


A COMPARATIVE STUDY OF THE EFFECTIVENESS OF THE
RELAXATION RESPONSE AND PERSONALIZED RELAXATION
TAPES IN MEDICAL TECHNOLOGY STUDENTS

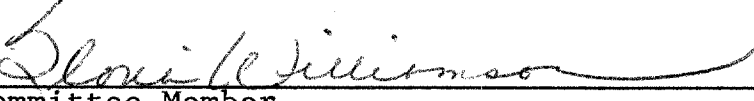
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DISSERTATION

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By

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This investigation was a development of a Personalized Relaxation Technique which was used in a comparative study of the effectiveness of this technique with the Relaxation Response, a popular relaxation method. The purposes of the study were (1) to design a Personalized Relaxation Technique and (2) to determine if this Personalized Relaxation Technique is as effective as the Relaxation Response.

Ninety-three medical technology students at Northeast Louisiana University volunteered to take part in the study. These subjects were randomly assigned to three groups, two treatment groups and a control group. The treatment groups included a group trained in the Relaxation Response and a group trained in the use of the Personalized Relaxation Tape Technique. The dependent variables for this study were systolic and diastolic blood pressure, heart rate, and subscales on the State-Trait Anxiety Inventory. Pretest and posttest measures were taken on the dependent variables. The posttest measures were obtained during the students' final exam in a medical technology course. Eight research

questions and two hypotheses were investigated in this study. The statistical methods used to evaluate the data for the hypotheses were the multivariate analysis of covariance (MANCOVA), and the univariate analysis of covariance.

From analysis of the data, no significant difference was found in the three groups. Therefore, the two hypotheses were rejected. The conclusions of the study were (1) discrepancies exist in the literature concerning various relaxation techniques, (2) individual differences may be responsible for these discrepancies, and (3) fine tuning is needed between the theoretical concepts of a study on a relaxation technique and the research measures used to explore these concepts.

It is recommended that the present study be replicated after modification of the Personalized Relaxation Tape Technique, especially the stress questionnaire and the narration of the tapes. A second recommendation is that of re-analyzing the data of previous studies on relaxation techniques finding significant differences using more appropriate statistical tests if the original researcher had not done so initially.

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CHAPTER I

INTRODUCTION

Prior to the 1930s, the major health concerns of mankind involved infectious diseases such as smallpox, polio, and the plague. With the advent of antibiotics and other chemotherapeutic agents, these causes of sickness and death have largely been controlled, in some cases even eradicated. Today, we are faced with different types of health problems for which there are no ready cures. The major health problems of the mid- and late twentieth century are the so called chronic illnesses. Heart disease, cancer, diabetes, and emotional problems are included in this category.

Stress has been implicated with various chronic illnesses. The early work of Hans Selye (19) and Kenneth Pelletier (14) lends support to the idea that prolonged stress can make the human body vulnerable to physiologic and emotional breakdown. Such breakdown has been postulated as the initial starting point of certain health disorders. According to Selye (20, p. 28), the human body has just so much adaptation energy. This adaptation energy is used up as the individual attempts to deal with every day stresses and strains. Once this adaptation energy is used up the

body's defenses can no longer fight off the various disease agents. As a result, disease or death ensues. Selye (20) recommends that each individual learn to utilize this energy reserve judiciously and learn to deal with the stresses of life in a constructive rather than destructive manner.

Stress can be caused by many different factors. These factors can usually be categorized as internal or personality factors and external or environmental factors. Schuler (18) found that many individuals exhibit the effects of stress when exposed to certain environmental situations. Such things as time pressure and deadlines, rapid change, and much responsibility, as well as others, are common sources of pressure. However, the effects of this stress often depends on the individual's own personality.

Friedman and Roseman (7) studied the effects of stress on different personality types. From their research, they isolated two main personality types, Type A and Type B personalities. Type A individuals are affected more by stressful situations, while Type B individuals have very little, if any, health problems due to stress. Although certain stressful situations may be deleterious for the Type A individual, the same situation may have little or no harmful results for the Type B individual. Some actually thrive in such environments.

The environment that often exhibits the most stress is in the workplace. Several investigators have studied various occupations and the stress level of each (3, 7, 16). Air traffic controllers (4), critical care nurses (22), and medical technologists (9) are only three of the most stressful occupations. The stress level of these professions often stems from the reasons previously mentioned, time pressure, much responsibility, and rapid change.

Several recent studies have focused on stress in the clinical laboratory. The field of laboratory science often involves life and death situations and the demand for accurate and precise work. Many such instances also involve the element of time pressure. Such conditions often lead to health problems or job dissatisfaction in the laboratory scientist (12, 15). Colligan et al. (3), in a 1977 study investigated 130 major occupations for the incidence of stress in each. These occupations were rank ordered according to the number of admissions to mental health centers by members of the occupation. Of these 130 occupations, clinical laboratory technologists ranked seventh according to the amount of stress.

Rogers (15) surveyed 58 medical technologists to determine job satisfaction and stress level. In this group, 29 (48%) technologists were dissatisfied with their jobs due to the stress level. In another study, Matteson and

Ivancevich (12) surveyed 682 medical technologists regarding stress on the job and health problems. High-stress respondents were found to have increased likelihood of health problems in a six month period following reporting of their stress levels.

Presently, there are many programs, exercises and methods being advocated as stress controls. Unfortunately, there is much misinformation in this area of health maintenance. Research is currently being conducted on various stress relieving techniques to determine their efficacy and longevity. Exercise, yoga, hypnotism, progressive relaxation, meditation and relaxation tapes are popular methods of stress control.

Today, there is growing popularity with Herbert Benson's Relaxation Response, a modification of transcendental meditation, as well as a number of other stress relieving techniques. However, no relaxation method has proved effective for every individual. Each individual has a unique personality, biological characteristics and ways of adapting to change in his or her life. A study examining a more personalized relaxation technique would be beneficial for those individuals who fail to respond to the previously mentioned stress reduction methods. A relaxation method geared for individual differences would seem to be more effective than one aimed at a general

population. Preparing a person to meet the daily stresses and strains of life would help that person live a more enjoyable and extended life.

The present study involves the effects of two different relaxation techniques in medical technology students during a stressful event. Hopefully, knowledge gained from this study will aid these future medical technologists, as well as other individuals, in dealing with their stressful environments.

Statement of the Problem

The problem of this study concerned the development of a personalized relaxation technique followed by a comparative study of the effectiveness of this technique with the Relaxation Response, a current popular relaxation method.

Purposes of the Study

The purposes of this study were

1. To design a personalized relaxation technique geared for the individual's unique personality and situation;
2. To determine if this personalized relaxation technique is as effective as the popular technique advocated by Herbert Benson, the Relaxation Response.

Research Questions

In order to achieve the first purpose mentioned above, answers to the following research questions were asked subjects in this study.

1. What are the perceived most common sources of stress?
2. What are the perceived most common physiological responses experienced to these stresses?
3. What are the perceived most common psychological responses experienced to these stresses?
4. What are the usual ways in which the subjects deal with a stressful reaction?
5. What are the most common medical problems resulting from stress in these subjects?
6. Is there a change in the diastolic and systolic blood pressure and pulse rate during a stressful event of the subjects?
7. How do various relaxation techniques affect changes in blood pressure and pulse rate of the subjects?
8. What is the state and trait anxiety level of the subjects before and after relaxation training as determined by the State-Trait Anxiety Inventory?

Hypotheses

To carry out the second purpose of the study the following hypotheses were tested.

1. The Personalized Relaxation group will have a greater decrease in blood pressure, pulse rate, and psychological anxiety levels than the Relaxation Response group.

2. The Personalized Relaxation group will have a greater decrease in blood pressure, pulse rate, and psychological anxiety levels than the control group.

Background and Significance of the Study

This research study emanated from the recognition that stress is an ever present and potentially harmful component of human life and as of present no one method has been found to successfully combat this hazard in all individuals. Research on relaxation techniques has often had conflicting findings (2, 10, 17). It is hoped that this study will shed light on ways to combat stress by taking into consideration individual differences.

The subjects utilized in this research study were medical technology students. The field of laboratory science has stress components that are inherent in the job: time pressure, responsibility, and rapid change (21). The use of such students, who will soon enter a profession which research studies have shown to be highly stressful, makes this study even more significant. Hopefully, knowledge gained from this study will aid these individuals in coping with a very important, yet stressful, profession.

The study focused upon the individual stress response patterns of the subjects and determined to what extent a personalized stress management program helped ameliorate this response during a stressful event. Several studies suggest that stress is a multifaceted subject including the individual's personality (7), type of occupation (3), life events (11), as well as others. How one handles stress is, according to Selye (20), often the determining factor of whether the stress response is good (eustress), or bad (distress).

We have learned that there is a stereotyped physical pattern of the body's response to stress of any cause. The outcome of our interactions with the environment depends as much upon our reactions to the stressor as upon the nature of the stressor itself. We must choose carefully between efforts to resist the challenge or to disregard it by merely submitting to it (20, p. 66).

Relaxation is one approach of coping with stress. Various methods of achieving relaxation will be related in the Review of Related Literature chapter. The findings in many of these studies are encouraging but often conflict with other studies. A lack of attention to individual differences is quite obvious in the literature and, therefore, is one area which seems to need additional research. Benson et al. state

Furthermore, practicing a relaxation technique during these breaks is associated with greater improvements than sitting quietly without using special relaxation techniques. Additional studies are needed to investigate alternative practice patterns, alternative

indices of change, and predictability of individual change (2, pp. 946-952).

This study is significant in that it

(1) Determined the individual stress response patterns of the subjects,

(2) Used these stress response patterns to develop an individualized stress management program for the subjects,

(3) Tested the efficacy of this program in the reduction of various stress parameters.

Definition of Terms

The following terms are defined for use in this study.

1. Stress is defined by Girdano as follows:

. . . a term used mostly in physics to mean strain, pressure, or force on a system. When used in relation to the body cells, it describes the effects of the body reacting, that is, the buildup of pressure, the strain of muscle tensing. . . . stress is taken to mean a fairly predictable arousal of psychophysiological (mind-body) systems which if prolonged can fatigue or damage the system to the point of malfunction and disease (5, p. 5).

2. Stressor, according to Swogger, is "any stimulus, internal or external, which activates our psychological and physiological coping mechanism" (23, p. 29).

3. Anxiety is defined as a psychological condition originating from emotional stress. There are two components of anxiety, state and trait anxiety. Anxiety can be exhibited in such emotional symptoms as fear, dread, or

an uneasy feeling. Physical signs of anxiety may take the form of sweating, trembling, and increased heart rate.

4. Tension is the physical symptoms of stress. This frequently takes the form of feeling "uptight," jittery, headache, and muscle tightness.

5. Stress management techniques are those used to decrease stress reactions or the physical and emotional responses to such events.

6. Relaxation response is the relaxation method advocated by Herbert Benson. It is a modification of transcendental meditation and consists of essentially the following steps:

- (1) Sit quietly in a comfortable position.
- (2) Close your eyes.
- (3) Deeply relax all your muscles, beginning at your feet and progressing up to your face. Keep them relaxed.
- (4) Breathe through your nose. Become aware of your breathing. As you breathe out, say the word, "ONE," silently to yourself. For example, breathe IN . . . OUT, "ONE," IN . . . OUT, "ONE;" etc. Breathe easily and naturally.
- (5) Continue for 10 to 20 minutes. You may open your eyes to check the time, but do not use an alarm. When you finish, sit quietly for several minutes, at first with your eyes closed and later with your eyes opened. Do not stand up for a few minutes.
- (6) Do not worry about whether or not you are successful in achieving a deep level of relaxation. Maintain a passive attitude and permit relaxation to occur at its own pace. When distracting thoughts occur, try to ignore them by not dwelling upon them and return to repeating "ONE." With practice, the response should come with little effort. Practice the technique once or twice daily, but not within two hours after a meal, since the digestive processes seem to interfere

with the elicitation of the Relaxation Response (1, p. 27).

7. Meditation is a catchall term for a variety of relaxation techniques in which the individual attempts to clear his or her mind by concentrating on a mantra or some other sound or object. Meditation is often associated with Eastern religious practices and often associated with altered states of consciousness (6).

8. Progressive muscle relaxation is a relaxation technique devised by Edmund Jacobson, M.D. In this method the individual learns to identify the muscle tension caused by tension and stress by alternately tensing and relaxing various muscle groups (6).

9. Type A personality is a personality type which has been linked with hypertension and heart disease. Individuals who display a Type A personality often are overly ambitious, competitive, striving and dominated by a self-stimulated sense of time-urgency (7).

10. Type B personality is a personality type which is less at risk of heart disease than the Type A personality type. These individuals are less competitive and ambitious than the Type A and lack the sense of time urgency of the former (7).

11. Transcendental meditation (TM) is a relaxation technique popularized by Maharishi Mahesh Yogi. The TM participant uses a mantra to gain the relaxed state. It

is recommended that the meditators meditate twice daily for 20 minutes (6).

12. Blood pressure is the force exerted by the blood on the walls of the blood vessels.

13. Diastolic blood pressure is the lowest phase of the blood pressure. This pressure is measured when the heart relaxes.

14. Systolic blood pressure is the highest phase of the blood pressure. This pressure is measured when the heart contracts.

15. Pulse rate refers to the rate of the heart beat per minute as measured in a peripheral artery. The pulse rate is measured from heart beat to heart beat or heart relaxation to heart relaxation.

16. State anxiety is anxiety associated with given situations that are perceived as threatening and is relatively transitory (17).

17. Trait anxiety, according to Sachs, is ". . . a stable, relatively permanent, long range disposition that reflects anxiety proneness" (17, p. 44).

18. Autogenics is a relaxation technique using auto-suggestion. The technique employs a series of phrases that the individual repeats to himself/herself. These phrases may be similar to "my muscles are very relaxed" or "my white blood cells are devouring the cancer cells."

The phrases are used to reduce stimulation or to redirect the person's attention (6).

19. Cognitive modification is a stress reduction method which involves a change of interpretation of various stimuli. According to LaGrand,

Many people consistently expect the worse to happen, dwell on weaknesses and past mistakes rather than strengths, and in the process become prime candidates for tension syndrome. These thought patterns are both self-defeating and capable of being reversed. Although certain situations, feelings, and emotions can increase stress levels, what we tell ourselves about a situation is the major stressor. It follows that we can reverse thinking patterns that create stress by substituting more realistic images and beliefs. Our interpretation of stressors is learned and can be relearned to reduce the intensity of stress (13, p. 66).

Limitations

One limitation of this study is that the students who completed the State-Trait Anxiety Inventory reported only that which they desired to report. The completeness and correctness of their responses rested primarily with the individual subjects. This study, therefore, will be subject to all the limitations recognized in self-reported instruments.

A second limitation concerns the Type A personality type. Since this personality type tends to have greater emotional reactions to various stimuli, the biometric and psychometric variables used in this study might also be expected to be higher for this type of individual.

Basic Assumptions

It was assumed that the responses recorded on the State-Trait Anxiety Inventory reflected the true feelings and actions of the individual subjects. Furthermore, it was assumed that the daily log of relaxation exercise reflected the true frequency and duration of such experiences.

CHAPTER BIBLIOGRAPHY

1. Benson, Herbert, The Relaxation Response, New York, Avon Publishers, 1975.
2. Benson, Herbert, Ruanne K. Peters, and Douglas Porter, "Daily Relaxation Response Breaks in a Working Population: Effects of Self-Reported Measures of Health, Performance and Wellbeing," American Journal of Public Health, 67 (October, 1977), 946-952.
3. Colligan, Michael J., Joseph Hurrell, and Michael J. Smith, "Occupational Incidence Rates of Mental Health Disorders," Journal of Human Stress, 3 (September, 1977), 34-39.
4. Dougherty, John D., "Cardiovascular Findings in Air Traffic Controllers," Aerospace Medicine, 38 (January, 1967), 26-30.
5. Everly, George, and Daniel Girdano, Controlling Stress and Tension, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1979.
6. Frederick, A. B., Relaxation: Education's Fourth "R," Washington, ERIC Clearinghouse on Teacher Education Publishers, 1979.
7. Friedman, Meyer, and Ray H. Roseman, Type A Behavior and Your Heart, Greenwich, Connecticut, Fawcett Crest Book, 1974.
8. Gardner, M. J., Aubrey Kagan, J. N. Morris, D. C., Pattison, and P. A. B. Raffle, "Incidence and Prediction of Ischaemic Heart Disease in London Busmen," Lancet, 2 (September, 1966), 553-559.
9. Griffin, Patricia, and Carol Klun, "Laboratory Stress: What Causes It?," Journal of Medical Technology, 46 (July, 1980), 490-494.
10. Holmes, David S., "Meditation and Somatic Arousal Reduction," American Psychologist, 39 (January, 1984), 1-10.

