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The Effects of Deep Breathing and Positive Imagery on Stress and

Coherence Levels among College-Age Women

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Abstract

Stress is steadily becoming a problem of epidemic proportions in American society. Diseases and other health problems that are a direct result of high, chronic stress levels are on the rise. As bad as they are, the physical effects of stress are not the only concern. There are also mental and emotional concerns to increased and continuous stress levels. It is therefore vitally important for people to learn effective methods for reducing stress. This study investigates two techniques done together, deep breathing and positive imagery, for their effectiveness in reducing stress and increasing coherence. The sample consisted of thirty 18-26 year-old female college students at Liberty University who volunteered and were randomly placed into either an experimental group or a control group. The hypothesis was that the techniques would increase coherence, which occurs when the heart and brain are perfectly synchronized, and thereby reduce stress. Results showed that the techniques effectively reduced low coherence levels and increased high coherence levels, indicating a reduction in stress.

The Effects of Deep Breathing and Positive Imagery on Stress and

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Introduction

Stress is a prevalent affliction for Americans today; the culture's fast pace creates many

seemingly inconsequential stressors in people's lives which can cause the effects of stress to

accumulate, resulting in harmfully elevated levels (Childre & Rozman, 2005). Stress is the

body's response to stressors, which are experiences that may be seen as good as well as bad

(Hart, 1999). In low doses, stress is necessary to survival. However, most Americans experience

much more than low amounts of stress. Since human beings are highly adaptable to situations,

whether explicitly or covertly harmful, some people are not even aware that their bodies are

under stress. High and chronic stress results in great damage to the body. According to the

American Institute of Stress, 75-90% of all doctor visits are due to complaints associated with

stress (Childre & Rozman, 2005). This is an alarming percentage. These elevated levels of stress

affect American culture physically, psychologically, emotionally, mentally, and academically.

It is not only adults who suffer from high levels of stress. High stress levels are also

affecting college students, adolescents, and children. Increased stress for college students and

adolescents is a great concern because of the previously mentioned ramifications and also

because being overstressed inhibits students' learning and academic performance (Hanson, 2000;

Largo-Wight, Peterson, & Chen, 2005; LePine, LePine, & Jackson, 2004). Stress can develop

especially for college freshman, who experience many changes that they must adapt to and

handle as they first enter college (Dyson & Renk, 2006). Research has also revealed that college

students have many challenges to face, such as dealing with family and friend relationships,

romantic relationships, autonomy, illness, and so forth (Hall, Chipperfield, Perry, Ruthig, &

Goetz, 2006). Furthermore, college is a time when students make choices that form habits for the rest of their lives. Sometimes those habits are detrimental, such as binge drinking, unhealthy sexual practices, and damaging sleep patterns. Learning ways to counteract the effects of stress while in college can be beneficial throughout the tense and anxious times of life.

Review of Literature

Perception and Stress

There are different types of stress abundant in today's society. According to some research done on the differences between challenge stress and hindrance stress, *both* types were found to eventually lead to exhaustion (LePine et al., 2004). Stress can be caused by fun stressors such as the exhilaration of going on a roller coaster, challenge stressors which allow someone to have enough motivation to accomplish a task, and fear stressors such as being informed of a pop quiz (Childre & Rozman, 2005; LePine et al., 2004; Largo-Wight et al., 2005; Hanson, 2000). Invariably, however, though there are different types of stressors in peoples' lives, everything that is perceived as a stressful situation can be detrimental to health (Hanson, 2000). If a situation is perceived as stressful, the body's response is the same regardless of whether the stressor is a tiger poised to attack, an upcoming job interview, or speaking in public (Hanson, 2000; Hart, 1995). As Archibald D. Hart (1995) wrote, "[T]hreatening or challenging events actually don't have to take place or be real. Often it is enough simply to imagine them . . . [t]he stress response cannot tell the difference between real and imagined threats" (p. 7). Thus, a person's perception and interpretation of a situation, despite the situation's actual level of threat or danger, is a vital factor in how much stress the person experiences (Childre & Rozman, 2005; Hanson, 2000; Hart, 1995; LePine et al., 2004; Largo-Wight et al., 2005).

Stress can also result from situations that are perceived as positive as well as from situations that are thought to be negative (Hart, 1995). For example, people may have positive feelings about their jobs and love staying busy, and yet they may be under stress from their jobs that they are not even aware of having. In addition, people's perceived problem-solving abilities are a factor in their awareness of how high their stress levels are; a situation is viewed as stressful when people believe that they do not have the abilities or means to handle the situation (Largo-Wight et al., 2005). This indicates that increased confidence may help to reduce the perception of stress, and according to Childre and Rozman (2005), a person's feelings about stressors may alter her actual levels of stress. If people view a situation through negative feelings, their stress levels will be higher than if they observe a situation through positive feelings. Also, verbalizing and constantly reiterating all the negative difficulties in life tend to spread stress around like a virus among people and result in more stress. Furthermore, over time each negative emotional response to a stressor becomes ingrained in the brain's neural circuitry and then becomes the body's automatic response to that stressor. Consequently, the stress response becomes a habit.

