al., 2010).

The study was conducted on two classes of medical students in Norway. The first graduating class consisted of 129 students. The following year's class was used as a control and consisted of 152 students. Both classes had the same curriculum and were measured at the same points during the school year. Students in both classes could choose between interventions, either a self-development group or a special topics discussion group. Informed consent was gathered on 83.3% of the entire sample, and 63% of the entire sample responded to all questions during both intervention periods. The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Social Science Data Service (Holm et al., 2010).

Discussion of the PMSS and SCL-5 was included, but no validity or reliability figures for previous uses were available to the reader. Chronbach's alpha coefficient

(reliability) for the PMSS scale for the first test was .79. The second test was identical to the first, but the alpha coefficient was not available to the reader. The article discussed subjecting the 13 PMSS questions to a component analysis and confirmed three factors, but no specific data were available to the reader. The SCL-5's use in previous studies was discussed, but no validity or reliability data were available to the reader. For this test, the SCL-5 had a Chronbach's alpha coefficient of .88. No information on the validity or reliability in this test was available to the reader. Like the PMSS, the administered SCL-5 surveys in both tests were identical. Scores were computed using a variable, then subtracting the second test from the first for both the PMSS and SCL-5. The data collection process was adequately described and seemed appropriate to the study (Holm et al., 2010).

DB and nursing student test-taking. DB was found to have an inconsistent effect on student heart rate and stress test scores. DB alone did not reduce heart rate or improve test scores in the participants. Measured stress levels also showed no statistical improvement. The authors discussed the desirability of other variables as measurement tools (Consolo, Fusner, & Staib, 2008).

Due to inconsistent results, DB alone could not reliably be recommended to reduce stress. The validity and reliability of the study is questionable, due to those figures' being unavailable to the reader. Overall results were similar to previous studies on the subject (Consolo et al., 2008).

This study was conducted with 21 nursing students. Students performed a cognitive skills test and nursing skills test without the intervention, and their heart rates were recorded, a skill the students were taught previously. Students then listened to a 5-

minute audio tape on DB before each measurement period and then performed DB before performing similar tests on a different day. Students also filled out two stress surveys: the Life Experience Survey and the Stress Vulnerability Survey. Both surveys had been used in previous studies. Independent t-tests were used to study the means among groups of data. No other reliability or validity testing information was available to the reader. With a small sample size and no reliability or validity data, the results of this study should not be generalized. The authors did mention that more comprehensive stress reduction should be tested and that pulse and test score results may not have been the best indication of stress levels in participating students (Consolo et al., 2008).

Mindfulness for stress reduction. A Tilburg University study in the Netherlands used many scales to correlate a positive effect of mindfulness as a technique to manage stress. Mindfulness is an awareness of an individual's thoughts, feelings, and bodily functions, in the present moment. The study determined that mindfulness appeared to play a role in stress reduction. (Nyklicek & Kuijpers, 2008).

This study used respondents to an ad in a local paper to gather participants. Selected participants were randomly assigned to an intervention group and a control group, then responded to several different scales intended to measure various aspects of stress in the participants' lives. The study exceeded the minimum number of participants for results to be statistically significant. Specific details of the number and demographics of participants were not available to readers (Nyklicek & Kuijpers, 2008).

This study showed that mindfulness could play a key factor in stress reduction. This information could be useful in directing patients to pay attention to what their bodies are saying about stress. Using that knowledge can help an individual alleviate that stress

by being aware of what is happening physiologically and self-intervening using techniques like mindfulness or other relaxation techniques (Nyklicek & Kuijpers, 2008).

Multiple behavioral interventions. Health consultations and using contracts with college students can help promote lifestyle changes desired by students. Combining health consultations with a dated contract with a log to measure activity can aid in further improvement and progress towards the desired outcome. Providing education and support towards a goal appears to help students in developing routines that have positive effects on their health (Werch et al., 2007).