11. Holmes, Thomas, and Richard H. Rahe, "The Social Readjustment Rating Scale," Journal of Psychosomatic Research, 11 (April, 1967), 213-218.
12. Invancevich, John M., and Michael T. Matteson, "Stress and the Medical Technologist: I. A General Overview," American Journal of Medical Technology, 48 (March, 1982), 163-168.
13. LaGrand, Louis E., "Reducing Burnout in the Hospice and the Death Education Movement," Death Education, 4 (Spring, 1980), 61-75.
14. Pelletier, Kenneth, Mind as Healer/Mind as Slayer, New York, Delta Books, 1977.
15. Rogers, Donna Ann, "Stress and Job Satisfaction of Clinical Laboratory Scientists," American Journal of Medical Technology, 49 (March, 1983), 183-188.
16. Russek, H. I., "Stress, Tobacco, and Coronary Heart Disease in North American Professional Groups," J.A.M.A., 192 (April, 1965), 189-194.
17. Sachs, Michael, "Running Therapy: Change Agent in Anxiety and Stress Management," Journal of Physical Education, Recreation, and Dance, 153 (October, 1982), 44-45.
18. Schuler, Randall S., "Stress Management for College Administrators," Educational Record, 62 (Summer, 1981), 14-18.
19. Selye, Hans, The Stress of Life, New York, McGraw Hill Book Company, 1978.
20. _____, Stress Without Distress, New York, Signet Books, 1974.
21. Shulruff, Faith, "Getting at the Roots of Laboratory Stress," Medical Laboratory Observer, 15 (April, 1983), 115-122.
22. Stillman, Stephen M., and Betsi L. Strasser, "Helping Critical Care Nurses with Work-Related Stress," The Journal of Nursing Administration, 10 (January, 1980), 28-31.
23. Swogger, Glenn, "Toward Understanding Stress: A Map of the Territory," The Journal of School Health, 51 (January, 1981), 29.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The field of stress management is a very broad and complex field. Indeed, volumes have been written on stress management techniques. Although the main focus of this study is on stress management, it seems pertinent to include a review of various other studies and concepts in the stress field. This is done primarily to place stress management in the proper perspective, to provide valuable background information and rationale for various stress management techniques. Therefore, this literature review will include the following topics: The Stress Response, Major Causes of Stress, Personality Types, Stressful Occupations, Health Effects of Stress, and Methods of Stress Management.

The Stress Response

The term stress is familiar to most people. We constantly see this word in popular magazines, health and medical oriented journals, and in numerous paperback books. Today, the concept of stress is being recognized as one of the major factors in health and disease. According to Schwartz,

Over half of all illness can be traced to stress. Heart disease, high blood pressure, colitis, asthma, sleep disorders, kidney disease, peptic ulcers, rheumatoid arthritis, obesity, anxiety, depression--even cancer--are some of the more common stress linked illnesses. The evidence is startling (45, p. 16).

However, until a relatively few years ago this term and the meaning behind it was almost unknown. Although the stress concept has just recently gained prominence in the news, research in this area has been going on for several decades.

The major work on the stress response is credited to Has Selye. As a medical student at the University of Prague in 1925, Selye began noticing a commonality of certain symptoms in illnesses of all types. This non-specific reaction of the body to various diseases was the focus of much of his later work on stress (46).

In his research, Selye subjected laboratory animals to numerous stress provoking stimuli. Whether the test animals were exposed to extreme temperature, restrained, or injected with chemical irritants, the physiological response of the animals were the same. In each case, upon autopsy he found enlargement of the adrenal glands, atrophy or shrinkage of the spleen, thymus, and lymph nodes, disappearance of a specific kind of white blood cell, and the development of bleeding ulcers in the lining of the stomach (46, pp. 21-25). In other words, the response of the laboratory animals to the stress was "nonspecific."

This nonspecific response to stressful stimuli led Selye to formulate a theory on the stress response in animals which he called the General Adaptation Syndrome (G.A.S.).

According to the General Adaptation Syndrome concept, the physiological response of the body to any stressful stimuli is always the same. This response is characterized by three major stages: the alarm stage, the resistance stage, and the exhaustion stage (46, p. 38).

The alarm stage begins when a stressor excites the hypothalamus to release corticotropin releasing factor (CRF) which stimulates the pituitary gland to discharge adreno-corticotropic hormone (ACTH) and thyrotropic hormone (TTH) (8). ACTH stimulates the cortical portion of the adrenal glands to secrete corticoids, and TTH stimulates the thyroid gland to secrete thyroxin. Thyroxin causes an increase in the metabolic rate of the individual. In addition, the adrenal medulla is stimulated by the splanchnic nerve to secrete adrenalin (epinephrine) and noradrenalin (norepinephrine). The combined effects of this nervous and hormonal stimulation has been named the "fight-or-flight response:" the blood pressure increases, the heart rate speeds up, muscle tone increases, the temperature and chemical content of the skin changes, respiratory rate increases, changes occur in the brain waves with an increase in mental alertness, and the digestive system is inactivated. All of these changes are geared to help the individual eliminate

the stressor and regain physiological and psychological equilibrium (17, 22, 46).

In the resistance phase, the level of ACTH decreases. The stress response is channeled into the specific organ system most capable of dealing with the stressor. In this stage, the subject is best prepared to react to the stressful stimuli. The body also attempts to compensate for the physiological changes that occurred in the first stage (17, 22, 46).

The exhaustion stage is reached if the stressful event continues and the body is unable to regain homeostasis in the resistance stage. The body's resources are used up and the body begins to malfunction or die. As the body responds to one source of stress, it depletes its source of available adaptive energy and is thus less able to respond to an additional stressful event. This has led many researchers to believe that chronic illnesses often follow an episode of emotional stress or some other stress (17, 22, 46).

Selye (47), in his research, concluded that the body is endowed with just so much adaptive energy from birth and that this store of energy cannot be replenished, even with rest. Once the total store of energy is used up the body falls prey to any one of many diseases. Since it is impossible to avoid all the stressors in one's life, Selye recommends that we learn to be aware of those stressors that we are exposed to and eliminate those we can, and

learn to react differently to those which we cannot (47).

Selye says,

We have seen that the stress of frustration is particularly harmful. Man, with his highly developed central nervous system, is especially vulnerable to psychic insults, and there are various little tricks to minimize these. Here are a few that I have found useful:

Even if you systematically want to hoard love, don't waste your time trying to befriend a mad dog.

Admit that there is no perfection, but in each category of achievement something is tops; be satisfied to strive for that.

Do not underestimate the delight of real simplicity in your life style. Avoidance of all affectations and unnecessary complications earns as much goodwill and love as pompous artificiality earns dislike.

Whatever situation you meet in life, consider first whether it is really worth fighting for. Do not forget what Nature has taught us about the importance of carefully adjusting syntoxic and cata-toxic attitudes to any problems of a cell, a man, or even a society.

Try to keep your mind constantly on the pleasant aspects of life and on actions which can improve your situation. Try to forget everything that is irrevocably ugly or painful. This is perhaps the most efficient way of minimizing stress by what I have called voluntary mental diversion. As a wise German proverb says, "Imitate the sundial's ways;/Count only the pleasant days (47, p. 141).

Causes of Stress

Stressors, or the causes of the stress reaction, are many. However, most authorities separate the causes into two main classes: (1) external (environmental) and (2) internal (personality) (17, 47). Schuler recognizes the following causes of stress that are common to many individuals:

- (1) the pressure of time and deadlines
- (2) experiencing rapid and multiple changes
- (3) never having enough time to accomplish everything
- (4) fear of failure
- (5) being unsure about career and life directions
- (6) working in a role whose responsibilities are ambiguous or viewed differently by different people in authority and
- (7) disliking a job or finding it unfulfilling but not knowing what to do about it (44, p. 14).

One of the best suited causes of stress is the effects of rapid and multiple change. Holmes and Rahe developed the following scale based on the amount of change required in different life situations.

The Social Readjustment Rating Scale

Life Events	Point Values
Death of spouse	100
Divorce	73
Marital separation	65
Jail term	63
Death of close family member	63
Personal injury or illness	53
Marriage	50
Fired from work	47
Marital reconciliation	45
Retirement	45
Change in family member's health	44
Pregnancy	40
Sex difficulties	39
Addition to family	39
Business readjustment	39
Change in financial status	38
Death of close friend	37
Change to different line of work	36
Change in number of marital arguments	35
Mortgage or loan over \$10,000	31
Foreclosure of mortgage or loan	30
Change in work responsibilities	29
Son or daughter leaving home	29
Trouble with in-laws	29
Outstanding personal achievement	28
Spouse begins or stops work	26
Starting or finishing school	26

Life Events	Point Values
Change in living conditions	25
Revision of personal habits	24
Trouble with boss	23
Change in work hours, conditions	20
Change in residence	20
Change in schools	20
Change in recreational habits	19
Change in church activities	19
Change in social activities	18
Mortgage or loan under \$10,000	17
Change in sleeping habits	16
Change in number of family gatherings	15
Change in eating habits	15
Vacation	13
Christmas season	12
Minor violations of the law	11

(28, p. 216)

In the scale, each event was assigned a number according to the amount of stress it was found to have on different individuals. These researchers found that 80 per cent of persons whose scores were more than 300, when the changes in their lives were given numerical ratings according to the above scale, suffered a serious illness within two years. Of those individuals having scores between 250 and 300, 53 per cent had similar illnesses, while only 33 per cent of those with scores between 150 and 200 had serious illnesses. The results of this scale help show that unusual stress due to life changes can be a great risk to one's health (27, 35).

While many of the above sources of stress listed by Schuler may be eliminated by a change of lifestyle, many are a result of an individual's personality type and are not so readily changed.

Personality Type and Stress

Closely associated with the stress response is personality types. Through observation and research it has been found that an individual's response to stress--rather than the stressful event itself--is what causes the damage, both physiological and psychological (38). According to these findings, two individuals can be exposed to the same stressful stimuli with different resultant bodily effects. One individual may suffer the ill effects of the stress, while the other person experiences no ill effects at all. In some cases, some individuals flourish from the stress that causes others physiological harm (47).

In the 1960s and early 1970s two physicians, Meyer Friedman and Ray Rosenman, began studying the relationship between personality types and disease. In their research, they isolated two main personality types, which they arbitrarily called Type A and Type B (19). The Type A person has a higher incidence of heart disease and other chronic illnesses. They are typically very ambitious, competitive, impatient, time pressured, and feel a vague sense of guilt during relaxation. These individuals often exhibit physical signs such as nervous tics, muscle tightness, increased blood pressure and heart rates during stressful activities (12, 19).

Speed is another characteristic of the Type A person. The typical Type A strives to achieve more things in less

time than ordinary individuals. A traffic jam, waiting lines, or even relaxation may be viewed as a "waste of time." These individuals, not infrequently, try to perform several tasks at the same time (19, 35).

The Type B person, however, does not feel the time pressure of the Type A. Instead of being time pressured, and competitive, these individuals may even withdraw from the situation. Speed of performance is of less importance to this group. Pittner and Houston (29), in their study on Type A and Type B subjects, found that the Type A subjects had higher pulse rates and greater systolic and diastolic blood pressures in response to threat to self esteem than did the Type B individuals. Since increased blood pressure has been implicated as a risk factor in arteriosclerosis and heart disease, these findings help explain the greater incidence of heart disease in Type A individuals (12). In fact, Friedman and Rosenman reported that Type A individuals have more than twice the heart disease, five times more second heart attacks, and twice the number of fatal heart attacks as Type B individuals (14, p. 825; 19).

Occupational Stress

Another major area of stress research has aimed at occupational stress. Different occupations present different rewards, challenges, and disappointments. Various studies have attempted to pinpoint those occupations that

present unusually high levels of stress to its employees. Colligan et al. (13) rated 130 occupations according to stress level as determined by the number of admissions of employees to a medical center. This study, conducted in Tennessee, by the National Institute for Occupational Safety and Health (NIOSH), involved the examination of medical records from 22 mental health centers. The frequency of admissions of individuals employed in major occupational categories was recorded and the occupations rank-ordered according to the frequency of the mental health center admissions.

In another study by Russek (43), it was found that emotional strain associated with job responsibility preceded heart attacks in 91 per cent of a group of heart attack victims. In a normal control group only 20 per cent reported similar strain on the job.

In a 1966 study, Morris et al. (20) studied the effects of job responsibility and the occurrence of health problems. This study compared London bus drivers and conductors. During this five year study it was found that the bus drivers, who had more responsibility for the welfare of their passengers than did the conductors, had a significantly higher incidence of heart disease as well as higher blood-lipid level than did the conductors.

From these and other studies, the occupations found to be highly stressful tended to have several common

denominators. A lack of control over one's position, a high degree of time pressure, demand for accuracy, responsibility for the lives or livelihood of other human beings, much responsibility but limited amount of authority, and boredom are common traits of the more highly stressful occupations (11, 23, 36). Numerous studies on air traffic controllers, nurses in critical care areas, medical technologists, managerial positions, tax accountants, and public school teachers tend to support the findings of Colligan (10, 23, 49, 51). Individuals in these occupations exhibit an above average turnover rate, burnout, and health related problems (17, 19).

Health Effects of Stress

The effects of stress on health is the focus of much research. The most commonly recognized detrimental results of stress are peptic ulcers, heart disease, hypertension, muscle tension, backaches, cancer, as well as other chronic illnesses (12). Heart disease alone accounts for the leading cause of death and morbidity in the United States today. According to Trevor Hancock,

Heart disease is the major health problem of the era. In the United States, 1,250,000 people suffered heart attacks in 1977, and 700,000 died of heart disease. In addition, heart disease is the greatest single cause of permanent disability in those aged 65 and over, and the greatest cause of hospitalization (25, p. 8).

Although the precise mechanism underlying many of these

conditions are unknown at the present time, much progress is being made in the areas of coronary heart disease and chronic diseases with an underlying immune system breakdown. Coronary heart disease (CHD), according to various authorities, is the result of a complex interaction of several factors which include diet, smoking, obesity, heredity, sedentary lifestyle, and the result of the stress response (12, 19).

The stress component of CHD appears to be the result of the chronic elicitation of the "fight or flight" mechanism. This system, which was necessary to our ancient ancestors in coping with physical assaults and environmental situations, is still present in modern man. However, unlike our ancestors who either fled or dealt with the situation and regained rapid equilibrium of the body's adaptation system, modern man is often unable to do so. Instead of venting his/her physical and emotional anger at a potential threat, human beings today must contain their physical and emotional feelings. As a result the G.A.S. has its main detrimental effect on the individual's own body, and it tends to remain activated longer when the situation is not quickly resolved. This chronic daily rise in blood pressure, heart rate, hormone level, and metabolic rate all tend to enhance the development of hypertension and heart disease (4, 17).

Research into the role of the stress response in chronic and infectious disease has recently focused on the immune system. Disorders of the immune system can make the body vulnerable to not only infectious diseases, but also chronic diseases such as cancer, and autoimmune diseases, in which antibodies turn against themselves (24). The role of one particular white blood cell, the lymphocyte, in chronic illness is currently under study. Locke, in a research study at Boston University, found that persons who cope poorly with stress appear to suffer defects in cell mediated immunity against certain diseases. On the other hand, those individuals who deal effectively with stress displayed comparatively active "Natural Killer Cell Activity" (NKCA) when the body was exposed to disease processes (50).

Riley and Keller et al. (33, 42), in separate studies, found that stressed laboratory mice developed decreased immunocompetence and increased number of tumor development. In Riley's study (42), stress was found to increase the corticosterone level in the blood plasma which resulted in (1) lymphocytopenia, or decrease circulating lymphocytes, (2) thymus involution, and (3) related loss of tissue mass of the spleen and peripheral lymph nodes. These findings seem to confirm Selye's earlier studies on the stress effects in laboratory animals (46). Since these structures are main components of the immune system, Riley concluded,

Anxiety, as well as other emotional or psychosocial stresses in experimental animals, produces a series of well-known neuroendocrine and biochemical events. At least one of these biochemical responses to stress has an easily demonstratable destructive effect on specific cells and tissues that are required for optimum immunological defense as a consequence, the stress compromised animal is less capable of defending itself against cancer cells, infectious agents, and other disease processes that are normally responsive to cell-mediated immunity (42, p. 1101).

In another study, headed by R. W. Bathop (34) of the University of New South Wales in Sydney, Australia, the effects of stress on a battery of immune parameters and various hormones were measured. The subjects included twenty-six persons whose spouses had recently died. Measurements were taken two weeks and eight weeks after the death of the spouses. The study found that at eight weeks, but not at two weeks, T cell lymphocyte response to proteins that normally promote lymphocyte proliferation were lower in the bereaved spouses than in normal controls.

While the precise mechanisms underlying many of these results of stress have not been elucidated, evidence is mounting that stress has a detrimental effect on human health. Presently, research is being conducted to attempt to develop a means by which the stress response can be controlled (8), however, the main focus of therapeutic stress research appears to be in the area of prevention. Relaxation techniques are part of stress prevention.

Relaxation Methods

Many stress reduction techniques have been advocated for decreasing the detrimental effects of stress. The more common methods include cognitive modification, physical exercise, environmental engineering (stimulus control), and a host of relaxation techniques. This latter category includes such methods as Benson's Relaxation Response, Jacobson's Progressive Relaxation, yoga exercise, autogenic training, biofeedback training, countdown, transcendental meditation (TM), music, and relaxation tapes (33).

Cognitive modification utilizes a change in interpretation of various stimuli to reduce the stress reaction. The way one perceives another person, place, or object is ultimately the basis for their own increase or decrease in stress response. According to LaGrand,

Although certain situations, feelings, and emotions can increase stress levels, what we tell ourselves about a situation is the major stressor. It follows that we can reverse thinking patterns that create stress by substituting more realistic images and beliefs. . . . This presupposes an awareness of causes of stress and images that can intervene in the usual stress response. Our interpretation of stressors is learned and can be relearned to reduce the intensity of stress (33, p. 67).