The Stress Response

Though some stress-causing situations seem desirable, such as the thrill of a roller coaster or a suspense film, and others do not, such as the anxiety that comes before a speech, each one evokes the same stress response in the body (Hanson, 2000). Hanson (2000) described the first stress response that people experience as the fast response. This response is automatic and sometimes occurs before people even realize what the particular stressor is. The hormone involved here, sent out by the sympathetic nervous system, is adrenaline. Adrenaline is the hormone that allows people to be able to escape dangerous situations or to remain and engage

them. This fast response is also called the "fight or flight" response. The parasympathetic

nervous system then responds with adrenocorticotrophin (ACTH) which in turn initiates the

manufacturing of cortisol. Cortisol is a hormone that is released in order to re-energize the body

after its energy stores have been depleted by the physical exertion of escaping or engaging the

threatening situation. This process is a natural, built-in mechanism to help the body successfully

handle stress. One problem for American society, however, is that there is frequently little

opportunity to engage in the "fight or flight" response that the body primes up for and the

hormones begin to build without being used. For example, a student in the classroom cannot bolt

out of her chair to physically fight a professor who just announced a pop quiz or additional

assignment due next week. Likewise, a person stuck in traffic is undergoing stress in her body,

yet there is no way, short of jumping out of her car and dragging other people out of their cars to

fight them, for her to use up the adrenaline.

Stress on the Roads

　　This brings up another frequent cause of stress. Road rage is becoming an emergent trend

in today's world of constant commuting and heavy traffic (Dukes, Clayton, Jenkins, Miller, &

Rodgers, 2001; Sharkin, 2004; Ayar, 2006). The anger caused by being cut off on the road or the

worry generated by being cut off or tailgated (Britt & Garrity, 2006) make driving an added

stress essentially unavoidable in everyday life. The demands of time constraints and adverse

driving situations cause a build-up of stress that increases in a more serious manner with every

new stressful encounter on the road (Ayar, 2006). In fact, road rage and stress are so closely tied

together that one suggested treatment for road rage is stress reduction, such as practicing deep

breathing while driving. Occasionally, road rage becomes the method for venting stress, such as

in the example above of a person becoming aggressive. Indeed, it is a growing concern not just

because of the stress experienced in the body. In a study done by Mann, Zhao, Stoduto, Adlaf, Smart, and Donovan (2007), it was found that there is a significantly greater risk of vehicle collisions for those who have been either recipients or perpetrators of road rage.

Physical Dangers of Stress

Though there is always a small amount of cortisol in the blood, over time, the build-up of cortisol from constant minor stressors gradually becomes what the body considers a normal level. Each time cortisol levels have been consistently held at higher levels, the baseline level resets to the new "normal" baseline level (Childre & Martin, 1999; Hanson, 2000). This occurs after a person has experienced chronic stress due to the accumulation of minor stressors (Hanson, 2000). This is extremely detrimental to peoples' health. High levels of cortisol due to chronic stress can cause a loss of bone mass, osteoporosis, asthma, allergies, sleeplessness, acid reflux, ulcers, relocation of fat to the waist and hip area, and fat build-up in arteries which can lead to heart disease as well as other types of diseases (Childre & Rozman, 2005). Furthermore, *any* negative emotion, such as anger and frustration, can increase cortisol levels. Stress in college students has also been found to lead to avoidant coping and depressive symptoms (Dyson & Renk, 2006). Furthermore, stress weakens the immune system, thereby causing symptoms of disease and physical illness to develop (Childre & Rozman, 2005). By learning how to recognize what situations produce stress, taking appropriate action to alleviate the situations' stress-inducing effects, and finding positive ways to cope, students can increase their health.

Stress Among Students

Reducing stress can also help students to perform better academically and enhance learning (Hanson, 2000; Largo-Wight et al., 2005; Rausch et al., 2006; Maquet, 2001). LePine, LePine, and Jackson (2004) discovered in their study of 696 college students that students assess

possible stressful situations as being either challenging and therefore helpful, or threatening and therefore hurtful. The more students perceived stress as motivating them to overcome a challenge, the more students' motivation to learn increased, and consequently so did their learning performance. However, the more students experienced hindrance stress, where they felt stressed because a situation was threatening, the more their motivation to learn decreased. The effects of hindrance stress can result in hindering learning and academic performance. In addition, challenge stress and hindrance stress were found to increase levels of exhaustion in the students. In the case of challenge stress, the heightened senses, stronger awareness, and increased boldness and determination can be beneficial.

When stress becomes chronic, however, it will impair students' learning abilities and performance (Childre & Rozman, 2005; Hanson, 2000). This is due to the fact that when people are stressed, they have increased levels of arousal and eventually become tired when continually operating at such high arousal levels. Childre and Rozman (2005) found that when the body is attempting to prepare to fight in a situation or flee from danger, it is not focusing on higher brain functioning, it is merely trying to survive. The body's response to stress is physical and is not concerned with contemplating intellectual or psychological issues and problems. Instead, physical needs are what take precedence when a person perceives severe stress.

Maslow's (1954) research and theory of hierarchy of needs, though gathered and developed many years ago, also indicates the hindrance that stress has on the ability for students to learn. Safety needs are second on Maslow's hierarchy, coming after the need for food and shelter. According to his theory, people cannot have concern for the next level of needs before the lower needs have been met. Someone who is operating on the level of trying to meet her safety needs is probably not concerned with self-actualization, which is a growth need and

located at the top of the hierarchy, according to Maslow. Therefore, if people's safety needs are

not met, i.e., if stress causes insecurity, anxiety, and a feeling of threat, then they cannot continue

to move up in the hierarchy and reach self-actualization, where learning is highly valued and

where people desire to reach the potential they are capable of achieving. People who are

functioning efficiently by having their physical needs met are able to operate at a higher level;

people who are not as efficient will experience negative psychological outcomes.