This study demonstrates the effectiveness of education combined with follow-ups on creating desired outcomes for patients, as well as increasing patient compliance within the college setting. Students that received only consultations or only a contract with a log of activity both showed lifestyle improvements in physical activity, nutrition, and healthy behaviors. When consultations and contracts were combined, there was a greater effect on compliance and improvement (Werch et al., 2007). Education and evaluation of progress are a part of the nursing process and could be used by nurses to help a patient make progress in a desired lifestyle change. While the focus of the study was on improvements in fitness, students in the consultation and contract combination intervention groups showed improvements in stress management, which could be one method of approach to helping a student with stress management in the college environment (Werch et al., 2007).

The Werch et al. pilot study was conducted at a major university in the South and involved 155 participants who were recruited by fliers, announcements on the university's health clinic website, and announcements in chosen health-related classes. Participation

was voluntary and no incentives were given to participate. Informed consent was obtained prior to participation. Students were asked base-line data about their overall fitness, drug use, quality of life, sleep hygiene, stress management, and diet using the Fitness Behavior Screen. Upon completing baseline data, participants were placed in one of three groups: consultation only, contract with self-reported log only, or consultation and contract with log combination. All interventions were based on the Behavioral Imaging Model (BIM), which is not clearly defined in the literature, but is sourced often, and multiple sources to previous studies using the model are given. Behavioral Imaging is a method used to define an end result in a broad focus. In this study, the focus was fitness. Once the result was defined, the participant chose actions in their lives that they could perform that would move them closer to reaching their selected goal.

Consultations were individually tailored for the participants and lasted 25 minutes in a private room in the university health clinic where their individual needs were addressed. The BIM was used as a method for setting the goals for the intervention period. The consultation and contract group received both interventions. Each group was measured pre-test and at one month. Contracts and logs were given that measured for 12-week intervals, but data were not collected beyond the fourth week. Seven students were lost to attrition. Data were analyzed using SPSS v. 13.0, and analysis of variance (ANOVA) and mean analysis of variance (MANOVA). The results of the study showed statistically significant ($p < .05$) improvements in reduced alcohol consumption, improved consumption of fats from nuts, seeds, vegetable oils, and fish, improved sleep satisfaction, improved body image, and improved stress management in all groups. The combination consultation and contract groups showed greater improvements in the same

areas than the individual interventions alone. The limitations of the study were concluded to be the data collection period's being at 30 days into the study, as opposed to a longer time interval. Further, there was no control group to determine what the effects of no intervention were during the data collection. The sample size was also small and performed at one university, so generalization of findings was not recommended. Lastly, the contract and log were combined in one intervention, and the authors would like further exploration into separating the two processes (Werch et al., 2007).

Theoretical framework

This study is based on the Carroll College Nursing Department's Four Dimensional Guide for assessment (4-D). The 4-D guide was developed by the Carroll Nursing Department in 1974 as a way to teach students how to address individual clients on a holistic level, as opposed to presenting symptoms or disease process. Students use the 4-D guide to gather and process information on clients to develop plans of care (D. Greenwood, personal communication, November 1, 2011).

The 4-D guide consists of four areas of assessment that make up the major subjects of a client's life that could affect that person's health or be affected by that person's health. A client's occupation could be a source of exposure to an environmental toxin that is causing illness. Another example could be if the client provides the only source of income for the family, that client's illness could affect not only the client, but the client's family. Having this information can lead to better client care, referral to more services, and care for not just the patient, but the patient's family or significant others (D. Greenwood, personal communication, November 1, 2011).

Physical. The Physical section of the 4-D guide covers any physical data relating to the client. This data could influence what treatments, medications, or activities a client is able to receive or participate in. The effectiveness of a treatments or medication regimen could also be tracked through changes in this section. Information such as weight, vital signs, lab values, current symptoms, and any disease process or diagnoses that relate to the client's body falls into this section of the 4-D guide (D. Greenwood, personal communication, March 1, 2012).

Psychological. The Psychological section of the 4-D guide covers any data relating to the client's psychological well-being. This data could influence a course of treatment or track changes in this section. The client's mental status, psychological symptoms, DSM-IV diagnoses, affect, and any other pertinent psychological data fall into this section of the 4-D guide (D. Greenwood, personal communication, March 1, 2012).