Physical activity is another popular method for stress reduction. Such activities as walking, swimming, jogging, as well as others help provide a release for pent-up energy (33). Exercise is a natural tranquilizer for the mind and body; however, the benefits of exercise in stress

managements are related to the frequency, duration, and intensity of the exercise. The American Heart Association recommends a minimum of three workouts of twenty minutes duration per week (33). DeVries' (15) research suggests that the best exercise for relaxation involves intensity such that the heart rate is maintained at 30 to 60 per cent of maximum heart rate, and durations of five to thirty minutes. Zentner (52) found that regular moderate running can result in a decrease in tension, depression, anger, fatigue, confusion, and an increase in vigor. In a similar study, Reiter (40) found that physical exercise resulted in similar results in women over the age of sixty-five. There were significant changes in mood, reduction of state anxiety and improvement of feelings of well-being following the exercise program. The experimental group felt more relaxed, less tense and anxious. Selye (46) concurs that physical activity helps the body mediate the effects of stress.

Biofeedback is another popular method of stress control. In this method electronic equipment is used to amplify autonomic signals of the body (i.e., heart rate, muscular tension, blood pressure). These signals can be either a flashing light, a tone, or the movement of a needle. Biofeedback works on the principle that if an individual becomes aware of his/her physiological responses to stress they can learn to control it (18).

Studies by Prager-Decker (37), Reed and Saslow (39), and Holmes et al. (9), investigated the claim that biofeedback is an effective means to decrease the physiological response to stressful stimuli. Reed et al. and Holmes et al. research data did not support the above claim that biofeedback is an effective means by which to reduce stress. However, Prager-Decker did find significant stress reduction with biofeedback. In her study, eighty-one college aged males were randomly assigned to one of four relaxation groups. These groups included music relaxation, modified version of progressive muscle relaxation (PMR), electromyograph biofeedback (EMG) and a combination group trained in EMG facilitated PMR. The groups were shown a ninety-two second stressor film to cause arousal. After testing to determine the effects of the stressful stimuli it was found that the greatest reduction in EMG levels existed among those subjects in the biofeedback facilitated PMR and the biofeedback group.

The common technique used in autogenics is for the subjects to tell themselves they are relaxed and calm or to recall times and places in which they felt relaxed or tranquil. According to Williams et al., "Autogenic therapy includes a set of prescribed standardized exercises that promote relaxation of the mind and body. The exercises involve the repetition of self-statements which emphasize heaviness and warmth of the limbs" (35, p. 119).

Worthington and Shumate (48) found that women who use imagery can better control pain than women who did not use imagery. Kamholtz (31) tested the effects of a stress reduction program on various stress variables. The subjects who practiced autogenic training showed statistically significant improvement on the Relaxation Inventory when compared to subjects who practiced meditation, biofeedback, or progressive relaxation.

Several stress management programs often utilize a combination of relaxation techniques (1, 2, 6, 29). Charlesworth et al. (6) found that a stress management program involving progressive relaxation, deep muscle relaxation, autogenic training, visual imagery and modified systemic desensitization resulted in decreased state and trait anxiety when compared with a control group. Allen (1) studied the effectiveness of the stress management course offered at the University of Maryland. This program involved social engineering, cognitive reappraisal, relaxation theory, meditation, Jacobsonian progressive neuromuscular relaxation, calming response, selective awareness techniques and EMG (electromyograph) biofeedback training. Utilizing frontalis EMG (muscular tension across the forehead), pulse rate, pulse amplitude, and skin potential response (activity of the sweat glands during cognitive stress) as biomedical measures and Jenkin's Activity Survey

(a measure of Type A/B behavior), The Rotter Scale (a measure of internal versus external locus of control) and Taylor Manifest Anxiety Scale (a measure of manifest anxiety) as psychometric measures of stress. Allen found that the multiple stress management program had a positive effect in reducing the stress response in his subjects. Limitations of this study included self selection and non random assignment to groups which make the above conclusion less than definite.

The Richardson et al. (2) study focused on a stress management program designed for high school students. The program's physiological management of stress included progressive relaxation, yoga, meditation, imagery, and biofeedback. Heart rate and EMG were utilized to measure the effectiveness of the program. While the EMG findings were not conclusive, the heart rate measurements showed a measurable reduction in the experimental group. According to the researchers,

The results of this study support the conclusion that a stress management unit for high school students results in some measurable effectiveness. Deep breathing, autogenic training, muscle relaxation, and imagery skill practice produced a measurable reduction in heart rates (2, p. 233).

Limitations of this study were also noted by the authors. The major limitation of the study is that the experimental group met after lunch and the control group met before lunch. Difference in activity and ingestion of food in the two groups could make the data questionable.

Kamholtz (31) studied the effectiveness of a stress reduction workshop on undergraduate college students intended to reduce Type A behavior, blood pressure, muscle tension, and increase the practice of relaxation skills. The relaxation techniques of autogenic training, meditation, progressive relaxation and electromyographic (EMG) feedback were utilized in the workshop. Dependent variables of this study included scores on the Jenkins Activity Survey (MJAS), Relaxation Inventory, average readings on the Sphygmostat Electronic Blood Pressure Monitor, and average muscle tension readings on a portable Cyborg J33 EMG machine. Slight improvement was found in the psychometric measurements, however, no significance was found on the biomedical measures. In analyses of subgroup data, the authors found that the subjects who practiced autogenic training were the most successful in reducing their systolic blood pressure as well as muscle tension. The meditation subjects had the most success in modifying their Type A behavior as reflected in their lower MJAS scores, leading to the conclusion that certain types of relaxation training are more effective than others.

Dr. Edmund Jacobson is credited with devising the progressive relaxation technique in 1929. This method combats tension and anxiety by having the participating individuals alternately tense and then relax various muscle

groups in the body. The technique is designed to help give the person discriminatory control over skeletal muscles (41). According to Jacobson (30), anxiety and muscular relaxation produce opposite physiological states, and therefore, cannot exist together. The essence of the technique is that it is physically impossible to be "nervous" in any part of the body, if that part of the body is completely relaxed. This method has been used for a variety of problems including borderline hypertension, headache, insomnia, and anxiety.

There are essentially five main steps in progressive relaxation. The following sequence is frequently used:

- (1) The individual focuses his/her attention on the muscle group.
- (2) The person is instructed to tense the muscle group.
- (3) Tension is maintained for five to seven seconds.
- (4) The muscle group is then relaxed.
- (5) The person's attention is focused upon the muscle group as it relaxes.

The number of muscle groups utilized can vary from as few as four to as many as sixteen (41).

Progressive relaxation has been used in stress management programs to control stress and tension (21). In a study comparing progressive relaxation with Benson's relaxation response technique, Green et al. (3), found that progressive relaxation is the treatment of choice for reducing physiological arousal and the subjective response to stressful stimuli.

The Relaxation Response is a modification of transcendental meditation advocated by Herbert Benson, the author of the Relaxation Response. The main elements of this response include the following:

- (1) a quiet environment
- (2) a passive attitude
- (3) concentration on a mantra
- (4) a time span between ten to twenty minutes once or twice daily and
- (5) comfortable position (4, p. 27).

Herbert Benson claims that the Relaxation Response is a natural mechanism to overcome stress (4).

If the continual need to adjust to new situations can bring on a detrimental fight-or-flight response, and if we live continuously with stressful events which trigger that response, it is natural to question whether we know how to check the dangerous results that inevitably follow. Take this line of reasoning one step further. If the fight-or-flight resides within animals and humans, is there an innate physiologic response that is diametrically different? The answer is Yes. Each of us possesses a natural and innate protective mechanism against "overstress," which allows us to turn off harmful bodily effects, to counter the effects of the fight-or-flight response. This response against "overstress" brings on bodily changes that decrease heart rate, lower metabolism, decrease the rate of breathing, and bring the body back into what is probably a healthier balance. This is the Relaxation Response (4, p. 25).

In an effort to establish the efficacy of the relaxation response, Benson et al. (5) conducted a twelve week experiment with 126 office workers with "normal blood pressure." Volunteers were randomly assigned to one of three groups: Group A was taught the relaxation response; Group B was told to sit quietly; and Group C was a control

group which was taught nothing. The effectiveness of the study was measured by the change in blood pressure from baseline measures to recordings at the end of the twelve weeks. The mean changes in both systolic and diastolic blood pressure were significantly greater in Group A than in Group B ($p < 0.05$) or C ($p < 0.001$). According to Benson et al.,

The present investigation has demonstrated that it is feasible for volunteer office workers to incorporate relaxation breaks into their daily routines, at least for a two month period; and that, if these breaks are used to practice a technique that elicits the relaxation response, blood pressure can be significantly reduced, even if the initial blood pressure is within normal ranges (5, p. 959).

Although meditation type relaxation techniques have received much favorable comment, not all investigators are convinced of their merits. Holmes (26), in an article in the American Psychologist, reviews recent research studies in which meditation was used as a relaxation technique.

In his examination of research involving relaxation techniques which utilized meditation, Holmes found a number of research errors which could invalidate several of the studies. These errors included such things as lack of proper controls, methodological issues, improper subject selection, and faulty analyses of data. In discussing the analyses of data errors, Holmes comments,

The major statistical problem encountered in this body of research revolves around the failure of investigators to control for the influence of initial differences in

arousal between meditating and nonmeditating subjects (i.e., the law of initial values). Initial differences between meditating and nonmeditating subjects can influence subsequent scores directly (e.g., in the absence of any change, subjects with lower initial arousal may appear to have decreased their arousal at subsequent times relative to subjects with higher initial arousal) and can inhibit the degree to which subjects can change their levels of arousal (e.g., ceiling and floor effects). The effects of initial differences are particularly pronounced with physiological measures, and it has been demonstrated that even nonreliable initial differences can create or obscure subsequent reliable differences. Simple difference scores are insufficient for controlling for the effects of initial differences, and therefore covariance or residualization procedures must be employed. Unfortunately, these controls have been used only rarely (26, p. 3).

When considering experiments involving somatic arousal during meditation, Holmes (26) discovered a number of interesting findings:

- (1) In none of the sixteen experiments in which heart rate was monitored did the meditating subjects evidence reliably greater decreases in heart rate than did the resting subjects. In fact, in four of the studies the meditating subjects actually had greater increases in heart rate than did the resting subjects.
- (2) In the thirteen experiments examined in which electrodermal activity was measured, only one provided evidence that meditating subjects achieved greater decreases in arousal than did resting subjects.
- (3) In eight studies in which the changes in respiration rates associated with meditation and rest revealed only one case in which meditating subjects showed a greater decrease in respiration rates than did resting subjects. One study even found the opposite true.
- (4) Of four experiments in which blood pressure was measured, only one demonstrated that meditating

subjects had a decrease in blood pressure when compared with a group of resting subjects.

- (5) EMG, skin temperature, and biochemical variables were also examined with similar results (i.e., no reliable evidence that meditating subjects demonstrated a decrease over resting subjects (26, pp. 3-6).

Finally, Holmes reviewed studies involving meditation and control of somatic arousal in threatening situations. There were four such experiments examined in which heart rate, and electrodermal measures (skin conductance response frequencies, skin conductance) were the common dependent variables. Holmes concluded that, "The results were very consistent: not one of the comparisons yielded evidence that meditation was effective for reducing arousal in threatening situations" (26, p. 8).

Zen meditation and music have also been used to reduce the effects of stress. In a study on the effects of zen meditation, Goldman et al. (16) found no significant difference in anxiety reduction between zen meditators and two control groups.

The results from the present study offer no support for the beneficial effects of zen meditation on measures of anxiety. Anxiety was found to decrease after the meditation period, but no more so than after control conditions.

. . . The results from the present study strengthen these negative findings in that the meditation exercises were monitored in the laboratory and checked through a daily log to ensure that a valid meditation experience was achieved (16, p. 555).

In his study on the effects of music, Blanchard (7) did find that this method resulted in significant stress reduction. Dependent variables in this study were pulse rate, blood pressure and final exam scores. The difference between the mean scores, pulse rates, and blood pressures of the control group and two experimental groups were found to be statistically significant at the 1 per cent level.

Summary

In summary, stress is a multifaceted phenomenon involving both environmental stimuli and personal reaction to the stimuli. Studies have been surveyed that investigated the occupational, personality type, and life change aspects of the stress reaction. The health consequences of distress were also noted. Finally, research studies into various relaxation techniques were reviewed. From this review, we can see that while some of the techniques show promise in stress reduction, several of the studies had conflicting results. One study involving a review of meditation research concluded that much of the research is flawed due to errors of method, analyses or interpretation.

One obvious aspect of most of the studies was a complete lack of attention to individual differences and circumstances. The reaction to stress is a very individual matter; surely the stress management technique should be just as individual.

CHAPTER BIBLIOGRAPHY

1. Allen, Roger, "Controlling Stress and Tension: Bio-medical and Psychometric Evaluation of Programs at the University of Maryland," The Journal of School Health, 51 (May, 1981), 360-364.
2. Beall, B. Sue, George T. Jessup, and Glen E. Richardson, "The Effects of a High School Stress Management Unit on Students' Heart Rate and Muscle Tension," The Journal of School Health, 52 (April, 1982), 229-233.
3. Beiman, Irving, et al., "Progressive and Self-Induced Relaxation Training: Their Relative Effects on Subjective and Autonomic Arousal to Fearful Stimuli," Journal of Clinical Psychology, 37 (April, 1981), 309-315.
4. Benson, Herbert, The Relaxation Response, New York, Avon Publishers, 1975.
5. Benson, Herbert, John Peters, and Ruane K. Peters, "Daily Relaxation Response Breaks in a Working Population: Effects on Blood Pressure," American Journal of Public Health, 67 (October, 1977), 954-959.
6. Beutler, Larry, Edward A. Charlesworth, and Sheila Murphy, "Stress Management Skills for Nursing Students," Journal of Clinical Psychology, 37 (April, 1981), 284-290.
7. Blanchard, B. Everard, "The Effects of Music on Pulse Rate, Blood Pressure and Final Exam Scores of University Students," The Journal of School Health, 49 (October, 1979), 470-471.
8. "Brainswitch for Stress," Science Digest, 90 (July, 1982), 91.
9. Burnish, Thomas, Randy Frost, and David Holmes, "Effects of Instructions and Biofeedback on EEG-Alpha Production and the Effects of EEG-Alpha Biofeedback Training for Controlling Arousal in a Subsequent Stressful Situation," Journal of Research in Personality, 14 (June, 1980), 212-223.

10. Cacha, Frances B., "Teacher Burnout: Causes and Solutions," Kappa Delta Pi Record, 18 (Fall, 1981), 26-27.
11. Caplan, R. D., "Organizational Stress and Individual Strain: A Social-Psychological Study of Risk Factors in Coronary Heart Disease Among Administrators, Engineers, and Scientists," unpublished doctoral dissertation, School of Education, University of Michigan, 1972.
12. Chobanian, Aram, Heart Risk Book, New York, Bantam Books, 1982.
13. Colligan, Michael, Joseph J. Hurrell, and Michael J. Smith, "Occupational Incidence Rates of Mental Health Disorders," Journal of Human Stress, 3 (September, 1977), 34-39.
14. Cunningham, D. A., John H. Howard, and P. A. Rechnitzer, "Work Patterns Associated with Type A Behavior: A Managerial Population," Human Relations, 30 (September, 1977), 825-836.
15. DeVries, H., "Physical Education, Adult Fitness Programs: Does Physical Activity Promote Relaxation?" Journal of Physical Education and Recreation, 46 (February, 1975), 53-54.
16. Domitor, Paul J., Barbara Goldman, and Edward J. Murray, "Effects of Zen Meditation on Anxiety Reduction and Perception Functioning," Journal of Counseling and Clinical Psychology, 47 (June, 1979), 551-556.
17. Everly, George, and Daniel Girdano, Controlling Stress and Tension, Englewood Cliffs, New Jersey, Prentice-Hall, 1979.
18. Feltz, Deborah L., and Daniel M. Landers, "Stress Management Techniques for Sport and Physical Education," Journal of Physical Education and Recreation, 51 (February, 1980), 41-43.
19. Friedman, Meyer, and Ray H. Rosenman, Type A Behavior and Your Heart, Greenwich, Connecticut, A Fawcett Crest Book, 1974.
20. Gardner, M. J., et al., "Incidence and Prediction of Ischaemic Heart Disease in London Busmen," Lancet, 2 (September, 1966), 553-559.

21. Germerath, Stephen, "Stress and Tension Control Lessons as Part of Health Education," Health Education, 8 (May/June, 1977), 20.
22. Greenberg, Jerrold S., "Stress, Relaxation and the Health Educator," The Journal of School Health, 47 (November, 1977), 522-525.
23. Griffin, Patricia, and Carol Klun, "Laboratory Stress: What Causes It?" American Journal of Medical Technology, 46 (July, 1980), 490-494.
24. Hales, Dianne, "Psycho-Immunity," Science Digest, 89 (November, 1981), 12-14.
25. Hancock, Trevor, "Beyond Health Care," The Futurist, 16 (August, 1982), 4-13.
26. Holmes, David S., "Meditation and Somatic Arousal Reduction," American Psychologist, 39 (January, 1984), 1-10.
27. "Holmes Scale," Family Health, 11 (January, 1979), 32.
28. Holmes, Thomas H., and Richard H. Rahe, "The Social Readjustment Rating Scale," Journal of Psychosomatic Research, 11 (April, 1967), 213-218.
29. Houston, Kent B., and Mark S. Pittner, "Response to Stress, Cognitive Coping Strategies, and the Type A Behavior Pattern," Journal of Personality and Social Psychology, 39 (January, 1980), 147-157.
30. Jacobson, Edmund, Progressive Relaxation, Chicago, University of Chicago Press, 1974.
31. Kamholtz, J. Dennis, "The Effects of a Stress Reduction Workshop on Undergraduate College Level Students Possessing Type A Behavior Pattern," Health Education, 13 (November/December, 1982), 42-45.
32. Keller, Steven, et al., "Suppression of Immunity by Stress: Effect of a Graded Series of Stressors on Lymphocyte Stimulation in the Rat," Science, 213 (September, 1981), 1397-1399.
33. LaGrand, Louis E., "Reducing Burnout in the Hospice and the Death Education Movement," Death Education, 4 (Spring, 1980), 61-75.