The theory of memory has also suggested how stress can hinder learning. According to

George Miller (Ormrod, 2004), a person's working memory can only contain about seven units

of information, plus or minus one or two units. Therefore, when a college student is stressed

during class or when trying to focus on homework, her mind is being occupied with many

different past, present, and future stressors, such as her lack of sleep the previous night, the

argument she just had with her boyfriend, and other assignments that are coming due in the next

week. Overlooking the obvious physical effects that are occurring in her body at this time, her

mental capacity is not enough to handle those three or four units of information and still allow

her to function at her best level of academic performance. This consequently affects her learning

in class or understanding of the subject she attempts to study. Furthermore, the theory of memory

stresses the value of having attention in order for learning to occur most effectively. If a person's

attention, or concentration, is not drawn to what is trying to be learned and held there, then she

will not have learned the information well enough to retrieve it at a later time.

Detrimental Habits

There are a few habits that college students in particular are prone to engage in which

increase their risk for feeling stressed. The first is that college students are often likely to lose

many hours of sleep each night on a regular basis. Losing sleep negatively affects students

because lack of it creates more stress for people and can cause poor physical, emotional, and mental health (Hart, 1995). Hart (1995) emphasized that the American culture is predisposed to believing that it is possible to sleep too much and that people are considered more productive the less they sleep. However, Hart (1995) affirmed that, if people are healthy individuals and not depressed or suffering from sleep disorders, sickness, and diseases, then they can not get too much sleep. The body will only take the amount of sleep that it needs. He also asserted that those who obtain healthier sleep patterns can handle their stress more effectively and are not as injured by stress.

It has been shown that stress, excitability, and irritability are often brought on by lack of sleep. In addition, an inability to sleep (insomnia) is often due to the effects of adrenaline in the body which is brought on by stress. People who believe that they can function well despite having only a few hours of sleep are simply accustomed to working under high levels of arousal (high adrenaline) and their bodies have become acclimated to sleeping despite their aroused state. Hart (1995) strongly stressed that sleep is vitally necessary for helping the body's immune system fight off disease and sickness, decreasing people's levels of anxiety, and lowering the occurrence of heart diseased provoked by stress.

Lack of sleep not only creates more physical and emotional stress on the body, it can also affect students' abilities to learn (Hart, 1995; Maquet, 2001). When people do not get the amount of sleep their bodies need, they not only increase the stress on their bodies, but they also tend to lack creativity and clarity of thought. This would clearly have a direct relationship with students' academic performance. Furthermore, directly affecting students' learning abilities, sleep is a necessary factor in order to have the capacities to process the information that they have stored in short-term memory (Maquet, 2001). Maquet (2001) also stated that there is information pointing

to the fact that if someone is in rapid eye movement (REM) sleep, new pieces of information and new pathways are strengthened and older pathways begin to fade somewhat. In fact, when a person learns new information, if she does not receive sleep, the new memory traces stay faint; they do not become strong and deep memory traces.

Another damaging habit that college students often give way to is to drink large amounts of coffee and other beverages that contain high caffeine content. As Hart (1999) stated, the substances that people ingest have a significant impact on anxiety "because it has a direct effect on [the] body's internal physiology and biochemistry" (p. 103). Caffeine is an important and strong factor in elevating anxiety levels and causing panic attacks, as well as in lowering the body's ability to handle that anxiety. Caffeine is a stimulant which in large amounts induces the stress response and increases adrenaline in the body. Blood pressure dramatically escalates, heartbeat increases, and people will experience the symptoms of anxiety when they ingest caffeine into their systems. In fact, Hart (1999) stated that "[o]f all the stimulants that can aggravate anxiety and trigger panic attacks, caffeine is at the top of the list" (p. 103). However, people tend to reach for caffeine when they are stressed about situations and events in their lives. Either they drink more coffee because it makes them feel better and helps keep their adrenaline going when they need to stay awake to do work, or they eat chocolate as a comfort food when they are anxious or stressed. These habits are detrimental because those stimulants automatically increase the body's stress response by creating higher arousal.

Stress Reduction Techniques

Largo-Wight, Peterson, and Chen (2005) found in their study of college students that when the students had weekly amounts of strenuous exercise and social support, they perceived lower stress than those who did not exercise regularly or have as much social support. Therefore,

physical activity and the support of friends are also important factors in helping to reduce stress. Setting aside time for leisure has also been shown as a way people can cope with stress (Iwasaki, 2003). Leisure coping beliefs have been shown as increasing psychological well-being. Additionally, friendships that are considered leisure friendships were shown to improve psychological well-being. When people believe that they are empowered through having leisure time, they also had higher psychological well-being. According to Iwasaki (2003), this finding might be because these people also interpret situations and stressors positively and as a challenge rather than negatively. Moreover, leisure provides people with a chance to catch up, to relax, and to regain their energy.