Socio-cultural. The Socio-cultural section of the 4-D guide covers any social or cultural data of the client or client's family. Certain societies and cultures may require slightly different treatment or have values that could conflict with standard treatment. Knowing what a client values or prefers can help in providing higher quality care. The client's marital status, occupation, neighborhood the client lives in, language the client speaks, and any other cultural or social data fall into this section of the 4-D guide (D. Greenwood, personal communication, March 1, 2012).

Spiritual. The Spiritual section of the 4-D guide covers any areas of spiritual belief for the client. A client's spirituality may influence what types of treatment, medications, how much care is desired in critical care and the types of foods a client is able to eat. This area of the 4-D guide covers religion, faith, spiritual practices, level of

participation, and any other areas relating to the supernatural beliefs of the client (D. Greenwood, personal communication, March 1, 2012).

CHAPTER III

Methodology

The lack of a standardized measurement tool for short-term changes in stress is a problem in research related to stress. Available studies have used changes in vital signs, such as pulse, as well as available tools to measure changes in a participant's stress level. These studies have reported inconsistent results. Researchers speculate that pulse and current stress instruments do not accurately measure changes in stress. Current instruments often measure long-term or situational stressors that may be causing stress in an individual, but an intervention alone may not relieve that stressor. An example of unresolved stress from an intervention in the 2008 Consolo et al. study was one of the items the instrument measured was financial stress. A person's overall stress level may be reduced with an intervention, such as DB, even though a specific origin of stress remains unresolved (Consolo et al., 2008).

Another area of interest regarding stress and stress reduction where little research exists is in anecdotal evidence of stress reduction. Students participating in stress reducing techniques often report "feeling better"; however, there is little-to-no research to validate that these changes occur. With few proven tools, and much anecdotal evidence, studying this gap in information could provide scientific insight (L. Fahlberg, personal communication, October 19, 2010).

A quasi-experimental design was used to better understand the effects of DB on stress levels of participants. Quasi-experimental designs can be used when there is no control or random assignment in the experiment (Nieswiadomy, 2008). A pre-test was

used to determine the stress levels of participants before the DB exercise. A post-test was used to compare changes in participant stress.

Sample and Setting

Participants were recruited from a yoga class, at a private Catholic college in the Northwest. This convenience sample included 47 students, ages 19-54. There were 39 females and 8 males. The data collection took place in a classroom setting on the third day of the class.

Confidentiality

The study was explained to participants by the researcher. No identifiable data were collected. IRB approval was obtained. Participants were informed prior to administration of the pre-test/post-test questionnaire that participation implied informed consent to this study.

Data Collection

A pre-test/post-test questionnaire was administered to allow the participant to report stress levels before and after the DB intervention. The pre-test questionnaire asked age and gender, and how participants rated their stress on a seven- point Likert-like scale. The post-test was the same as the pre-test, excluding the age and gender items.

Intervention

Participants were instructed how to perform DB. Participants were invited to participate for five minutes. The researcher demonstrated proper breathing technique, then allowed participants to continue on their own for five minutes.

Instrument

The questionnaire asked the participant's gender and age, as well as seven Likert-like questions that allowed students to self-report stress levels before and after the five-minute breathing exercise. Likert-like scales can be used to measure an individual's viewpoint (Fain, 2009).

Data Analysis

Descriptive statistics were used to analyze the sample characteristics. A paired t-test was used to look for any significant differences in outcomes between pre- and post-intervention stress levels. Statistically significant results were calculated at $p < .05$.

Limitations

Limitations to this study included a small, non-random, convenience sample. Participants were not well-distributed evenly across the parameters of age and gender. Participation was biased to those enrolled in a class at a small, private Catholic school with a liberal-arts emphasis in the Northwest. One participant's questionnaire was discarded due to multiple answers on each question.

CHAPTER IV

Results

The purpose of this research study was to explore the effects of five minutes of diaphragmatic breathing on stress levels of college students. A paired t-test was used for each question to determine statistical significance in this study. Age had no significant correlation. See Table 1 for pre- and post-test mean and p-values for each question.