34. Macek, Catherine, "Of Mind and Morbidity: Can Stress and Grief Depress Immunity?", J.A.M.A., 248 (July, 1982), 405-407.
35. Miller, Donna M., and Jean M. Williams, "Administration: Stress and How to Manage It," Physical Educator, 39 (October, 1982), 116-120.
36. Pelletier, Kenneth, Mind as Healer/Mind as Slayer, New York, Delta Books, 1977.
37. Prager-Decker, Iris J., "The Efficacy of Muscle Relaxation in Combating Stress," Health Education, 11 (January/February, 1980), 40-42.
38. Rapley-Evans, Suzanne, "The Signs of Stress," Corporation Fitness and Recreation, 2 (February/March, 1983), 18-24.
39. Reed, Michael, and Carl Saslow, "The Effects of Relaxation Instructions and EMG Biofeedback on Test Anxiety, General Anxiety, and Locus of Control," Journal of Clinical Psychology, 36 (July, 1980), 683-690.
40. Reiter, Marion A., "Effects of a Physical Exercise Program on Selected Mood States in a Group of Women Over Age 65," unpublished doctoral dissertation, School of Education, Columbia University Teachers College, New York, New York, 1981.
41. Richter, Judith M., and Rebecca Sloan, "A Relaxation Technique," American Journal of Nursing, 79 (November, 1979), 1960-1964.
42. Riley, Vernon, "Psychoeuroendocrine Influences on Immunocompetence and Neoplasia," Science, 212 (June, 1981), 1100-1109.
43. Russek, H. I., "Stress, Tobacco, and Coronary Heart Disease in North American Professional Groups," J.A.M.A., 192 (April, 1965), 89-94.
44. Schuler, Randall S., "Stress Management for College Administrators," Educational Record, 62 (Summer, 1981), 14-18.
45. Schwartz, Jackie, Letting Go of Stress, New York, Pinnacle Books, 1982.

46. Selye, Hans, The Stress of Life, New York, McGraw Hill Book Company, 1978.
47. _____, Stress Without Distress, New York, Signet Books, 1974.
48. Shumate, Michael, and Everett Worthington, "Imagery and Verbal Counseling Methods in Stress Inoculation Training for Pain Control," Journal of Counseling Psychology, 28 (January, 1981), 1-6.
49. Stillman, Stephen M., and Betsi L. Strasser, "Helping Critical Care Nurses with Work-Related Stress," The Journal of Nursing Administration, 10 (January, 1980), 28-31.
50. "Stress May Damage Cell Immunity," Science News, 113 (March, 1978), 151.
51. Wisdom, Barry Lee, "An Empirical Investigation of Sources and Patterns of Stress Among Hospital Administrators," unpublished doctoral dissertation, School of Education, University of Arkansas, Fayetteville, Arkansas, 1981.
52. Zentner, Rod William, "Psychological Effects of a Running Program," unpublished doctoral dissertation, School of Education, University of Oregon, Eugene, Oregon, 1981.

CHAPTER III
METHODS AND PROCEDURES FOR
COLLECTION OF DATA

The present study concerns stress management in medical technology students. The purposes of this study are (1) to design a personalized relaxation technique which is geared for the individual's unique personality and situation, and (2) to determine if this personalized relaxation technique is as effective as the popular technique advocated by Herbert Benson, the Relaxation Response. In order to discuss the Methods and Procedures for Collection of Data, this chapter contains a description of (a) the source and selection of the population, (b) the instruments, (c) the procedures for collection of the data, and (d) the analysis of the data.

Source and Selection of the Population

The research setting for this study is Northeast Louisiana University located in Monroe, Louisiana. Northeast Louisiana University is a public-supported, multipurpose institution of higher education with an enrollment of approximately 12,000 students. The University accepts students without regard to age, sex, creed, ethnic background, or physical handicap. Degree programs are offered

in business administration, education, liberal arts, pharmacy and health sciences, and pure and applied sciences. The College of Pharmacy and Health Sciences contains the two Schools of Pharmacy and Allied Health. The School of Allied Health is made up of departments of dental hygiene, radiologic technology, occupational therapy, and medical technology.

The Department of Medical Technology is an open admission program and is the largest program of its kind in the State of Louisiana. Currently, the program has approximately 160 students at various stages of training. Thirty of these students are in their final year of training. This phase of the student's training is considered an internship and takes place off-campus in an affiliated hospital. The remaining 130 students are enrolled in courses located on campus and comprises the population of this study. Prior to data collection, permission to conduct the research at Northeast Louisiana University was requested from the Research Subcommittee on Experimental Investigation Using Human Subjects. Permission was granted with revision of the subject consent form (see Appendix A).

The research sample was obtained by requesting volunteers from among the on-campus medical technology students. A letter describing the study was sent to each on-campus student requesting their participation. A total of ninety-three students volunteered to take part in the study. Of

this number, six students eventually dropped out leaving a sample size of eighty-seven. This final sample was composed of twenty-three men with an average age of 22.1 years, and sixty-four women with an average age of 20.2 years. The average age for the total sample was 20.9 years.

Assignment of subjects to one of the three groups (two experimental and one control) was made by random assignment. The names of the original ninety-three volunteers were written on index cards. The cards were then placed in a container and placed alternately into one of the three groups, the order of which was determined in like manner. Assignment continued until there were thirty-one names in each group.

Instruments

Three instruments were utilized in this study to collect the data. A stress questionnaire was used to obtain demographic as well as stress related information. There were twelve questions on this instrument. The first five questions were concerned with demographic information, while the last seven pertained to stress or the effects of stress in the person's life (see Appendix C). For the stress questions, there was space available for as many as three answers. These items sought information about the main stresses in the person's life, activities used to relax, activities the person thought would help them relax, medical

problems resulting from stress and whether or not the person found taking college exams stressful.

The second instrument was the Timex Healthcheck Digital Blood Pressure Monitor. This is an automated digital sphygomanometer that records pulse rate as well as systolic and diastolic blood pressure. The Healthcheck meets the standards for electronic sphygomanometer accuracy proposed by the Association for the Advancement of Medical Instrumentation (AAMI SP 10, February 1982). Comparisons with direct radial artery readings in a hospital study demonstrated the accuracy of the instrument (5).

The selection of the Timex Healthcheck was made in order to help eliminate technician bias and deficiencies in auditory acuity. Another consideration was the instrument's simplicity of operation. The blood pressure cuff is wrapped around the subject's arm and pumped up when the instrument's indicator light appears. The cuff is pumped up to 160 mm Hg. The instrument then automatically lowers the pressure until the systolic and diastolic blood pressures are detected. The values are displayed in the window of the Healthcheck. Once the blood pressures are measured the pressure is released. After eight seconds the value of the pulse rate is displayed in the window of the instrument.

The third instrument is the State-Trait Anxiety Inventory developed by Spielberger, Gorsuch, and Lushene. This self-report inventory measures the state anxiety and trait

anxiety components of an individual's personality. This instrument was chosen to measure the psychogenic parameters of stress. The STAI consists of two different scales for measuring different stress concepts and both scales were used in this study (3).

Scale X-1 (A-State) of the inventory was designed to measure state anxiety. According to Spielberger (3), "State anxiety (A-State) is conceptualized as a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feeling of tension and apprehension, and heightened autonomic nervous system activity" (3, p. 3).

This scale consists of twenty statements in which the subject is asked to respond. The instructions direct the subject to indicate "how you feel right now, that is, at this moment." The subject responds to the statements by blackening in a circle below one of the four possible answers, (1) not at all, (2) somewhat, (3) moderate so, and (4) very much so. It has been found that scores on the A-State scale increase in response to various types of stress and decrease after certain kinds of relaxation training (3, p. 3).

Scale X-2 (A-Trait) of the inventory was designed to measure trait anxiety. This type of anxiety refers to relatively stable individual differences in anxiety proneness, that is, to differences between people in the tendency to respond to situations perceived as threatening with

elevations in A-State intensity. Spielberger (3) states that trait anxiety is analogous to potential energy in physics, while state anxiety is analogous to kinetic energy. Like the X-1 scale, this scale also consists of twenty statements which the subject is asked to respond. However, the directions in this scale ask the subject to respond to the statements to indicate "how you generally feel." Like in the previous scale there are four possible responses, however, the four responses for the X-2 scale are (1) almost never, (2) sometimes, (3) often, and (4) almost always. According to Spielberger et al.,

In general, it would be expected that those who are high in A-Trait will exhibit A-State elevations more frequently than low A-Trait individuals because they tend to react to a wider range of situations as dangerous or threatening. High A-Trait persons are also more likely to respond with increased A-State intensity in situations that involve interpersonal relationships which pose some threat to self-esteem (3, p. 3).

The State-Trait Anxiety Inventory has been used in a variety of research situations. In a 1969 study, Sachs and Diefenhaus (3) studied the effects of college examination stress on scores on the STAI scales of undergraduate students at the University of Illinois. This study found that the mean A-State score in the stress condition (40.87) was significantly higher than in the nonstress condition (38.98). There was a small but significant decrease in A-Trait scores from the nonstress situation to the stressful situation which the researchers interpreted as a general tendency for

subjects to obtain lower scores on repeated administration of personality tests (3, p. 15).

The STAI has been determined to be a reliable and valid instrument for the two dimensions of anxiety. Test-retest correlations using undergraduate college students were used to analyze the reliability of the instrument. The test-retest correlations for the A-Trait scale were fairly high, ranging from .73 to .86. The correlations for the A-State scale were fairly low, ranging from .16 to .54, with a median correlation of only .32 (3, p. 9). Spielberger et al. (3) explains that the low r for the A-State scale was anticipated "because a valid measure of A-State should reflect the influence of unique situational factors existing at the time of testing" (3, p. 9).

Internal consistency of the instrument using the alpha coefficient was also performed to evaluate the reliability. The alpha coefficient was computed by Cornbach's modified K-R 20 formula. Both subscales had reliability coefficients ranging from .83 to .92 which indicates reasonably good internal consistency (3, p. 10).

Correlations with several other anxiety inventories were used to determine the concurrent validity of the STAI. Correlations between the STAI A-Trait Scale and the IPAT Anxiety Scale are between .75 and .77; those with the Taylor Manifest Anxiety Scale are between .79 and .83; while those

with the Affect Adjective Checklist are between .52 and .58 (3, p. 10).

Construct validity of the A-State Scale was determined by administering the instrument to 977 undergraduate college students at Florida State University. The students were first asked to complete the A-State Scale under normal or nonstressful conditions. They were then asked to respond to the scale according to how they believed they would feel prior to a final examination in an important course, a stressful condition. Under the nonstressful condition the mean score for the males (N = 332) was 40.02 while under the stressful situation it was 54.99. For the females in the study (N = 645) the values were 39.36 and 60.51, respectively.

Edward S. Katkin, reviewing the STAI in Buros' The Eighth Mental Measurements Yearbook, says

Test-retest reliability for the A-trait scale for male and female college undergraduates over a six-month period are .73 and .77, respectively, indicating that the trait measure is quite stable. Test-retest reliabilities for the A-State measure are low, as might be expected since the State measure conceptually does not measure a persistent characteristic of the individual. However, internal consistency of the A-State-Scale, as measured by K-R 20, ranges from .83 to .92. The A-Trait scale correlates very highly with the Taylor and IPAT anxiety scales, indicating that the A-Trait scale measures essentially the same concept and may be interpreted in the same context. The validity of the A-State scale has been demonstrated in a wide variety of studies, many of which are summarized in the test manual.

. . . In summary, it appears that the STAI is an excellent choice for the clinical psychologist or personality researcher looking for an easy-to-administer, easy-to-score, reliable, and valid index

of either individual differences in proneness to anxiety or individual differences in transitory experience of anxiety (4, p. 1096).

Procedures for Collection of Data

After permission was granted for the study to be conducted at Northeast Louisiana University by the Research Subcommittee on Experimental Investigation Using Human Subjects, letters were sent to the on-campus medical technology students requesting volunteers for the research study. This preliminary letter explained what the study involved and what would be expected of the subjects. Ninety-three students volunteered to participate in the study. These students were given another letter containing a subject consent form, a State-Trait Anxiety Inventory, and stress questionnaire. The subjects were asked to complete the forms and return them to the researcher.

In order to assign the volunteers to the different groups, the names of the ninety-three subjects were written on index cards, placed in an open container and then drawn randomly and placed alternately into one of the three research groups (relaxation response group, personalized tape group, and control group), the order of which was determined in like manner. At the completion of the process, each group contained thirty-one subjects. Therefore, at the beginning of the study the sample was composed of ninety-three subjects ($N = 93$) with thirty-one subjects in each

group. However, during the course of the semester six subjects dropped out for various reasons leaving a $N = 87$. Five of the six were from the relaxation response group, and one from the personalized tape group. Therefore, upon completion of the study there were unequal N s in the research groups (1) relaxation response ($N = 26$), (2) personalized tape group ($N = 30$), and (3) control ($N = 31$).

In order to obtain baseline values, blood pressure and pulse rate measurements of each subject were taken on three different occasions during the sixth through eighth week of the Spring semester. Measurements were taken in the researcher's office or classroom between class periods.

During the ninth week of the semester each subject was given another letter informing them in which group they had been placed. Students placed in the relaxation response group or personalized tape group also received their relaxation calendars. Training in the relaxation technique also occurred during this week. Class time was set aside for the training of the subjects in the relaxation response group and personalized tape group. During one class session, all the class was dismissed except the relaxation response group. During this time the subjects were given verbal and written instruction on how to perform their relaxation technique. Time was also allowed for the subjects to practice the technique. During the following class period, subjects in the personalized relaxation tape group

were given verbal and written instruction on how to perform their relaxation technique. Again, time was allowed for the subjects to practice the technique. The subjects in this group were given relaxation tapes that had been developed from their responses on the stress questionnaire. All members of this group had access to a cassette player. Both experimental groups were told to begin their exercises on the same date and to end on the same date. They were also reminded to record each time the technique was performed. Individuals who were absent from class during the training session or who were not in the researcher's class were asked to come by his office for explanation and practice of the technique.

Control group subjects were told nothing except that they had been placed in the control group and would have their blood pressures and pulse rates taken during their final exam in a medical technology course and would be asked to complete the STAI once again. The members of this group and members of the class not involved in the study were excused from class during the training session of the other two groups.

During the last six weeks of the semester the subjects in the two experimental groups were encouraged to practice their relaxation technique and record their sessions on their relaxation calendars. Three different letters were

sent to the subjects in the two groups to encourage them to continue the exercises.

During the final examination the subjects in all three groups were again asked to complete the STAI and have their blood pressures and pulse rates measured. During this time the subjects were alternately asked to come to the back of the classroom and have their blood pressure and pulse rate measured. The subjects of the two experimental groups were asked to return the relaxation calendars during this time. The above measurements, the return of the final STAI and relaxation calendars completed the data collection phase of the study.

Procedures for Analysis of Data

The analysis of the data involved the analyses of the eight research questions and the testing of the two hypotheses. Research questions concerned the physical and emotional effects of stress, medical conditions arising from stress, the methods used by the subjects to cope with stress and the biometric and psychometric measures of the subjects before and after a stressful event. The hypotheses concerned the effectiveness of a new technique as compared with a popular relaxation technique, the Relaxation Response, and a control group where no relaxation technique was utilized.

Data for the research questions were acquired from the individual stress questionnaires of all the subjects. The responses of the individual subjects were tabulated into frequency tables for analysis. In certain cases where the subject responses were different variations of the same parameter, the categories were collapsed into a more inclusive heading (e.g., swimming and jogging were collapsed into athletic exercise, etc.). Where appropriate the means and standard deviations were included in the various tables.

The statistical technique of multivariate analysis of covariance (MANCOVA) was used in the analysis of the biometric and psychometric data and were used in testing the two hypotheses. This procedure provided a statistical control over initial differences in the subjects of the three groups on the initial level of the biometric and psychometric measures (2). This procedure also provided a control for the difference in frequency of relaxation technique utilization in the two treatment groups (2). Wilk's lambda, a multivariate test of significance was used to evaluate the significance of the differences between the adjusted post test means of the three groups (1).

In addition, univariate analysis of covariance was used to analyze the biometric and psychometric measures (dependent variables) individually across the three groups. The results of these statistical procedures are recorded in appropriate tables in the following chapter.