Meditation has been a practice among people for centuries (Hart, 1999). According to Hart (1999), there are two kinds of meditation. The first one is concentrative meditation. This method is used for people to try and block out some of the outside world of sensory stimuli. People who use concentrative meditation focus on a particular thought or object. People may focus on a visual image, a certain far off sound, or restrict their physical movement. The second kind of meditation is external awareness mediation. This type of meditation is exactly the opposite of concentrative meditation. External awareness meditation is a type that focuses on the outside world and everything that is going on around the person. Meditation, using either method, is useful in reducing stress because it directs people to reduce their fast-paced way of living and also teaches people to have more control over their thoughts. According to Hart (1999), concentration and imagination are two abilities, which most people possess, that are important for people to draw on when they meditate. People can possess imagination in different forms; they can either imagine visual images and pictures, or they can imagine descriptions and words. Likewise, people have the ability to concentrate. For instance, when there are many

people talking in a room, a person is able to concentrate on the one person that they are carrying on a conversation with. She is able to focus on something specific and particular and block out everything else that is not necessary.

Rausch, Gramling, and Auerbach (2006) did a study on college students and compared three different techniques for effectively reducing stress and anxiety levels: the use of meditation, progressive muscle relaxation, or simply closing the eyes and trying to relax. Though meditation is sometimes viewed as a practice common with cults, the researches simply employed it to see its effects on reducing stress. They instructed the participants to choose a "mantra" that they could focus on, any word or phrase that would provide a focal point. They were also informed not to choose words with negative emotions attached, such as the words hate and kill. This is similar to the positive imagery technique described by Childre and Rozman (2005), which instructs people to consistently focus (meditate) on a positive place or feeling. The participants were told that whenever their thoughts began to stray, they should gently bring their thoughts back to focusing on the mantra (Rausch, et al., 2006). Another experimental group in this study was instructed to use progressive muscle relaxation where they methodically tensed and then relaxed different groups of muscles at a time. The final group was simply informed to close their eyes and try to relax. The results of the study showed that meditation and muscle relaxation were more effective in reducing stress than simply trying to relax. Therefore, merely concentrating on relaxation is not as effective in helping people lower stress levels as more intentional and focused mental and physical tasks are. All of the above studies have evaluated successful methods for college students to effectively reduce stress, thereby increasing their academic performance and their ability to learn, as well as improving their mental, emotional, and physical health.

HeartMath® Solution

By learning ways to reduce stress, people can significantly decrease the harmful physical, emotional, mental, and consequently academic ramifications of stress (Childre & Rozman, 2005). Lowering stress levels can be accomplished through a variety of actions, such as exercise, deep breathing, positive guided imagery, healthy amounts of sleep, social support, problem solving abilities, and meditation (Childre & Rozman, 2005; Hart, 1995; Hart 1999; Largo-Wight et al., 2005; Maquet, 2001; & Rausch, Gramling, & Auerbach, 2006). Childre and Rozman (2005) suggested the HeartMath® method for reducing stress. This method explains how people get into patterns of attaching negative emotions with situations that are perceived as stressful. Those patterns then become ingrained pathways in the brain. The HeartMath® method works to help people learn to change their emotions when faced with a stressful situation or when experiencing chronic stress. According to Childre and Rozman (2005), each time people become tempted to respond with negative emotions, they should immediately practice the HeartMath® method.

This method involves a technique that combines a mental/emotional task and a physical task. First, people are instructed to close their eyes and picture themselves in a place that evokes peaceful and calming thoughts and emotions, such as lying out on the beach with the waves crashing and ocean stretched out to the horizon. This is referred to as focusing on positive feelings. Then, people should begin deep breathing, making sure that their diaphragm moves up and down. This has been shown to quickly reduce levels of stress.

The results of using the HeartMath® method have been measured by the HeartMath® Freeze-Framer® monitor that measures heart rate variability (HRV). HRV are the changes in time between each heart beat. These changes depict variations in peoples' emotional states.

Research has shown that feelings of frustration, anger, and anxiety from stress produce an erratic pattern of HRV (Childre & Martin, 1999; Childre & Rozman, 2005). In contrast, feelings of appreciation, contentment, care, and love create a steady and regular pattern of HRV. The Freeze-Framer® monitor shows the current HRV of the person using the instrument. When someone's heart rhythm gram shows a pattern that is jagged and irregular it indicates that the person is feeling stress from negative emotions. When a person has a smooth pattern it indicates that she has positive emotional feelings and does not feel stressed. When people achieve this pattern through positive emotions, they are referred to as having higher coherence. Coherence is reached when the parts of an organism or system function with perfect synchronization. This creates optimum power for the organism. With the HeartMath® solution, coherence occurs when the parts of the body, namely the heart (comprised of both feelings and intelligence) and the brain, work together rather than be torn in different directions.

The HeartMath® solution for lowering stress has used the idea of positive focus, though it is referred to as heart feeling (Childre & Martin, 1999; Childre & Rozman, 2005). Doc Childre (1999, 2005) founded HeartMath® and its method for measuring and reducing stress. The method is somewhat unique in that its focus is not only on relaxation and focused breathing. Instead, the program also takes into account the need for people to divert their thought patterns and heart rhythms away from their constant negative routines. According to HeartMath® research, heart rhythm patterns, or HRV, mirrors peoples' emotions (HeartMath, 2006). Measurement of HRV is a noninvasive way to see fluctuating emotional states by seeing how the brain and heart relate to each other and by seeing the dynamics of the autonomic nervous system. Stress causes, and is also caused by, an emotional response as well as a physiological response. Therefore, HRV can be used to measure stress levels.