Table 1. Questionnaire Pre-test/Post-test Analysis

Questions	Pre-test Mean	Post-test Mean	P- Value
1. My overall stress level	3.85	2.92	$p < 0.00$
2. My level of physiological stress	3.28	2.70	$p < 0.00$
3. My level of psychological stress	4.02	3.15	$p < 0.00$
4. My level of socio-economic stress	2.64	2.13	$p < 0.00$
5. My level of spiritual stress	2.46	1.98	$p < 0.00$

It was hypothesized that there would be no statistical differences in a college student's stress level before and after a five-minute diaphragmatic breathing exercise. A null hypothesis was utilized for statistical analysis of the paired t-test. Therefore, the null hypothesis was rejected. There was statistically significant reduction in overall stress, physiological stress, psychological stress, socio-economic stress, and spiritual stress. Significance was set at $p < .05$ and actual significance for each question was $p < 0.00$. These results provided evidence that five minutes of diaphragmatic breathing can reduce stress reported by students within a classroom setting.

CHAPTER V

Discussion

The purpose of this study was to explore the effects of a five-minute DB exercise on college student stress. The result of the pre/post-test indicates that five minutes of DB do reduce the perception of stress in many different areas. However, this study was performed on a small sample and may not be representative of all college students. The most significant finding of this research is that the five-minute DB intervention reduced participants' stress perception in all measured areas by the pre/post-test. An unexpected observation during the intervention was that every participant closed his or her eyes while performing the DB, even though no instructions were given to do so. It is possible that DB is associated with the closing of the eyes through other exposures to many other relaxation modalities. Further, the instructor of the yoga class that was used for this study invites students to close their eyes for guided meditations and other forms of relaxation during the regular class period. Perhaps the students had grown accustomed to this routine at the time of the intervention and assumed that they were expected to close their eyes.

There was only one report of increased stress in any participant in any area and that was an increase in physical stress related to asthma in one participant. There was no discussion of the effects of DB on asthma in any of the research that used a deep breathing element to the overall intervention. Further research could be conducted on the use of DB in people with asthma.

Physiological stress

A 2009 study by Moura, Mahajan, Singh, and Jain studied how different breathing exercises affected blood pressure in those with hypertension. Participants were trained and divided into three groups: a slow-breath exercise group, a fast-breath exercise group, and a control that used no intervention. The study found that both breath exercise groups saw reductions in blood pressure, and the group that performed slow-breathing exercises showed the most improvement in blood pressure reduction. The slow-breathing group also showed the most overall improvement in other tests (Moura, Mahajan, Singh, & Jain, 2009).

Psychological stress

Mindfulness and well-being. A 2011 study by Josefsson, Larsman, Bruberg, and Lundh explored the connection between mindfulness and psychological well-being. In this study, Buddhist meditators, Western mindfulness meditators, and non-meditators participated in a pre-test, post-test analysis of psychological well-being and mindfulness on five facets. One element of both Buddhist meditation and Western mindfulness meditation is the use of DB as an entry point into meditation. Of the participants, those that meditated performed better than those that did not. Also, meditation experience was shown to be a factor in scores among those that meditated. This study demonstrated that the more practiced a person is at meditating, the more benefits that person will receive from the meditation. These results also provide evidence that the longer the meditative experience, the higher the level of mindfulness. And the higher level of mindfulness is associated with improved psychological well-being (Josefsson et al., 2011).

Decentering and repetitive thoughts. In a 2010 study by Feldman, Greeson, and Senville, participants were asked to track how often they had repetitive thoughts during a relaxation exercise as well as any negative reaction to those thoughts. Participants practiced one of three modalities: mindfulness breathing, progressive muscle relaxation, or loving-kindness meditation. The mindfulness breathing group had the greatest degree of decentering among all participants, suggesting that mindfulness breathing may assist in reducing reactivity to repetitive thoughts (Feldman et al., 2010).