CHAPTER BIBLIOGRAPHY

1. Biskin, Bruce H., "Multivariate Analysis in Experimental Leisure Research," Journal of Leisure Research, 15 (April, 1983), 344-358.
2. Bounds, William G., William H . Cormier, and Schuyler W. Huck, Reading Statistics and Research, New York, Harper and Row, Publishers, 1974.
3. Gorsuch, Richard L., Robert E. Lushene, and Charles D. Spielberger, STAI Manual, Palo Alto, California, Consulting Psychologists Press, Inc., 1970.
4. Katkin, Edward S., "The State-Trait Anxiety Inventory," The Eighth Mental Measurements Yearbook, edited by Oscar K. Buros, Highland Park, New Jersey, The Gryphon Press, 1978, pp. 1088-1096.
5. "Timex Healthcheck," The Canadian Nurse, 79 (September, 1983), 3.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

Data from the various measures of the three groups will be analyzed in this chapter to determine the effectiveness of the relaxation techniques. Data from the stress questionnaires are expressed as frequencies and percentages and arranged in tabular form. These tables are discussed in the order of the research questions for which they were computed. Data from the biometric (blood pressures and heart rates) and psychometric measures (Strait-Trait Anxiety Inventory) are also presented in tabular form and are discussed in reference to the two hypotheses.

The data presented in this chapter were collected from eighty-seven volunteer medical technology students at Northeast Louisiana University located in Monroe, Louisiana. These subjects were asked to complete a stress questionnaire, the State-Trait Anxiety Inventory, and have their blood pressure and heart rate measured on four different occasions. The subjects of the two experimental groups were also asked to complete a relaxation calendar to record the number of times they practiced their relaxation technique.

The stress questionnaire included demographic as well as stress related questions. Six of the stress related questions had space available for as many as three responses although not every subject completed all three spaces. Some subjects failed to complete some of the questions if they did not pertain to their particular situation. Therefore, in some tables the total for the frequency is greater than eighty-seven (the number of subjects in the study) while in others the total is less. The percentage value in the tables refers to the percentage of the particular response in reference to the total number of responses.

Data from the State-Trait Anxiety Inventory were collected from each subject on two different occasions. Baseline data for the STAI were collected prior to any experimental treatment, while posttest STAI data were collected during the students' final exam in a medical technology course.

Data from the biometric measures (blood pressures and heart rates) were collected from each subject on four different occasions. The first three measures were collected prior to any experimental treatment and were averaged together to obtain the baseline biometric data. The post-test biometric measures were obtained, as were the STAI data, during the students' final exam.

An analysis of variance was performed on the pretest measures of the biometric and psychometric variables to

determine if randomization had indeed resulted in equal subgroups. The results of this procedure indicated there was a significant difference in the pretest measures of the psychometric variables. Also, examination of the relaxation calendars demonstrated a difference in the number of times the two experimental groups utilized their particular relaxation technique. Therefore, two covariates were addressed: (1) pretest STAI measures and (2) difference in frequency of relaxation technique utilization.

The Findings

Table I addresses research question one: What is the leading cause of stress for medical technology students? There were thirty-seven different responses to this question by the subjects, and of these, school was the most commonly mentioned cause of stress. Eighty-three of the eighty-seven subjects indicated that school was one of the major stresses in their lives. This response comprised 34.4 per cent of the total 241 responses. Other frequently mentioned stresses included finances (22), death in the family (18), family life and relations (18), dating problems (18), work (17), and time pressure (13). The other stresses recorded by the subjects had a frequency of five or less. These results are much as would be expected in college students majoring in a highly demanding, technical field.

TABLE I
LEADING CAUSES OF STRESS FOR MEDICAL
TECHNOLOGY STUDENTS

Stress	Frequency	Percentage
School	83	34.4
Finances	22	9.1
Death in the family	18	7.5
Family life and relations	18	7.5
Dating problems	18	7.5
Work	17	7.1
Time Pressure	13	5.4
Personal health problems	5	2.1
Parents	5	2.1
Problems with friends	3	1.2
Interpersonal relations	3	1.2
The future	2	.8
Striving for success	2	.8
Marriage problems and divorce	2	.8
Personal life	2	.8
Employment worries	2	.8
Engagement	2	.8
Needless worry	2	.8
My past	2	.8
Getting into internship	1	.4
Living away from home	1	.4
Family health problems	1	.4
Making important decisions	1	.4
Business problems	1	.4
Children problems	1	.4
Responsibilities	1	.4
Nerves	1	.4
Marriage adjustment	1	.4
Unable to exercise enough	1	.4
Negative outlook on life	1	.4
Roommate problems	1	.4
Doing something new	1	.4
Losing something or someone	1	.4
Domestic problems	1	.4
Driving at night	1	.4
Traffic	1	.4
Total	241	100.0

Data found in Table II pertains to research question two: What are the most common physiological responses to the stresses experienced by the subjects in this study? By examining this table there were forty different physiological responses listed by the subjects. There were six physiological responses that were listed by ten or more subjects as being a significant physical result to stress in their lives. Headache was the most commonly listed physical effect with thirty-six subjects listing it. This response accounted for 18 per cent of the total 200 responses. Nervousness (24), fatigue (23), G.I. tract disorders (12), rapid heart beat (10), and hyperactivity (10) were the other five physical effects commonly listed by the research subjects.

These six responses seem to be those that might be expected in a stress provoking situation. Indeed, the other less commonly listed responses also seem plausible results of the body's interaction with a stressful stimuli.

Table III pertains to research question three: What are the perceived most common psychological responses to these stresses experienced by the subjects in this study? Subjects of the study listed thirty-four different psychological responses. The table has columns for frequency and percentage. The total for the frequency column was 190 indicating the sum of responses listed by all subjects.

TABLE II
PHYSIOLOGICAL RESPONSES TO STRESS IN
MEDICAL TECHNOLOGY STUDENTS

Physiological Responses	Frequency	Percentage
Headache	36	18.0
Nervousness	24	12.0
Fatigue	23	11.5
G.I. tract disorders	12	6.0
Rapid heart beat	10	5.0
Hyperactivity	10	5.0
Palms sweat	8	4.0
Increased appetite	8	4.0
Muscle tension	7	3.5
Muscle tremors	6	3.0
Fingernail biting	5	2.5
Restlessness	4	2.0
Insomnia	4	2.0
Skin breaks out	3	1.5
Weight gain	3	1.5
Decreased appetite	3	1.5
Change color in face	3	1.5
Increase in temperature	2	1.0
Backache	2	1.0
Crying	2	1.0
Smoke cigarettes	2	1.0
Hair loss	1	.5
Itch	1	.5
Weight loss	1	.5
Overwork myself	1	.5
Breathlessness	1	.5
Low blood pressure	1	.5
Kidney problems	1	.5
Over-talkative	1	.5
Circles under eyes	1	.5
Ulcers act up	1	.5
Cold	1	.5
Feel stronger	1	.5
Bite lip	1	.5
Difficulty talking	1	.5
Asthma attack	1	.5
Legs hurt	1	.5
Hyperventilation	1	.5
Nervous "tic"	1	.5
Total	200	100.0

TABLE III
 PSYCHOLOGICAL RESPONSES TO STRESS IN
 MEDICAL TECHNOLOGY STUDENTS

Psychological Responses	Frequency	Percentage
Short tempered	25	13.2
Anxious	25	13.2
Depression	25	13.2
Irritability	24	12.6
Social isolation	12	6.3
Short attention	12	6.3
Down on self	7	3.7
Cry easily	6	3.2
Helplessness	6	3.2
Moodiness	5	2.6
Anger	5	2.6
Absent-minded	4	2.1
Worry	3	1.6
Mental fatigue	3	1.6
Impatience with others	3	1.6
Fear	2	1.1
Unresponsive	2	1.1
Gloomy	2	1.1
Feel pressured	2	1.1
Confusion	2	1.1
Sleep problems	2	1.1
Increased appetite	1	.5
Cynical	1	.5
Judgement	1	.5
Defensive	1	.5
Doubtfulness	1	.5
Hysterical laughter	1	.5
Extraneous thoughts	1	.5
Loneliness	1	.5
Urge to sleep	1	.5
Heightened alertness	1	.5
Unhappy	1	.5
Unorganized	1	.5
Mood swings	1	.5
Total	190	100.0

The most commonly listed psychological responses to stress were short tempers, anxiety, and depression. Each of these three responses was listed by twenty-five of the subjects as major psychological responses to stressful stimuli. Each of these comprised 13.2 per cent of the total number of responses. Irritability (24), short attention span (12), and social isolation (12) were three other psychological responses frequently listed by the subjects.

In examining this table, only one response listed seems unusual and this was "hysterical laughter." However, this response was listed by only one subject. The other responses appear to be normal psychological responses to stressful stimuli.

Methods used to cope with stress is the essence of research question four, and Table IV attempts to answer this question. By examining this table there were forty-two different coping methods listed by the students. By far, the most commonly listed method was exercise. Sixty-three subjects (23.5% of the total number of responses) listed exercise as a major coping method to stress. Exercise as appears in the table is a broad heading and was a composite category which was derived by combining such forms of exercise as jogging, aerobic exercise, swimming, etc. Other commonly listed coping methods were television (20), music (38), reading (21), eating (34), talking the problem over with others (10), and go somewhere new (12). There was a

TABLE IV
 METHODS USED BY MEDICAL TECHNOLOGY
 STUDENTS TO COPE WITH STRESS

Method	Frequency	Percentage
Exercise	63	23.5
Listen to music	38	14.2
Sleep	34	12.7
Reading	21	7.8
Television	20	7.5
Ride around	12	4.5
Talk with others about problem	10	3.7
Take shower or bath	7	2.6
Drink alcohol	6	2.2
Cross stitching	5	1.9
Eat	4	1.5
Think positively	4	1.5
Praying	3	1.1
Play music instrument	3	1.1
Deep breathing	3	1.1
Smoke cigarettes	3	1.1
Sit and do nothing	3	1.1
Daydream	2	.8
Photography	2	.8
Keep busy	2	.8
Neck with boyfriend/girlfriend	2	.8
Thinking about the problem	1	.4
Go somewhere new	1	.4
Church activities	1	.4
Have back tickled	1	.4
Fishing	1	.4
Hunting	1	.4
Walk my dog	1	.4
Play cards	1	.4
Ride horse	1	.4
Drink coke	1	.4
Go shopping	1	.4
Look out window	1	.4
Go pistol shooting	1	.4
Sing	1	.4
Dance	1	.4
Do something enjoyable	1	.4
Hobbies	1	.4
Work around house	1	.4
Drawing	1	.4

TABLE IV--Continued

Method	Frequency	Percentage
Go to quiet place	1	.4
Visit parents	1	.4
Total	268	100.0

total of 268 responses to this question which indicates that most subjects had listed several methods to cope with stress. In fact, most students listed at least three coping methods.

Research question five concerns the medical problems of the subjects resulting from stress. Table V is a listing of twenty different medical problems recorded by the students which they felt to be a sequelae of stress in their lives. Some students listed several medical conditions while others (50) did not list any. In fact, there was a total of sixty-five responses to this question. Of the twenty different medical conditions, headache was the most commonly listed problem. Nineteen subjects indicated that headache was a major problem to them. This represented 29.2 per cent of the total number of responses. Stomach irritations (11) and ulcers (7) were the other commonly listed conditions. All the other conditions in the table had four or fewer responses.

TABLE V
 MEDICAL PROBLEMS RESULTING FROM STRESS
 IN MEDICAL TECHNOLOGY STUDENTS

Medical Condition	Frequency	Percentage
Headache	19	29.2
Stomach irritations	11	16.9
Ulcers	7	10.8
Skin irritations	4	6.2
Dizziness	3	4.6
Migraine headaches	3	4.6
Fainting spells	2	3.1
Nausea	2	3.1
Low blood pressure	2	3.1
High blood pressure	2	3.1
Insomnia	1	1.5
Mononucleosis	1	1.5
Fatigue	1	1.5
Nerve problems	1	1.5
Diarrhea	1	1.5
Hyperventilation	1	1.5
Difficulty breathing (dyspnea)	1	1.5
Allergies aggravated	1	1.5
Kidney problems	1	1.5
Cardiac arrhythmias	1	1.5
Total	65	100.0

In order to answer research question six, "How do the diastolic and systolic blood pressures and pulse rates change during a stressful event of the subjects?", Tables VI and VII must be examined. Table VI contains the pretest, or nonstressful condition, measures for blood pressure, pulse rate and the two subscales of the State-Trait Anxiety Inventory of the three different groups.

TABLE VI
PRETEST MEAN SCORES FOR THE
STRESS RELATED VARIABLES

Variables	Group A*	Group B**	Group C***
Systolic blood pressure	118.12	116.50	118.65
Diastolic blood pressure	72.81	73.23	73.26
Heart rate	73.08	74.03	72.61
STAI X-1 (State)	37.50	39.23	44.26
STAI X-2 (Trait)	40.35	39.57	45.55

*Group A = Relaxation Response Group
 **Group B = Personalized Relaxation Tape Group
 ***Group C = Control Group

Table VII contains the posttest, or stressful condition, measures for the same five variables previously mentioned. This table contains the observed measures as well as the adjusted values. The adjusted values are statistical adjustments of the observed measures necessitated by the initial differences in the pretest scores for

TABLE VII
OBSERVED AND ADJUSTED POSTTEST MEAN SCORES
FOR THE STRESS RELATED VARIABLES

Variables	Observed			Adjusted		
	Group A*	Group B**	Group C***	Group A*	Group B**	Group C***
Systolic blood pressure	120.12	118.13	119.45	118.78	118.87	119.85
Diastolic blood pressure	72.46	70.50	75.00	70.87	69.62	77.18
Heart rate	75.35	78.73	72.90	76.97	79.75	70.56
STAI X-1 (State)	43.12	38.13	49.77	47.24	41.44	43.12
STAI X-2 (Trait)	37.42	34.57	42.39	39.61	36.93	38.26

*Group A = Relaxation Response Group
 **Group B = Personalized Relaxation Tape Group
 ***Group C = Control Group

the three different groups in the study. The posttest measures were taken during the subjects' final examination in one of their medical technology courses.

In order to detect a change in the systolic blood pressure, diastolic blood pressure, and pulse rate attention is focused at the pretest or baseline values and these values are compared with the posttest values. The mean pretest systolic blood pressures for Group A (relaxation response group), Group B (personalized relaxation tape group), and Group C (control group), were 118.12, 116.50, and 118.65, respectively. The average for all three groups is 117.76. The observed posttest systolic blood pressures for the three groups were 120.12, 118.13, and 119.45, respectively. The average of these values is 119.23. From the average of the pretest values, 117.76, and the average of the posttest values, 119.23, it can be observed that there was an increase of 1.47 mm HG in systolic blood pressure during a stressful condition when compared with the baseline mean value. This finding was expected since the systolic blood pressure tends to increase in stress provoking situations (3, p. 41).

The diastolic blood pressure can be analyzed in a similar fashion. The mean pretest diastolic blood pressures for Group A, Group B, and Group C were 72.81, 73.23, and 73.26, respectively. The average of these three values is 73.1. The observed mean posttest diastolic blood pressures

for the three groups were 72.46, 70.50, and 75.00, respectively. The average of these three values is 72.65. For the diastolic blood pressure we have a net decrease of 0.45 from baseline to posttest measures. This finding was unexpected since it is generally believed that a stressful situation results in an increase of blood pressure (3, p. 41). However, the systolic blood pressure is generally more affected by stressful stimuli than is the diastolic blood pressure (3, p. 41).

The baseline mean heart rates for the three groups were 73.08, 74.03, and 72.61, respectively. The average value is 73.24. The observed posttest heart rates for the three groups were 75.35, 78.73, and 72.90, respectively. The average of these three values is 75.66. Therefore, there was a net increase of 2.42 from baseline to posttest measures. Again, this is an expected result that most anyone ever experiencing a frightening or otherwise stressful situation can readily verify (3, p. 41).

In summary, it is seen from Tables VI and VII there was a net increase in the systolic blood pressure and heart rate when we compared baseline with posttest measures. However, the diastolic blood pressure exhibited a small net decrease during the stressful event when compared with the baseline measures. This finding was unexpected since blood pressure (both systolic and diastolic) generally increase during a stress provoking situation.

Research questions seven and eight involve biometric and psychometric variables of stress, respectively, and the efficacy of relaxation techniques in the management of these stress related variables. Research question seven concerns the change in the systolic blood pressure, diastolic blood pressure, and heart rate following relaxation training. In Table VI it is observed that the mean pretest systolic blood pressures for Group A, Group B, and Group C were 118.12, 116.50, and 118.65, respectively. The observed posttest mean systolic blood pressure measures for the same groups were 120.12, 118.13, and 119.45, respectively. It can be seen that in the three groups there was an increase in the systolic blood pressure during the final examination. The increase varies according to the group. In Group A (Relaxation Response Group) there was an increase of 2 mm Hg; in Group B (Personalized Relaxation Tape Group) there was a 1.63 mm Hg increase; while in the Control Group there was an increase of only .80 mm Hg.

Now considering the adjusted scores in Table VI for the same dependent variables, a different picture of the change in the systolic blood pressure is presented. For Group A the change from pretest to posttest is now only .66 mm Hg, for Group B there is a 2.37 mm Hg increase, while for Group C (Control) there is a 1.20 mm Hg increase. By comparing the change in systolic blood pressure from pretest to the adjusted posttest scores in the three groups, it appears

that the Relaxation Response Group was more effective in controlling this parameter during a stressful event, while the Personalized Relaxation Tape Group was least effective of the three groups.