Statement of the Problem

Stress, with its abundance and its chronically high levels, is a relatively recent problem which seems to affect more and more people at some point in their lives. The focus of this study and research was to determine the acute effects of two easy techniques done together in reducing stress levels among female college students.

Purpose of the Study

Because stress is prevalent in society and related to a high percentage of health problems, it is vital to people of any age to learn how to manage stress. College is often a period when young adults experience increased levels of stress as a result of their transition into adulthood and the pressure of making many life-changing decisions. Furthermore, stress is often agitated by the lifestyles and choices of college students. The college years are very formative years and students establish habits which will remain with them for the rest of their lives. Consequently, inappropriate patterns of handling stress may harmfully affect students' emotional, physical, spiritual, and mental health for years to come. The purpose of this study is to apply a physical task and a mental task to evaluate their effectiveness in assisting female college students to reduce stress.

Need for the Study

Research has shown that constantly thinking, talking, and worrying about stressors on a daily basis can create deep and negative patterns in the mind and heart (Childre & Martin, 1999; Childre & Rozman, 2005). Also, positive imagery and deep breathing are helpful tools in quickly and effectively using the mind and heart to reduce stress levels (Childre & Martin, 1999; Childre & Rozman, 2005). However, there has been no study performed that uses these two techniques

together on female college students specifically. In addition, continued use of these techniques

may prevent negative, life-long habits from forming.

Delimitations

The study was delimited to:

1. Thirty female college students who were enrolled in at least one psychology course, ages ranging from18-26 years old.

2. A sample consisting of participants of a psychology activity during the Spring, 2007 semester.

3. The use of the HeartMath Freeze-Framer® heart monitor (Childre & Martin, 1999; Childre & Rozman, 2005) to measure heart-rate variability and coherence, and thereby stress, levels.

4. The use of two techniques done together, deep breathing, or diaphragmatic breathing, and positive imagery to measure their effects on stress levels.

5. Administration of a double testing session of the experimental group involving measurement of half (fifteen students) of the sample's stress levels prior to any treatment intervention, instruction on how to properly perform the two techniques, administration of the techniques, and a measurement of the students' stress levels following the treatment.

6. The use of a control group consisting of half (fifteen students) of the sample, where no treatment interventions were used.

7. Administration of a double testing session involving measurement of the control group's stress levels, instructions to relax, and a re-measurement of the group's stress levels.

Limitations

The study was limited by:

1. The sample size was small (N = 30) necessitating caution for extrapolation of the data to a larger population.

2. The sample consisted of only female Liberty University students, and may not be generalizable to other universities.

3. The participants were all female, and results may vary depending on gender.

4. Although the participants were instructed to perform deep breathing and positive imagery, total adherence to the techniques was unknown and could not be controlled.

Assumptions

1. For the duration of this study, it was assumed that the participants would follow the instructions and practice the techniques that they were instructed to perform.

2. The HeartMath Freeze-Framer® heart monitor is a valid and reliable tool for measuring stress levels.

3. The participants complied with the researcher's request to perform maximally on all aspects of the study.

Hypothesis

It was hypothesized that by practicing and doing deep breathing strategies and positive imagery, stress should be quickly and perceptibly reduced among female Liberty University students.

Definition of Terms

For consistency of interpretation, the following terms are defined:

1. Deep Breathing: This is also known as diaphragmatic breathing and is the act of breathing deep into the lungs by flattening the diaphragm rather than breathing shallowly by expanding the rib cage only (Wikipedia, 2006). This technique regulates the cadence of the heart, which then helps to calm the mind (Childre & Rozman, 2005). According to Childre and Rozman (2005), it is especially useful when combined with positive imagery.

2. Positive Imagery: This concept is defined as heart feeling (Childre & Rozman, 2005). It is described as thinking about a time or place where you have experienced the positive feelings of enjoyment, care, love, peace, or appreciation and focusing on the recollection.

3. Heart-Rate Variability (HRV): Heart rate variability is a measure of the beat-to-beat changes, or standard deviation, in a person's heart rate. (Childre & Martin, 1999).

4. Coherence: Coherence is what occurs when the parts of an organism or system function with perfect synchronization, thus giving the organism optimum power. When the heart and brain operate together, this reduces incoherence and stress which is caused by the heart and brain being torn in many negative directions (Childre & Martin, 1999).

<center>Method</center>

Participants

The participants of this study were selected from Liberty University. They were thirty women who ranged in age from 18-26 and who were enrolled in a psychology course. The students were asked to voluntarily help with this experiment to receive class credit. Participants were randomly assigned to one of two groups, either a control group or an experimental group. All participants received credit for one psychology activity by participating. They were also informed that this study was done to evaluate stress levels and stress reduction techniques, and they were asked to sign consent forms prior to volunteering for this study.

Instrument

An instrument called the Freeze-Framer® heart monitor was used to indicate each woman's level of coherence and stress in real time. The instrument was a small clip that attached to the participant's ear lobe. A cord was connected from the participant's ear to a USB port on a computer. The participant's stress level was understood through the low, medium, and high coherence levels. The levels were projected on the computer screen in the form of a bar graph. The readings provided were red, blue, and green bars which also were each given a number. The three numbers were a ratio that, when added together, totaled 100. A larger ratio of low coherence indicated an irregular pattern of HRV, a larger ratio of medium coherence indicated a somewhat regular pattern of HRV, and a larger ratio of high coherence indicated a regular and smooth pattern of HRV. Also included in the output from the instrument were average heart rate and a heart rhythm gram of the HRV pattern.