Mindfulness-based interventions and attention. A 2010 study by Semple found that mindfulness-based interventions could improve sustained attention over other relaxation modalities. Participants practiced mindfulness meditation, progressive muscle relaxation, or were part of a control group and measured four components of attention: sustained vigilance, concentration, inhibition of distraction, and executive control. The mindfulness meditation group showed greater discrimination on a signal detection task than the other test groups. Also, the mindfulness group showed the most improvement in the area of sustained attention than the other groups. The results of this study suggest that mindfulness interventions could be used to increase attention. (Semple, 2010).

Spiritual stress

Barkye (2008), discussed how principles of meditation can foster and enhance spiritual growth and development. Barkye's primary belief was that anyone could enhance his or her spiritual growth who seeks it. If a person chooses to seek out the divine, that person will plant a seed of spirituality that can be fertilized with meditation. With practice and willingness to listen, anyone can enhance the depth of faith and will be able to take what he or she learns in the silence and apply to daily life (Barkye).

Plante (2010) discussed both eastern and western contemplative practices as tools for healing, stress reduction, and spiritual growth. Plante analyzed the evolution of modern meditative practices and noted that many practitioners are taking only the contemplative and meditative aspects out of various faiths, but ignoring those available in their own faith practices. Plante argued that the same benefits of meditation and contemplation can be achieved within many of the major religions by practicing the traditions already established in those faiths. Plante discussed the contemplative aspects of several eastern and western religions and believed that a person would receive additional spiritual benefits from practicing what already exists in his or her current faith (Plante).

Future Nursing Research

Further research on this topic would include a larger, more varied sample in terms of gender and age in order to fully analyze the effects of DB as a standalone intervention for stress reduction across age and gender. Also, further research would be useful in determining the duration of the benefits of the DB exercise. This study only measured the immediate effects of DB, so there is room to measure again at more prolonged periods of time, such as one hour, four hours, and one day. Another area of research could be uncovering any benefits of regular practice of DB on stress perception. The level of experience each participant had with DB was not measured, so the effect of DB as a routine could not be evaluated.

Indications for Clinical Practice

Students could implement five minutes of DB as a tool to reduce their acute stress. DB could also be used as a non-pharmacologic treatment to reduce stress levels after a student receives stressful news, diagnosis, or other unexpected and stressing information related to health or life in general. Five minutes of DB could also be implemented as an acute intervention for students who are in high stress majors or know they currently have high levels of stress.

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Appendix

Sample Survey

This is a voluntary study.

By completing this pre- and post-test questionnaire, you are giving consent to participation in James McKay's honor's thesis study 'The Effects of Diaphragmatic Breathing on College Student Stress.' Participation in this study is voluntary and you may choose to withdraw from participation at any time during the pre-test, five minute exercise, or post-test. No personal data will be collected.

Potential risks of participation include hyperventilation, light-headedness, fainting, and/or dizziness. If you experience any of these symptoms, please remain seated, resume normal breathing, and inform Dr. Fahlberg immediately.

Pre-Test

Age:

Gender:

Please circle your response in each of the following areas:

1. My overall stress level is:

No stress Low Mild Moderate Elevated High Highest Possible

2. My level of physiological stress (stress related to your physical body, injuries, illness, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

3. My level of psychological stress (stress related to life situations, school, loss, self-esteem, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

4. My level of socio-cultural stress (stress related to culture, family, language, environment, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

5. My level of spiritual stress (stress relating to morals, spirituality, guiding force/higher power, meaning/purpose of life, etc) is:

No stress Low Mild Moderate Elevated High Highest Possible

Post-Test

Please circle your response in each of the following areas:

1. My overall stress level is:

No stress Low Mild Moderate Elevated High Highest Possible

2. My level of physiological stress (stress related to your physical body, injuries, illness, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

3. My level of psychological stress (stress related to life situations, school, loss, self-esteem, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

4. My level of socio-cultural stress (stress related to culture, family, language, environment, etc.) is:

No stress Low Mild Moderate Elevated High Highest Possible

5. My level of spiritual stress (stress relating to morals, spirituality, guiding force/higher power, meaning/purpose of life, etc) is:

No stress Low Mild Moderate Elevated High Highest Possible