The pretest mean scores of the diastolic blood pressure for the three groups were 72.81, 73.23, and 73.26, respectively. The observed diastolic blood pressure values were 72.46, 70.50, and 75.00. By comparing these two measurements it can be seen that for Group A there was a decrease of .35 mm Hg; for Group B there was a decrease of 2.73 mm Hg; and for Group C there was an increase of 1.74 mm Hg. The adjusted diastolic blood pressure values were 70.87, 69.62, and 77.18, respectively. Now comparing this set of values with the pretest scores, it can be seen that Group A has a decrease of 1.94 mm Hg; Group B had a decrease of 3.61, and Group C had an increase of 3.92 mm Hg. When considering the diastolic blood pressure, the Personalized Relaxation Tape Group was more effective in controlling this phase of the blood pressure than was the Relaxation Response Group. While the two treatment groups exhibited decreases in the diastolic blood pressure, the Control Group had a net increase of 3.92 mm Hg.

The pretest values of the heart rate for the three groups were 73.08, 74.03, and 72.61, respectively. The observed posttest measures were 75.35, 78.73, and 72.90, respectively. The adjusted scores were 76.94, 79.75,

and 70.56, respectively. By comparing the pretest values with the observed posttest values it can be seen that Group A had an increase of 2.27; Group B had an increase of 4.70; and Group C had an increase of only .29. Now comparing adjusted scores with pretest scores, Group A had an increase of 3.89; Group B had an increase of 5.72, and Group C had a decrease of 2.05. Therefore, both treatment groups were less effective than the control group in controlling this stress related variable. However, the Relaxation Response Group appeared to be more effective than the Personalized Relaxation Tape Group.

In summary, the above data concerning research question seven indicates that there was a change in the biometric measures following relaxation training. The systolic blood pressure was increased in both treatment groups as well as the control group. However, the Relaxation Response Group had the least increase, while the Personalized Relaxation Tape Group had the greatest increase. The diastolic blood pressure was decreased in the two treatment groups but increased in the control group. The Personalized Relaxation Tape Group demonstrated the greatest decrease in diastolic blood pressure. The heart rate was increased in all three groups when using the observed posttest scores in the comparison with the pretest scores, but when using the adjusted posttest scores the control group values were decreased while the other two group means were increased.

The Relaxation Response Group had a smaller increase in heart rate than did the Personalized Relaxation Tape Group. The significance of these changes in the biometric measures will be addressed in the discussion on hypotheses testing.

Research question eight concerns the change in the psychometric measures following relaxation training. Again, Tables VI and VII contain the pretest and posttest measures on these two dependent variables. The pretest mean scores of the State Anxiety subscale (X-1) for Group A, Group B, and Group C were 37.50, 39.23, and 44.26, respectively. The posttest observed values for the same subscale were 43.12, 38.13, and 49.77. Group A exhibited an increase of 5.62, Group B a decrease of 1.10, and Group C had an increase of 5.51. When using the adjusted posttest scores of 47.24, 41.44, and 43.12, respectively, Group A had an increase of 9.74, Group B an increase of 2.21, and Group C had a decrease of 1.14. Comparing the pretest scores with the adjusted posttest scores, both treatment groups appear less able to control state anxiety than does the control group. Of the two treatment groups, the Relaxation Response Group demonstrated the least ability in controlling this stress related variable.

The pretest mean scores of the Trait Anxiety subscale (X-2) for Group A, Group B, and Group C are 40.35, 39.57, and 45.55, respectively. The observed values are 37.42, 34.57, and 42.39, while the adjusted scores are 39.61,

36.93, and 38.26, respectively. Comparing the pretest values with the observed values, we see that all three groups had a decrease in the mean score for the X-2 subscale. These decreases were 2.93, 5.00, and 3.16, respectively. The comparison between pretest values and adjusted posttest X-2 values gives a similar picture. Here we have decrease in all three groups of .74, 2.64, and 7.29, respectively. By examining these decreases in trait anxiety scores, it appears that all three methods were able to reduce trait anxiety to some extent, even the Control Group which demonstrated the greatest decrease. The Personalized Relaxation Tape Group demonstrated a greater ability to reduce this stress related variable than did the Relaxation Response Group.

In summarizing the above data for research question eight, it can be observed that for State Anxiety Subscale (X-1) there was an increase in the observed posttest scores for Group A and Group C, while Group B exhibited a decrease. When using the adjusted values, Group A and Group B were increased while Group C was decreased. Neither treatment group was superior to the Control Group although the Personalized Relaxation Tape Group was more effective than the Relaxation Responses Group.

For the Trait Anxiety Subscale (X-2) both comparisons resulted in a decrease in posttest scores when compared with pretest scores. The Control Group demonstrated a greater

ability to control this stress related variable than either treatment group. The Personalized Relaxation Tape Group demonstrated a greater decrease in this measure than did the Relaxation Response Group. The statistical significance of the above changes will be addressed in the following section on Hypotheses testing.

Hypothesis I

Hypothesis I states that the Personalized Relaxation Tape Group will have a greater decrease in blood pressure, pulse, and psychological anxiety levels than the Relaxation Response Group. Tables VI, VII, VIII, and IX will be utilized in the discussion on hypotheses testing. Pretest mean scores for the stress related variables are presented in Table VI. Table VII contains the observed and adjusted posttest mean scores for the stress related variables. Table VIII contains the results of a univariate analysis of variance of pretest measures on stress related variables, while results of a multivariate and univariate analysis of covariance on effects of group on measures of stress are presented in Table IX. The dependent variables are systolic and diastolic blood pressures, pulse rate, and the state and trait subscales of the State-Trait Anxiety Inventory.

In order to evaluate the efficacy of the two relaxation techniques, the pretest and posttest measures for both

TABLE VIII
UNIVARIATE ANALYSIS OF VARIANCE OF PRETEST
MEASURES ON STRESS RELATED VARIABLES*

Variables	F Ratio	P
Systolic blood pressure	0.289	0.7495
Diastolic blood pressure	0.021	0.9790
Heart rate	0.127	0.8810
STAI X-1 (State)	2.923	0.0593**
STAI X-2 (Trait)	3.315	0.0411**

*df = 2, 84

**p ≤ .05

TABLE IX
MULTIVARIATE AND UNIVARIATE ANALYSIS OF COVARIANCE
ON EFFECTS OF GROUP ON MEASURES OF STRESS

Multivariate Analysis of Covariance			
df	Wilk's Lambda	Approx. F Ratio	P
10, 48	.846	1.286	.243
Univariate Analysis of Covariance*			
Variables	F Ratio	P	
Systolic blood pressure	.038	.963	
Diastolic blood pressure	1.689	.191	
Heart rate	1.685	.192	
STAI X-1 (State)	2.261	.111	
STAI X-2 (Trait)	1.300	.278	

*df = 2, 78

treatment groups are compared with each other and the control group. In order for a valid comparison to be made, it is assumed that all three groups are equal on the five dependent variables at the beginning of the experiment. Random assignment of subjects from the pool of volunteers into the three groups was used to enhance this assumption. However, examination of the pretest measures in Table VI fails to support this assumption. Therefore, a univariate analysis of variance of the pretest measures was performed to determine whether or not these measures were significantly different. If initial differences are not taken into consideration and there is an initial significant difference in the groups, faulty conclusions about the effect of the treatment could be drawn by the investigator. The univariate analysis of variance on the pretest measures (see Table VIII) did detect a significant difference in the measures of the two subscales of the State-Trait Anxiety Inventory for the three groups. The F ratio for the X-1 subscale was 2.923, while the F ratio for the X-2 subscale was 3.315. These values are significant at or below the .05 level of significance which was chosen for this study.

In order to correct for these initial differences of the groups, it was decided that the multivariate analysis of covariance (MANCOVA) would be the appropriate method of analysis for this study. Huck et al. (2) state that there are two purposes of the analysis of covariance:

The analysis of covariance is used most often by researchers to compare group means on a dependent variable, after these group means have been adjusted for differences between the groups on some relevant covariate (concomitant) variable. The hypothetical study described above falls into this category. The dependent variable was the score on the final exam, the covariate was the score on the pretest, and the analysis of covariance would (1) adjust the final exam means on the basis of the covariate (pretest) means and then (2) compare these adjusted final exam means to see if they are significantly different from one another. It is important to note that the adjustment is on the dependent variable means. The covariate means are never adjusted (2, p. 134).

As mentioned above, the pretest measures of the three groups were significantly different at the .05 level of probability. Hence, the pretest measure is a covariate. In addition, the number of times the subjects used the techniques is another covariate since these were different between the two treatment groups. Members of the Relaxation Response Group averaged 28.37 times for using the technique, while the members of the Personalized Relaxation Tape Group averaged 25.48 times. Therefore, there are two covariates that must be addressed in this study, pretest scores and number of times in which the subjects used the relaxation technique. As a result, the mean scores of the comparison groups on the dependent variables are adjusted to account for differences between the groups on each of the covariate variables (2, p. 134).

The basis for using a multivariate analysis involves the interrelationship among the dependent measures. In his article in the Journal of Leisure Research, Biskin (1)

explains why the multivariate analysis is preferred to less sophisticated methods:

Of the four experiments performed and published in JLR during this three-year period, two of them can be classified as univariate experiments, i.e., they were concerned with the effects of one or more manipulations (treatment) on a single dependent measure. The other two studies were multivariate experiments because they sought to examine the effects of treatment on two or more dependent measures simultaneously.

In order to analyze the results of a univariate experiment, researchers traditionally have used the t-test or univariate analysis of variance (ANOVA). While these techniques can be useful in the analysis of multivariate experiments, they are usually not sufficient if the investigator is to interpret adequately the results of the study, because these methods do not take into account the interrelationships among the dependent measures. More frequently, it is necessary to use methods that were developed specifically for the analysis of multivariate experiments. One such technique is MANOVA or MANCOVA (1, p. 345).

Another decision that must be considered is choosing an appropriate test of significance. Biskin (1) defines an experiment in which all dependent measures are all conceptualized as measuring aspects of a single underlying variable (stress) a Class II experiment. For such experiments he recommends the Wilk's Lambda as the test of significance.

Table VII contains the observed and adjusted posttest scores for the stress related variables. The adjusted scores were derived from the observed scores by adjusting for the initial difference in the pretest score (see Table VI). These adjusted scores were then used to determine any

statistically significant difference between the two experimental groups and the control.

Table IX contains the multivariate and univariate analysis of covariance on effects of groups on measures of stress. The top half of the table contains the multivariate analysis of covariance in the format recommended by Biskin (1, p. 352). From this part of the table it is observed that Wilk's Lambda for this study is .846; the approximate F ratio is 1.286 and the probability level is .243. Since .243 is much greater than .05 which was chosen as the level of probability for this study, there was no significant statistical difference between the Personalized Relaxation Tape Group and the Relaxation Response Group according to the multivariate analysis.

Although the multivariate analysis of covariance was found to be nonsignificant at the .05 level, some researchers advocate the use of univariate analysis of covariance for each of the dependent variables in addition to the MANCOVA. The lower half of Table IX contains the results of the five univariate analyses. The F ratios for the systolic blood pressure, diastolic blood pressure, heart rate, X-1 subscale, and X-2 subscale were .038, 1.689, 1.685, 2.261, and 1.300, respectively, while the probabilities were .963, .191, .192, .111, and .278, respectively. Each probability was much larger than .05. Therefore, as in the MANCOVA, all five univariate analyses of covariance were

nonsignificant at the .05 level. Since the above analyses found no significant difference in the three groups, the treatments made no change in the subjects using them. Therefore, Hypothesis I is rejected.

Hypothesis II

Hypothesis II states that the personalized relaxation group will have a greater decrease in blood pressure, pulse rate, and psychological anxiety levels than the control group. Table IX and the previous discussion under Hypothesis I also pertain to Hypothesis II. The multivariate analysis did not find a significant statistical difference in the three groups. Likewise the univariate analyses failed to find a significant difference. From these findings, it appears that there is one population in all three groups, i.e., there was no change due to the treatments. Therefore, Hypothesis II is also rejected.

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CHAPTER BIBLIOGRAPHY

1. Biskin, Bruce H., "Multivariate Analysis in Experimental Leisure Research," Journal of Leisure Research, 15 (Fourth Quarter, 1983), 344-358.
2. Bounds, William G., William H. Cormier, and Schuyler W. Huck, Reading Statistics and Research, New York, Harper and Row Publishing Company, 1974.
3. Ravin, Abe, The Clinical Significance of the Sounds of Korotkoff, United States of America, Merck, Sharp and Dohme Publishers, 1972.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary

There has been a growing concern in recent years about the effects of stress on human health. Various studies have been cited that involved various dimensions of stress. These have included personality type, occupation, as well as others (2, 3). The Type A personality has been found to be particularly prone to the ill effects of stress, namely heart disease. Certain occupations such as air traffic controllers, critical care nurses, and medical technologists have been found to pose a risk to the individuals engaged in these professions (4, 6, 7).

In order to counteract or prevent the ill effects of stress, recent research has focused on techniques that could be used to decrease this threat. Biofeedback, cognitive modification, and relaxation techniques are only a few of the methods under study. The Relaxation Response is currently one of the more popular relaxation methods. However, various studies have reached different conclusions concerning the effectiveness of this method, as well as other methods. One possible reason for the conflicting

findings in different studies may be due to individual differences. Few investigators have addressed this particular variable.

The problem of the present investigation was the development of a Personalized Relaxation Technique and then conducting a comparative study of the effectiveness of this technique with the Relaxation Response, a current popular relaxation method. The purposes of this study were (1) to design a Personalized Relaxation Technique which is geared for the individual's unique personality and situation and (2) to determine if this Personalized Relaxation Technique is as effective as the popular technique advocated by Herbert Benson, the Relaxation Response.

It was hypothesized that the Personalized Relaxation Group would have a greater decrease in blood pressure, pulse rate, and psychological anxiety levels than the Relaxation Response Group. In addition, it was hypothesized that the Personalized Relaxation Group would have a greater decrease in blood pressure, pulse rate, and psychological anxiety levels than the control group. Finally, eight research questions were posed to determine the effects of stress on five stress related variables before and after relaxation training. These five variables included systolic blood pressure, diastolic blood pressure, pulse rate, state anxiety, and trait anxiety.

The population for this study was the 130 on-campus medical technology students at Northeast Louisiana University in Monroe, Louisiana. Initially, ninety-three students volunteered to take part in the study. However, during the course of the study six subjects dropped out for various reasons. The initial ninety-three subjects were randomly assigned to one of three different groups, two treatment groups and one control group. The treatment groups included the Relaxation Response Group and the Personalized Relaxation Tape Group.

Prior to beginning the experiment all subjects were asked to complete a stress questionnaire, State-Trait Anxiety Inventory, a consent form, and have their blood pressure and pulse rate measured on three different occasions. These biometric values were averaged together to obtain baseline values. Likewise, the State-Trait Anxiety Inventory served as the baseline values for the psychometric variables.

The first part of the experiment involved training the two treatment groups in their particular relaxation technique. Training was accomplished during class time with one group being trained at a time. The groups were given written and verbal instructions on how to perform the techniques. In addition, the groups were allowed to practice these methods during the training session.

The tapes for the Personalized Relaxation Tape Group were developed from the information on this group's stress questionnaires. Each subject's tape was different from the other subjects' tapes. There were three major phases of the tapes: progressive muscular relaxation, shortened version of the Relaxation Response and Cognitive Modification. This group and the Relaxation Response Group were told to begin their relaxation exercises at the same time and to end their relaxation exercises at the same time. They were also asked to complete a relaxation calendar to determine compliance with the procedure. The exercise period lasted six weeks and ended just prior to the final examination.

The final examination was the stressful event that was used to determine the efficacy of the two relaxation techniques in counteracting the effects of stress. During the final examination all three groups were asked to complete the State-Trait Anxiety Inventory once again and to have their blood pressure and pulse rate measured. In addition, the two treatment groups were asked to turn in their relaxation calendars. Changes in the measures of the five dependent variables from pretest to posttest were assessed statistically with the multivariate analysis of covariance (MANCOVA) and five independent univariate analysis of covariance.

The results of the statistical analysis did not support the two hypotheses. The subjects in the Personalized

Relaxation Tape Group were not significantly different from the subjects in the Relaxation Response Group. Likewise, the members of the Personalized Relaxation Tape Group were not significantly different from the Control Group. Therefore, both hypotheses were rejected.

In addition to the hypotheses, eight research questions were addressed in this study. From review of the tables concerning these questions it was found that school by-far was the leading cause of stress for these students; the major physiological response to stress was headache; the major psychological reactions were short temper, depression, and anxiety. The most common method used by these students to cope with stress was exercise; and the most common medical problem due to stress was headache. Research questions seven and eight were addressed in the hypotheses testing.

Findings

From the results of this study the following conclusions were formulated.

1. The Personalized Relaxation Tape Technique as practiced in this study does not lead to a statistically significant reduction in the measures of five stress related variables.
2. The Relaxation Response Technique as practiced in this study does not lead to a statistically significant reduction in the measures of five stress related variables.

3. The Personalized Relaxation Tape Technique did not prove to be statistically superior to the Relaxation Response Group in reducing the effects of stress.

4. The Personalized Relaxation Tape Technique did not prove to be statistically superior to the Control Group in reducing the effects of stress.