Procedure

The first part of the study involved the participants' stress levels being measured by the HeartMath Freeze Framer® heart monitor. There was one participant plus the researcher in the room at a time. Each student was randomly assigned to either a control group or the experimental group. Regardless of which group she was placed in, every participant was connected to the instrument and was asked to sit quietly and comfortably in her chair while the researcher set up the program and took the first two minutes of feedback. Since many events, whether seemingly significant or insignificant, occur throughout the day to cause anxiety and stress, the bar graph feedback indicated the following levels of stress and coherence: 1) A red bar, meaning that the participant was very stressed and heart rhythms were incoherent; 2) A blue bar, showing that the participant had achieved some level of relaxation and coherence, and; 3) A green bar, indicating

that the participant's HRV had become coherent and the participant was relaxed and not stressed. Those who were part of the control group were then asked to sit for a moment while the researcher reset the program. Then, each person was asked to sit comfortably and quietly for another two minutes, as before. Each participant among the experimental group, following the initial two minute reading, was instructed on the techniques of deep breathing and positive imagery and asked to close her eyes and do the techniques as she was again connected to the instrument for two minutes. The results of the first and second measurements of the experimental group were compared with the results of the first and second measurements of the control group to see whether there was any change in the participant's stress level due to the techniques.

<div align="center">Results</div>

Effects of Relaxation Techniques: Deep breathing and Positive Imagery Versus Sitting Quietly

To evaluate the true effects of the relaxation techniques, a control group was used to determine if any relaxation occurred in the participants as they sat still without speaking and adjusted to the procedure. By comparing the experimental group to this, we can see what effect the training has, controlling for the effect of experience with the measure. The hypothesis was that the relaxation techniques of deep breathing and positive imagery would reduce stress among the female college students in the experimental group, and that this reduction would be larger than that seen in the control group. The instrument measured levels of coherence between the heart and mind through heart rate variability (HRV) and provided a coherence ratio, totaling 100, of low, medium, and high coherence. Higher numbers of low coherence were indicative of stress in the body, whereas higher numbers of high coherence were indicative of little to no stress in the body.

The data was analyzed by calculating the change scores of the first and second readings of the low, medium, and high coherence scores. Among the low coherence scores, each participant's first reading was subtracted from her second reading, and the same was done with the medium and high coherence scores. These low, medium, and high change scores of the experimental group were then compared with the respective change scores of the control group. Three separate independent t-tests were used to analyze the scores. Table 1 provides the method used for determining the change scores of each category for the two groups.

Table 1. *Each student's low, medium, and high change scores in the experimental group were compared to each student's low, medium, and high change scores in the control group using three independent t-tests.*

Experimental Group Low Coherence	Control Group Low Coherence
Part.1: 1st reading – 2nd reading = **change score**	Cont.1: 1st reading – 2nd reading = **change score**
Experimental Group Medium Coherence	**Control Group Medium Coherence**
Part 1: 1st reading – 2nd reading = **change score**	Cont.1: 1st reading – 2nd reading = **change score**
Experimental Group High Coherence	**Control Group High Coherence**
Part.1: 1st reading – 2nd reading = **change score**	Cont.1: 1st reading – 2nd reading = **change score**

As shown in Figure 1, the experimental group showed a significant reduction in low coherence scores compared to the control group: $t(28) = -2.943$, $p = .003$ (one-tailed). Though the control group had a moderate reduction in low coherence (Mean = -20.4667), the experimental group had a reduction that was more than 2 ½ times as large (Mean = -54.5333). This palpable difference indicates that the techniques helped the experimental group to move out of a state of extreme incoherence and stress more than the effects of experience did in the control group. In regards to the high coherence scores, it was found that the group who received the treatment significantly increased their scores (Mean = 65.1333) compared to the control group