5. The Relaxation Response Method did not prove to be statistically superior to the Personalized Relaxation Tape Technique in reducing the effects of stress.

6. The Relaxation Response Method did not prove to be statistically superior to the Control, or no method at all, in reducing the effects of stress.

Conclusions

Based on data collected and the findings of this study, the following conclusions about relaxation techniques seem to be warranted.

1. Discrepancies exist in the literature concerning various relaxation techniques. While some researchers find one technique effective in a particular group of subjects, other researchers often fail to replicate these findings.

2. Individual differences may be responsible for discrepancies in the various research studies. The majority of studies focus on a general population without considering

the unique differences of the individual subjects of that population.

3. Fine tuning is needed between the theoretical concepts of a study on a relaxation technique and the research measures used to explore these concepts. Therefore, followup studies should take into consideration various modification in the initial research study in order to strengthen the relationship between the theoretical and practical application of a relaxation technique.

Implications

Although no significant differences were found to exist between the Personalized Relaxation Tape Technique and the Relaxation Response Technique in the management of stress, there are indications that the Personalized Relaxation Tape Method may be useful in stress reduction programs. From the findings previously cited, it was found that essentially there was no difference between the two methods. This fact can also be approached from another angle, namely, that the Personalized Relaxation Technique was just as good as the Relaxation Response Method which has been in existence for some time and with various refinements. In practically all new machines and procedures flaws have to be screened out before there is a finished product. The same holds true for relaxation techniques. Although the theory behind this technique appears sound on face value, there surely are

adjustments to be made before it is a finished product. The next section will consider these adjustments.

Another implication of this study is that the Relaxation Response Method proved to be no more effective than no method at all (Control) in managing stress. This is in direct contradiction to the findings of Benson et al. (1). These researchers found the mean changes in both systolic and diastolic blood pressure were significantly greater in the Relaxation Response Group than in a group instructed to sit quietly ($p < 0.05$) or the Control Group ($p < 0.001$) (1). The findings of the present study appear to dispute Benson's results and support the article by Holmes concerning a review of recent research studies in which meditation was used as a relaxation technique (5). According to this article, the major statistical problem encountered was the failure of the researchers to control for the influence of initial difference in arousal between meditating and non-meditating subjects (5). In the Benson (1) study one-way analyses of variance were used to compare mean changes in blood pressure among the groups. This particular statistical method could possibly have led the researchers to reach erroneous conclusions about the efficacy of this relaxation technique. Since randomization does not always yield truly equal groups initially, another statistical method may have been more appropriate.

Also, the findings of this study suggest that there may not be one best relaxation technique for all individuals, even the Personalized Relaxation Tape Technique. Some individuals will undoubtedly respond more to one technique than another. The crucial thing here is that the individual search around for the relaxation method best suited for his or her own personality and circumstance in life.

Finally, the findings of this study suggest that refinements are needed in the Personalized Relaxation Tape Method if it is to be a truly useful procedure. These refinements may involve the stress questionnaire, the narrator of the tapes, the speed or pace of the narration of the tapes, the duration of the tape, or the variety of exercises narrated in the tape. All or any of these changes could have an influence on the effectiveness of this technique.

Recommendations

Based on the findings and implications of this study, the following recommendations are suggested.

1. Replication of the present study after additional research has been conducted on modifications of the Personalized Relaxation Tape Technique to determine their effect on stress related variables.
2. Replication of the statistical analyses of previous research data using an appropriate statistical method to

determine if significant findings are truly significant.

3. Replication of the present study should be conducted using the subject's own voice in the relaxation tape.

4. Replication of the present study after modification of the stress questionnaire to make it less superficial and more reflective of the person's inner feelings and needs.

5. Replication of the present study and have subjects practice their relaxation technique immediately prior to the test.

6. Replication of the present study with the additional examination of the test grades of the subjects in each group.

CHAPTER BIBLIOGRAPHY

1. Benson, Herbert, John M. Peters, and Ruanne K. Peters, "Daily Relaxation Response Breaks in a Working Population: Effects on Blood Pressure," American Journal of Public Health, 67 (October, 1977), 954-959.
2. Colligan, Michael, Joseph J. Hurrell, and Michael J. Smith, "Occupational Incidence Rates of Mental Health Disorders," Journal of Human Stress, 3 (September, 1977), 34-39.
3. Friedman, Meyer, and Ray H. Rosenman, Type A Behavior and Your Heart, Greenwich, Connecticut, A Fawcett Crest Book, 1974.
4. Griffin, Patricia, and Carol Klun, "Laboratory Stress: What Causes It?" American Journal of Medical Technology, 46 (July, 1980), 490-494.
5. Holmes, David S., "Meditation and Somatic Arousal Reduction," American Psychologist, 39 (January, 1984), 1-10.
6. Russek, H. I., "Stress, Tobacco, and Coronary Heart Disease in North American Professional Groups," Journal of the American Medical Association, 192 (April, 1965), 89-94.
7. Stillman, Stephen M., and Betsi L. Strasser, "Helping Critical Care Nurses with Work-Related Stress," The Journal of Nursing Administration, 10 (January, 1980), 28-31.

APPENDIX

APPENDIX A

NORTH TEXAS STATE UNIVERSITY

P.O. Box 13857
DENTON, TEXAS 76203-3857

104

HEALTH EDUCATION

June 30, 1983

Consulting Psychologists Press Inc.
Palo Alto, CA

Dear Sirs:

My doctoral candidate, Mike Ramsey, and I would like to review the State-Trait Anxiety Inventory for possible use in a research study. The instrument, if selected, would be used solely for the purpose of research.

If you can send Mr. Ramsey a review copy, it would be appreciated. Thanking you in advance, I am

Sincerely yours,

Bryan J. Gray, D.Ed., Chairman
Division of Health Education

wk

June 20, 1984

Permissions Officer
Consulting Psychologists Press
P.O. Box 60070
Palo Alto, California 94306

Dear Sir:

I am a doctoral student at North Texas State University. I have previously purchased the STAI inventory by Spielberger et al. from your company. My major professor has previously written your company explaining that the STAI would be used solely for research purposes.

Since I am now in the process of writing my dissertation, I am requesting a letter from you granting me permission to incorporate certain facts about the STAI in my dissertation. Full and appropriate documentation and acknowledgements will be included in the dissertation.

Hopefully, I will hear from you in the very near future.

Sincerely,

Michael K. Ramsey
Doctoral Student
North Texas State University
Denton, Texas 76203

P.S. Please send any correspondence to my home address:

Michael K. Ramsey
Apt. 138
2000 Barnett Springs Rd.
Ruston, Louisiana 71270

**CONSULTING PSYCHOLOGISTS PRESS, INC.**577 College Ave. (P.O. Box 11636), Palo Alto, California 94306 (415) 857-1444

June 25, 1984

Mr. Michael Ramsey
2000 Barnett Springs Rd.
Ruston, Louisiana 71270

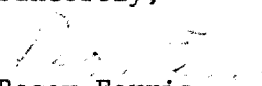
Dear Mr. Ramsey:

I was just about to mail my response to your letter of June 20th when I was given your letter of June 11th. It must have been tucked away on some ones desk.

I assume you are asking for some proof that you have permission to use the STAI in your dissertation. We do not provide such authorization, but instead require our purchasers to have certain qualifications before they are permitted to make a purchse. As a graduate student you had to provide authorization from your professor which you did.

S ince you purchased and did not request any permission from me, I have nothing in my file. I did check back to 6/83 to make sure. Sorry about this. You will just have to notify your committe that we do not authorize the use of our instruments for any specific research. Instead we make sure that out purchasers have the proper credentials to use the tests properly or are supervised by someone who has those credentials.

Sincerely,


Peggy Ferris
Permissions Editor

June 30, 1984

Ms. Peggy Ferris, Permissions Editor
Consulting Psychologists Press, Inc.
577 College Avenue (P.O. Box 11636)
Palo Alto, California 94306

Dear Ms. Ferris:

Thank you for your previous correspondence. In this letter I will attempt to be more precise in my description about what I plan to include in my dissertation concerning the STAI Manual, the instrument itself and any quotes.

I would like to reproduce the X-1 and X-2 subscales of the STAI instrument with your permission. I would include these subscales in the Appendix of the dissertation to allow the reader to view the actual instrument used to obtain the data.

Also, I have enclosed photocopies of the pages of the dissertation which contain quotes from the STAI Manual.

I hope this letter clarifies my previous request. As mentioned before, full documentation and acknowledgement will be included in the dissertation.

Thanks again for your assistance on my behalf. Hopefully, I will hear from you in the very near future.

Sincerely,

Michael K. Ramsey
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 577 COLLEGE AVENUE
 PALO ALTO, CALIFORNIA 94306

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 Ruston, LA. 71270

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Date 7/2/84



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

109

January 10, 1984

Dr. Robert Kee
Associate Professor of Pharmacy and
Assistant Dean
School of Pharmacy
Northeast Louisiana University
Monroe, Louisiana 71209

Dear Dr. Kee:

Enclosed is a copy of my dissertation proposal, Application for Permission to Use Human Volunteers in a Research Project, and Subject Consent Form. I hope these are to your specifications. If there is anything else you need in regard to my study, please do not hesitate to contact me.

I thank you and the committee for your time and effort on my behalf!

Sincerely,

Michael Kirby Ramsey
Instructor of Medical Technology



Monroe, Louisiana 71209

APPLICATION FOR PERMISSION TO USE HUMAN
VOLUNTEERS IN A RESEARCH PROJECT

Submitted to: Research Subcommittee on Experimental
Investigations Using Human Subjects
Northeast Louisiana University
Monroe, Louisiana 71209

Investigator: Michael K. Ramsey, M.S.
Instructor of Medical Technology
312 Nursing Building
School of Allied Health Sciences
Northeast Louisiana University

Title of Project: A Comparative Study of the Effective-
ness of the Relaxation Response and
Personalized Relaxation Tapes in Medical
Technology Students.

Level of Risk: Minimal

Date Submitted: January, 1984

NLU

Office of Research and Projects

RESEARCH PROJECT PROPOSAL FOR PROJECTS USING HUMAN SUBJECTS

Project Title: A Comparative Study of the Effectiveness of the Relaxation Response and Personalized Relaxation Tapes in Medical Technology Students. Accession: _____

Principal Investigator: Michael K. Ramsey
 Collaborators: _____
 Starting Date: February, 1984
 Termination: May, 1984
 Date of Proposal: January, 1984

Significance of Project: The Relaxation Response is currently a popular method to ameliorate the effects of stress. This relaxation technique is a modification of Transcendental Meditation and has been advocated by Harvard Medical School Researcher Herbert Benson. However, several studies on the effectiveness of the Relaxation Response have had conflicting findings. One possible explanation for this is that the Relaxation Response does not take into consideration individual differences. In the present study the researcher proposes to develop individualized relaxation tapes developed with the use of a stress questionnaire. The effectiveness of the personalized relaxation tapes will then be compared with the Relaxation Response.

Possible Risk to the Subject: One possible risk to the volunteer subject is the possibility that the subject's responses, which disclose physical and psychological characteristics of the subject, might become known to other persons. The risk will be minimized or prevented by not disclosing the subject's identity in any followup paper or summary sheet. The subject's identity will be used only in those instances where data collection makes such information vital.

Experimental Plan.

1. Volunteers for the study will be solicited from several medical technology classes.
2. Volunteers will be asked to complete a questionnaire concerning stress and its effect on their physical and psychological wellbeing. The subjects will also be asked to complete a volunteer consent form and the State-Trait Anxiety Inventory.

3. From the volunteers, subjects will be randomly selected for 3 different groups, 2 experimental and 1 control. The experimental groups will include a Relaxation Response Group and a Personalized Relaxation Group.
4. From the questionnaires of the subjects in the Personalized Relaxation Group, individual relaxation tapes will be developed for later use.
5. The two experimental groups will be instructed in their methods of relaxation. The Control Group will be told nothing.
6. Prior to beginning the experiment, 3 blood pressure and pulse rate readings will be taken of each subject in the 3 groups to obtain baseline data.
7. Following the collection of baseline data, the 2 experimental groups will be asked to practice their relaxation technique daily for the next 5 to 6 weeks.
8. During the student's final examination, the subjects in all 3 groups will again be asked to complete the State-Trait Anxiety Inventory and have their blood pressure and pulse rate taken.
9. The baseline and final data of the 3 groups will be compiled and analyzed.

METHOD FOR OBTAINING SUBJECT CONSENT: (Submit text of information to be given subject in obtaining advised consent on Subject Consent Form RAP 361.)

*Please see attached form.

Previous Work Done on This Project or Related Subjects:

Benson, Herbert, John Peters, and Ruane K. Peters, "Daily Relaxation Response Breaks in a Working Population: Effects on Blood Pressure," American Journal of Public Health, 67 (1977), 954-959.

Disapproved:

Signature, Department Head

Approved:

Signature, Department Head

Signature, Investigator

CONSENT TO ACT AS A RESEARCH SUBJECT
NORTHEAST LOUISIANA UNIVERSITY
SCHOOL OF ALLIED HEALTH SCIENCES

PROJECT TITLE

A COMPARATIVE STUDY OF THE EFFECTIVENESS OF THE
RELAXATION RESPONSE AND PERSONALIZED RELAXATION
TAPES IN MEDICAL TECHNOLOGY STUDENTS.

RESEARCH PROJECT
SUBJECT CONSENT FORM

Mr. Ramsey has requested that I participate in a study designed to compare the effectiveness of two relaxation techniques.

I understand that I should not expect any direct medical or health benefits from participating in this study but the investigator conducting the study expects to gain information on a new relaxation technique.

I have been told that I will be randomly assigned to one of three groups. I was also informed that the study requires that I:

- a. Complete a questionnaire concerning the physical and psychological effects of stress.
- b. Complete the State-Trait Anxiety Inventory on two different occasions (one time at the beginning of the study and one time during the final examination).
- c. Have my blood pressure and pulse rate taken three times at the beginning of the study and one time during the final exam.
- d. Practice a relaxation technique daily for a period of five to six weeks.
- e. Record the times and duration of the relaxation sessions on a calendar furnished by the researcher.

I understand that my participation is purely voluntary and that no financial compensation is involved.

I understand that I can decline to participate in the study without consequence to my course grade or other relationships with Northeast Louisiana University. Also, I understand that I can withdraw from the project with the same guarantee.

I believe I understand this form and the study and that I have been fully informed about the possible risks of the study.

Finally, I have been fully informed of the possible consequences of my participation in this study and agree to participate in the study to the best of my ability.

Signed:

Subject

Date



Northeast Louisiana University

College of Pharmacy and Health Sciences

School of Pharmacy

(318) 342-2180

116

January 31, 1984

MEMORANDUM

TO: Committee Members, Research Subcommittee on Experimental Investigations Using Human Subjects

FROM: R. D. Kee, Ph.D., Chairman 

There will be a meeting of the Research Subcommittee on Experimental Investigations Using Human Subjects at 10:00 a. m., Monday, February 6, 1984 in Sugar Hall room 150.

The agenda shall consist of consideration of the attached proposed project entitled "A Comparative Study of the Effectiveness of the Relaxation Response and Personalized Relaxation Tapes in Medical Technology Students" submitted by Mr. Michael K. Ramsey.

jh

Attachment

cc: Vice President Powers
Academic Deans
Dr. August Hochenedel
Mr. Michael Ramsey



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Pharmacy
(318) 342-2180

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February 7, 1984

MEMORANDUM

TO: Drs. John N. Davisson and Bobby L. Stephenson
Co-Chairmen, University Research Committee

FROM: R. D. Kee, Ph.D., Chairman, Research Subcommittee on
Experimental Investigations Using Human Subjects

RE: Subcommittee Minutes

The Research Subcommittee on Experimental Investigations Using Human Subjects met at 10:00 a.m., Monday, February 6, 1984 in Sugar Hall room 150. The following committee members were present: Dr. Robert D. Kee, Chairman; Dr. Edward Biersmith; Dr. John N. Davisson; Dr. Ed McGuire.

1. The committee reviewed a research proposal entitled "A Comparative Study of the Effectiveness of the Relaxation Response and Personalized Relaxation Tapes in Medical Technology Students" submitted by Mr. Michael K. Ramsey and voted to recommend approval of the proposed study as being in compliance with University policies and procedures related to research using human subjects pending the incorporation of the following changes in the Subject Consent Form:
 - a. Add parenthetical statement following "...of 3 groups" in paragraph three to identify the approximate number of participants in the study. A suggested statement is "(of # each)."
 - b. Rephrase withdrawal assurance in paragraph five to delete any reference to a student-University relationship between participants and include an assurance that the participants identity will be anonymous. A suggested alternative assurance statement for paragraph five is:

"I understand that I am free to withdraw from the study at any time without prejudice. Furthermore, I understand that all information I provide will be held in confidence and neither my identity nor participation will be revealed without my permission."

- c. A statement should be included to indicate that this project has been reviewed by an Institutional Review Board and that the subject is free to contact this board concerning the project. A suggested statement to this effect is:

"I understand the project has been reviewed by the Northeast Louisiana University Research Subcommittee for Experimental Investigations Using Human Subjects and that I am free to contact this review board through the Institution's Director of Research and Projects (telephone 342-4051) should I have any questions or concerns."