(Mean = 4.9333), t(28) = 6.315, p < .001 (one-tailed) (see Figure 2). These results indicate that the effects of experience were negligible in allowing the control group to achieve high coherence and reduce their stress levels. In contrast, the experimental group's ability to reach high coherence was 13 times as great. As seen in Figure 3, it was found that the experimental group showed a reduction in medium coherence levels (Mean = -10.1333), while the control group showed an increase in medium coherence levels (Mean = 15.3333). This difference was significant, t(28) = -2.456, p = .0105, (one-tailed). Though at first glance these results seem to contradict the previous findings, it can be explained by the type of data being analyzed. Since the three categories of coherence (low, medium, and high) that are measured by the instrument are described using a ratio, when two of the numbers are known, the third number becomes apparent. The experimental group reduced their low coherence scores and increased their high coherence scores by 2 ½ times compared to the control group. Consequently, their medium coherence scores declined overall as their high coherence scores increased. The control group had some decrease in low coherence scores, yet did not have a significant increase in high coherence scores. Therefore, the shift in numbers moved from low coherence towards medium coherence and caused an increase in medium coherence scores.
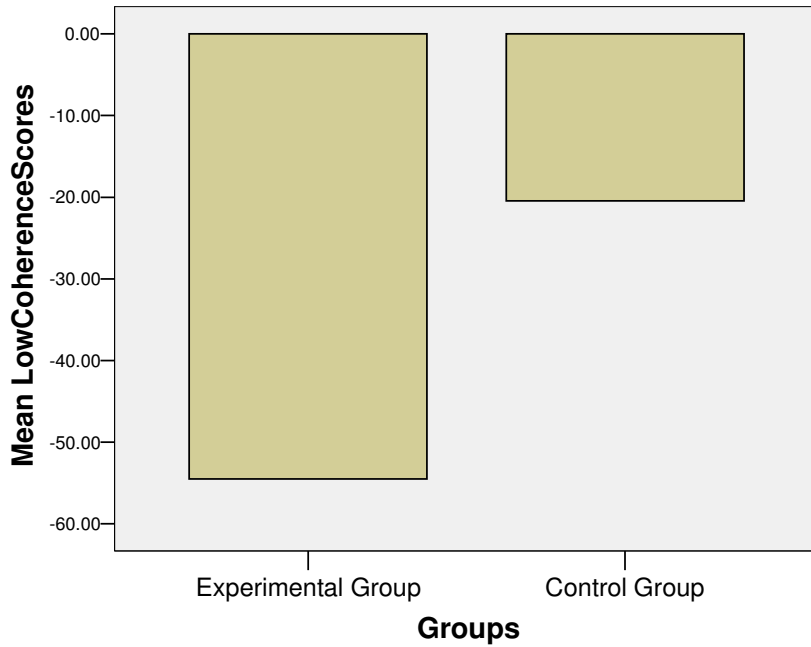
Figure 1. The experimental group showed a significant *reduction* in low coherence scores compared to the control group.
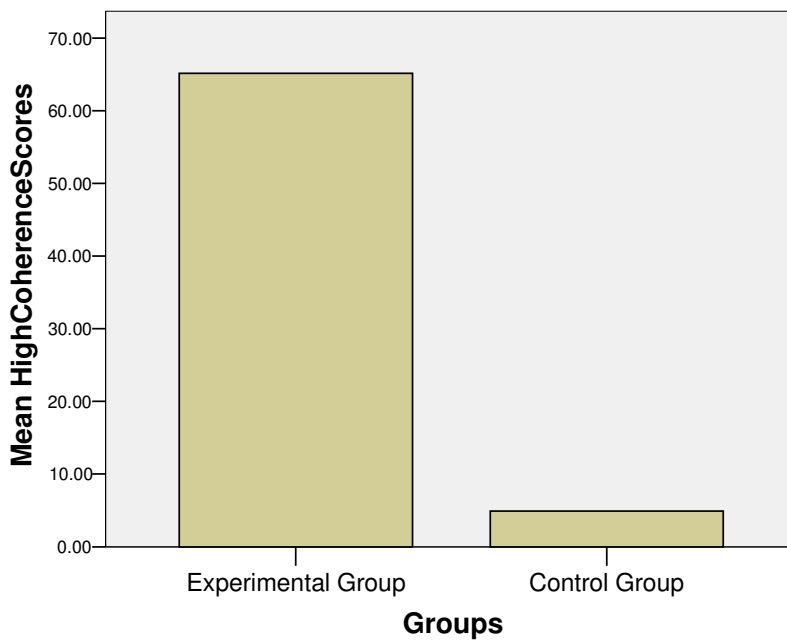

Figure 2. The experimental group showed a significant *increase* in high coherence scores compared to the control group.
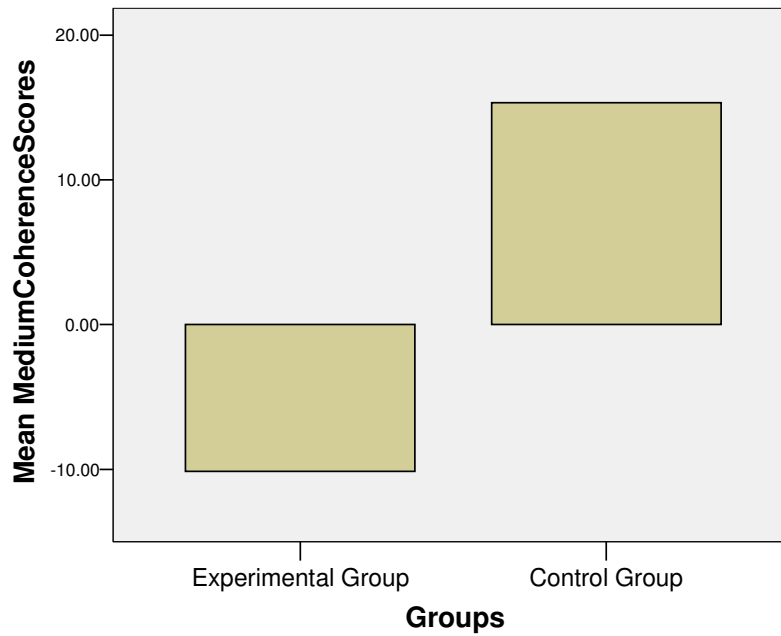
Figure 3. The experimental group showed a significant *reduction* in medium coherence levels compared to the

control group, which showed an increase in medium coherence levels.

Discussion

The initial hypothesis was that using deep breathing and positive imagery would help students to reduce their stress and increase coherence. This hypothesis was supported through the data analysis of the study. To account for any reduction in stress due to the effects of sitting quietly, a control group was included. Both groups were randomly assembled and both contained female Liberty University students between the ages of 18-26 who were enrolled in a psychology course. While the control group showed a slight decrease in low coherence scores and increase in medium coherence scores overall, the effect of sitting quietly was minimal compared to the effects of the treatment on the experimental group. In a five minute period, students in the experimental group were able to increase their coherence significantly, thereby lowering their stress. By focusing on positive thoughts and feelings associated with a particular image, as well as regulating their breathing, students effectively removed the negative thoughts and feelings that create stress. Furthermore, by learning to perform the techniques in any situation or environment, people can lower their stress quickly, refocus their energy, and increase their creativity with little effort or time (Childre & Rozman, 2005). This is a powerful tool for today's world.

The findings of this study hold significant ramifications for every person. According to Childre and Rozman (2005), helpful ways to handle the effects of stress are known to most people. Many are aware that habits such as eating healthy foods, getting regular exercise, eliminating coffee, not drinking alcohol, not smoking, and reserving time for friends or fun activities are beneficial habits to adopt and practice. In reality, however, some harmful habits are enjoyable to people, especially when they are feeling stressed. For many college students, activities such as drinking coffee or eating unhealthy snack foods are comforting during stressful times. Habits are difficult to change, and comforting or enjoyable habits are even more difficult.

The benefits of the techniques of this study, based on the results, are that they are readily available, easy to execute, and time efficient and people can use them to quickly interrupt their building stress. According to Childre and Rozman (2005), by pausing to re-focus and create coherence between the mind and heart through deep breathing and positive imagery, people can think more effectively and clearly and recharge their energy and emotions. The results of this study support the effectiveness of the techniques in creating coherence. Because staying alive is not the main goal when stress is reduced, the body can work coherently and the brain can think more clearly and creatively. People can then work towards positive development and self-actualization (Maslow, 1954).

The discovered effectiveness of these techniques is also important because negative emotions and stress can be like a virus that spreads rapidly and it is necessary to know ways to protect against the negative emotional virus (Childre & Rozman, 2005). Negativity creates more negativity, so when someone is around another person who is stressed or reacting with negative emotions, he is more likely to become susceptible to stress. Furthermore, cortisol is an effect of stress which is harmful to the body (Hanson, 2000). By proving their effectiveness in reducing stress, these techniques can help keep cortisol levels in the body from increasing. Simply changing negative emotion to positive emotion, as done in this study, decreases cortisol levels (Childre & Rozman, 2005). The results in this current study are similar to those found in the study performed by Rausch, Gramling, and Auerbach (2006). In their study, they found that meditation and muscle relaxation were more effective in reducing stress than sitting and trying to relax. Similarly, this study found that deep breathing and positive imagery were more effective in reducing stress than sitting quietly.

The findings of this study must be viewed within the context of its limitations. First of all, the treatment involved a combination of two techniques, rather than a single technique. Therefore, it is difficult to determine which technique had the largest effect on reducing stress, or if they had an equal effect. This study also did not measure gender differences and whether or not men are able to reduce stress more quickly or less quickly than women. Furthermore, the sample was small and a larger sample may have provided more accurate results. The study was also conducted during a short time duration (two minutes for each reading). Longer periods of being connected to the instrument may provide different results.

Despite its limitations, this study also contains strengths. The format involved a simple model without multiple measurement scales or multiple treatments. This allowed for careful attention to detail and control. In addition, the use of a control group accounted for the effect of experience or learning among the participants. The two groups were well balanced, with each group containing randomly selected college age women who covered the class range of the Undergraduate program, freshman, sophomore, junior, and senior. Furthermore, each student was tested alone with the researcher, without distractions due to others being in the room. Also, each participant was measured twice in one complete session, so that the findings reflect the participant's acute responses to the treatment.

Suggestions for Further Research

For researchers in the future, it would be beneficial to measure the effects of one technique at a time in order to see which technique has the largest effect or if each technique is equally effective in reducing stress. Four groups would be a more detailed study, with one group practicing deep breathing, a second practicing positive imagery, a third practicing both techniques, and a fourth control group. Additionally, it would be interesting to discover whether

these techniques are more or less effective depending on the race and culture of the participants. Finally, more research could be done on how this method of measurement, the HeartMath® FreezeFramer® monitor, compares to other stress measurement tests, and how deep breathing and positive imagery compare with other stress reduction methods.

Conclusion

Because hindrance, or negative, stress is a problem which affects everyone, it is important for people to find ways to reduce their stress. Though many people know of behaviors or activities that help alleviate stress, such as exercise, fun time with friends, and eliminating coffee and unhealthy food, few are able to actually consistently practice these habits. College students are at a time in life when they find themselves needing to adapt to many changes, cope with stress, and form either negative or positive habits which they may continue throughout life. This study has tested a simple and quick method to immediately change the incoherence and negativity of stress to coherence and positive energy. By using deep breathing and positive imagery together for two minutes, it has been found that female college students have reduced their levels of incoherence and increased their levels of coherence. By practicing these techniques on a regular basis, it is believed that a person can create new, positive pathways in her mind, and she can train her heart to adjust its rhythm (Childre & Rozman, 2005). Reducing stress, then, can be through a changing of emotion and an act of the mind.

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