The meeting adjourned at 10:40 a. m.

jh

cc: Vice President Powers
Academic Deans
Committee Members
Dr. Hochenedel
Mr. Ramsey ✓



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

119

February 8, 1984

Dr. Robert Kee
Assistant Dean
College of Pharmacy and Health Sciences
Northeast Louisiana University
Monroe, Louisiana 71209

Dear Dr. Kee:

I just wanted to take this time to thank you for the time and effort you spent on my research proposal and the volunteer consent form. Once I complete the corrections suggested by you and the Research Subcommittee on Experimental Investigations Using Human Subjects, I will submit a copy to your office for your review. Since I do not have the names of the committee members, please convey my appreciation to them.

Again, thanks for your suggestions and assistance.

Sincerely,

Michael K. Ramsey
Department of Medical Technology



Monroe, Louisiana 71209



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

120

February 10, 1984

Dr. Robert Kee
Assistant Dean
College of Pharmacy and Health Sciences
Northeast Louisiana University
Monroe, Louisiana 71209

Dear Dr. Kee:

I received your letter yesterday containing the Minutes of the Research Subcommittee on Experimental Investigations Using Human Subjects. I concur with the suggestions made by the Subcommittee and have made the recommended changes in the consent form. Enclosed you will find four copies of the corrected form. I hope these changes meet the Subcommittee's specifications.

Again, thanks for your help on my behalf!

Sincerely,

Michael K. Ramsey, Instructor
Department of Medical Technology



Monroe, Louisiana 71209



Northeast Louisiana University
College of Pharmacy and Health Sciences
School of Pharmacy
(318) 342-2180

121

February 10, 1984

MEMORANDUM

TO: Committee Members, Research Subcommittee for Experimental
Investigations Using Human Subjects

FROM: R. D. Kee, Ph.D., Chairman *RDK*

RE: Attached Subject Consent Form

Attached is a revised subject consent form prepared by Mr. Michael Ramsey pursuant to the committee's action on Monday, February 6, 1984. I have examined the revised form and find it to be in full compliance with the committee's recommendations.

jh

cc: Vice President Powers
Dean Shrader
Dr. Hochenedel
Mr. Ramsey ✓
Dr. John N. Davisson
Dr. Bobby Stephenson

RESEARCH PROJECT
SUBJECT CONSENT FORM

Mr. Ramsey has requested that I participate in a study designed to compare the effectiveness of two relaxation techniques.

I understand that I should not expect any direct medical or health benefits from participating in this study but the investigator conducting the study expects to gain information on a new relaxation technique.

I have been told that I will be randomly assigned to one of three groups (of twenty each). I was also informed that the study requires that I:

- a. Complete a questionnaire concerning the physical and psychological effects of stress.
- b. Complete the State-Trait Anxiety Inventory on two different occasions (one time at the beginning of the study and one time during the final examination).
- c. Have my blood pressure and pulse rate taken three times at the beginning of the study and one time during the final exam.
- d. Practice a relaxation technique daily for a period of five to six weeks.
- e. Record the times and duration of the relaxation sessions on a calendar furnished by the researcher.

I understand that my participation is purely voluntary and that no financial compensation is involved.

I understand that I am free to withdraw from the study at any time without prejudice. Furthermore, I understand that all information I provide will be held in confidence and neither my identity nor participation will be revealed without my permission.

I understand the project has been reviewed by the Northeast Louisiana University Research Subcommittee for Experimental Investigations Using Human Subjects and that I am free to contact this review board through the Institution's Director of Research and Projects (telephone 342-4051) should I have any questions or concerns.

I believe I understand this form and the study and that I have been fully informed about the possible risks of the study.

Finally, I have been fully informed of the possible consequences of my participation in this study and agree to participate in the study to the best of my ability.

Signed:

Subject

Date

APPENDIX B



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

125

February 16, 1984

Dear Student:

I am conducting a study on stress in medical technology students. I need approximately ninety students in the study in order for the study to be valid. If you are interested in being in the study, please contact me in my office (Nur. Bldg. 312) or by phone (342-2452).

The study involves having your blood pressure taken three times, filling out a questionnaire concerning stress in your life, completing a stress inventory (takes about five minutes), signing a consent form, and practicing a relaxation technique at your leisure and the place of your choice for five to six weeks. During your final exam in a medical technology course, I will take your blood pressure and have you once again complete the stress inventory (five minutes).

Your cooperation in this study is very much appreciated!

Sincerely,

Michael K. Ramsey, M.S., M.T. (ASCP)



RESEARCH PROJECT
SUBJECT CONSENT FORM

Mr. Ramsey has requested that I participate in a study designed to compare the effectiveness of two relaxation techniques.

I understand that I should not expect any direct medical or health benefits from participating in this study but the investigator conducting the study expects to gain information on a new relaxation technique.

I have been told that I will be randomly assigned to one of three groups (of twenty each). I was also informed that the study requires that I:

- a. Complete a questionnaire concerning the physical and psychological effects of stress.
- b. Complete the State-Trait Anxiety Inventory on two different occasions (one time at the beginning of the study and one time during the final examination).
- c. Have my blood pressure and pulse rate taken three times at the beginning of the study and one time during the final exam.
- d. Practice a relaxation technique daily for a period of five to six weeks.
- e. Record the times and duration of the relaxation sessions on a calendar furnished by the researcher.

I understand that my participation is purely voluntary and that no financial compensation is involved.

I understand that I am free to withdraw from the study at any time without prejudice. Furthermore, I understand that all information I provide will be held in confidence and neither my identity nor participation will be revealed without my permission.

I understand the project has been reviewed by the Northeast Louisiana University Research Subcommittee for Experimental Investigations Using Human Subjects and that I am free to contact this review board through the Institution's Director of Research and Projects (telephone 342-4051) should I have any questions or concerns.

I believe I understand this form and the study and that I have been fully informed about the possible risks of the study.

Finally, I have been fully informed of the possible consequences of my participation in this study and agree to participate in the study to the best of my ability.

Signed:

Subject

Date

APPENDIX C

PERSONAL STRESS QUESTIONNAIRE

Demographic Information:

1. Name: _____
2. Age: _____
3. Address: _____
4. Phone number where you can be reached: () _____
5. Sex: _____

Stress Related Questions:

6. List below the leading cause of stress in your life.
 - a.
 - b.
 - c.
7. List the physical effects you notice when you are under pressure or stress.
 - a.
 - b.
 - c.
8. List the emotional (psychological) effects you notice when you are under pressure or stress.
 - a.
 - b.
 - c.
9. List below those activities which you use to relax.
 - a.
 - b.
 - c.

10. List below those activities which you think you would find relaxing or comforting although you do not regularly do them.

a.

b.

c.

11. List any medical problems you have or have had as a result of stress.

a.

b.

c.

12. I find taking tests in college stressful (true/false).

SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

131

NAME _____

DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and "rattled"	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④



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NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	①	②	③	④
22. I tire quickly	①	②	③	④
23. I feel like crying	①	②	③	④
24. I wish I could be as happy as others seem to be	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough	①	②	③	④
26. I feel rested	①	②	③	④
27. I am "calm, cool, and collected"	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them	①	②	③	④
29. I worry too much over something that really doesn't matter	①	②	③	④
30. I am happy	①	②	③	④
31. I am inclined to take things hard	①	②	③	④
32. I lack self-confidence	①	②	③	④
33. I feel secure	①	②	③	④
34. I try to avoid facing a crisis or difficulty	①	②	③	④
35. I feel blue	①	②	③	④
36. I am content	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind	①	②	③	④
39. I am a steady person	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	①	②	③	④

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RELAXATION RESPONSE DIRECTIONS

Directions: The following exercise is called the Relaxation Response. To be effective the student should strive to practice it at least one time a day and for a twenty minute duration.

1. Sit quietly in a comfortable position.
2. Close your eyes.
3. Deeply relax all your muscles, beginning at your feet and progressing up to your face. Keep them relaxed.
4. Breathe through your nose. Become aware of your breathing. As you breathe out, say the word, "ONE," silently to yourself. For example, breathe IN . . . OUT, "ONE;" IN . . . OUT, "ONE;" etc. Breathe easily and naturally.
5. Continue for ten to twenty minutes. You may open your eyes to check the time, but do not use an alarm. When you finish, sit quietly for several minutes, at first with your eyes closed and later with your eyes opened. Do not stand up for a few minutes.
6. Do not worry about whether you are successful in achieving a deep level of relaxation. Maintain a passive attitude and permit relaxation to occur at its own pace. When distracting thoughts occur, try to ignore them by not dwelling upon them and return to repeating "ONE." With practice, the response should come with little effort. Practice the technique once or twice daily, but not within

two hours after any meal, since the digestive processes seem to interfere with the elicitation of the Relaxation Response.

EXAMPLE OF CASSETTE RECORDING AND/OR INSTRUCTION SHEET
FOR PERSONALIZED RELAXATION EXERCISE

Recording and Direction Sheet:

Stage I:

" _____ (subject's name), this is the time to relax and clear your mind and body of the stress and tension of the day. Before we begin, get in a relaxed position, preferably in a sitting position. Loosen any restricting clothing. Sit or lie in an area where you can have some freedom of movement."

"Now, we will begin your relaxation exercise."

"As you sit/lie comfortably clear your mind of any troubling thoughts, relax all your muscles, and breathe through your nose. Now slowly tense your feet by raising your toes toward your shins. Hold this tension and as you do think of some event in your life that causes you stress or anxiety. This tensing period should last only a few seconds."

"Now, relax your feet and clear your mind of the stressful thought. Do this several times using different instances of stressful events, ex. _____

(Stressful events listed by subject on questionnaire).

(PAUSE 30 SECONDS IN THE CASSETTE TAPE TO GIVE THE PERSON TIME TO COMPLETE THE EXERCISE)

"Now, tense your legs by stretching them out with your toes straight. As you tense your legs think of the same stressful events you used previously (_____, etc.). Now relax. Repeat using a different stressful event.

(PAULSE 30 SECONDS IN THE CASSETTE TAPE TO GIVE THE PERSON TIME TO COMPLETE THE EXERCISE)

"Now, tense your arms by stretching them with your fingers pointed straight ahead. Again, think of a stressful event as you tense your arms and then relax and clear your mind of the event. Repeat using a different stressful event.

(PAULSE 30 SECONDS IN THE CASSETTE TAPE TO GIVE THE PERSON TIME TO COMPLETE THE EXERCISE)

"Now, tense the muscles in your forehead, and repeat the sequence of tense, think of stressful event, relax muscle and clear your mind.

(PAUSE 30 SECONDS IN THE CASSETTE TAPE TO GIVE THE PERSON TIME TO COMPLETE THE EXERCISE)

Stage II:

"Now, _____ (subject's name) as you sit/lie comfortably, again relax as previously. Clear your mind by concentrating on a nonsignificant word, such as "ONE." In your mind repeat this word, "ONE," each time you take a breath. If any disturbing thought enters your mind do not

give it any attention. Just return to repeating "ONE."
Continue this part of your exercise for 1½ minutes."

(PAUSE 1½ MINUTES IN THE CASSETTE TAPE TO GIVE THE PERSON
TIME TO COMPLETE THE EXERCISE)

Stage III:

"Now, _____ (subject's name) I want you to think of a stressful event, ex. _____ (stressful events listed by subject on a stress questionnaire) and repeat to your self, "I am _____ (subject's name) and I am a very capable person. I will prepare myself and I can overcome this problem." Now, visualize in your mind you overcoming the stress or problem.
(PAUSE 5 SECONDS IN THE TAPE)

"Think of a relaxing situation, ex. _____ (relaxing event from the stress questionnaire).
(PAUSE 10 SECONDS IN THE TAPE)

"You are so relaxed."
(PAUSE 10 SECONDS IN THE TAPE)

"Now, visualize another relaxing event, ex. _____ (relaxing event from stress questionnaire). You are not tense, you are completely relaxed."

"Now, take a few minutes to arouse yourself to your normal wakeful state. Do not stand up immediately. Rise slowly and take a few minutes before you walk around or drive a car.

PSYCHOMETRIC AND BIOMETRIC WORKSHEET

<u>Subject</u>	_____				_____			
	S.B.P./D.B.P./H.R./STAI				S.B.P./D.B.P./H.R./STAI			
_____	1.	_____	_____	_____ /	_____	_____	_____	_____ /
	2.	_____	_____	_____ /				
	3.	_____	_____	_____ /				
	Avg.	_____	_____	_____ /				
_____	1.	_____	_____	_____ /	_____	_____	_____	_____ /
	2.	_____	_____	_____ /				
	3.	_____	_____	_____ /				
	Avg.	_____	_____	_____ /				
_____	1.	_____	_____	_____ /	_____	_____	_____	_____ /
	2.	_____	_____	_____ /				
	3.	_____	_____	_____ /				
	Avg.	_____	_____	_____ /				
_____	1.	_____	_____	_____ /	_____	_____	_____	_____ /
	2.	_____	_____	_____ /				
	3.	_____	_____	_____ /				
	Avg.	_____	_____	_____ /				

APPENDIX D



Northeast Louisiana University
College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

141

Dear Student:

In checking my files I do not have the following forms or measurements from you:

Self-Evaluation Questionnaire (STAI)	_____
Stress Inventory	_____
Blood Pressure/Pulse Rate (none)	_____
Blood Pressure/Pulse Rate (not all three)	_____
Consent Form	_____

Please complete the enclosed forms if applicable or come by my office at your earliest convenience to have the remaining blood pressure/pulse rate measurements taken.

Your help is very much appreciated!

Sincerely,

Michael K. Ramsey
Instructor of Medical Technology



Northeast Louisiana University
College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

142

Dear Student:

This is just a short note to encourage you to continue with your relaxation exercise. The success of the study depends on your cooperation. Also, please record the times you perform the exercises on your relaxation calendar. Remember also, that the calendars will be taken up during your final examination in a medical technology course. Therefore, please bring these calendars with you to the final examination.

Thanks again for your cooperation!

Sincerely,

Michael K. Ramsey
Instructor of Medical Technology

Mar 15	Mar 16	Mar 17	Mar 18	Mar 19	Mar 20	Mar 21
yes ✓	yes ✓	missed	yes ✓	missed	yes ✓	yes ✓



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

143

Dear Student:

You have been randomly assigned to the Relaxation Response Group in the stress research study. Thus far, you should have had your blood pressure and pulse rate measured three times for baseline data and completed and returned two forms (the Stress Inventory, STAI, and the Stress Questionnaire). If you still have not accomplished one of the previous items, please see me at your earliest possible convenience.

If you have completed the above mentioned tasks, we are ready to begin the relaxation training. Enclosed you will find several forms. One of these is the directions for performing the Relaxation Response. If you are a member of one of my classes, one class period will be utilized to demonstrate this procedure. If you are absent that day or not a member of one of my classes you may come by my office and I will train you in the technique individually. Anyway, the procedure is very simple and most students are able to perform the exercise without difficulty. Try not to be impatient. It may take several sessions to reach the relaxed feeling you expect.

Another form enclosed is a calendar for you to record the times of your exercises. Remember, this is NOT for a grade. To be able to accurately analyze the data from the study, we need to know the approximate number of times of the exercises. Please record the times on the calendar after each exercise. I will need you to return the calendar to me on the day of your final exam. During the final exam I will ask you to complete the STAI once again and take the final blood pressure and pulse rate.

Your help and cooperation is very much appreciated!!!!!!

Sincerely,

Michael K. Ramsey
Instructor of Medical Technology





Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

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Dear Student:

You have been randomly assigned to the Relaxation Tape Group in the stress research study. Thus far, you should have had your blood pressure and pulse rate measured three times for baseline data and completed and returned two forms (the Stress Inventory, STAI, and the Stress Questionnaire). If you still have not accomplished one of the previous items, please see me at your earliest possible convenience.

If you have completed the above tasks, we are ready to begin the relaxation training. Enclosed you will find several forms. One of these is the directions for performing the Relaxation Tape Exercise. If you are a member of one of my classes, one class period will be utilized to demonstrate this technique. If you are absent from class that day or not a member of one of my classes, you may come by my office and I will train you in the technique individually. Anyway, the procedure is very simple and most students are able to perform the exercise without difficulty. Try not to be impatient. It may take several sessions to reach the relaxed feeling you expect.

Another form enclosed is a calendar for you to record the times of your exercises. Remember, this is NOT for a grade. To be able to accurately analyze the data from the study, we need to know the approximate number of times of the exercises. Please record the times on the calendar after each exercise. I will need you to return the calendar to me on the day of your final exam. During the final exam I will ask you to complete the STAI once again and take the final blood pressure and pulse rate.

Your help and cooperation is very much appreciated!!!!!!

Sincerely,

Michael K. Ramsey
Instructor of Medical Technology

P.S. If you do not have a cassette tapeplayer or cannot borrow one from a friend, see me and I will try to locate one for you.



Monroe, Louisiana 71209



Northeast Louisiana University

College of Pharmacy and Health Sciences
School of Allied Health Sciences
(318) 342-3030

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Dear Student:

You have been randomly assigned to the Control Group in the stress research study. If you have had your three baseline blood pressure readings and pulse rate readings and have completed the two forms [Stress Inventory (STAI) and the Stress Questionnaire] you are finished with the study until your final examination. During the final examination you will be asked to complete the STAI once again and have your blood pressure and pulse rate measured.

Thanks again for your cooperation!!!!!!

Sincerely,

Michael K. Ramsey
Instructor of Medical Technology

BIBLIOGRAPHY

Books

- Benson, Herbert, The Relaxation Response, New York, Avon Publishers, 1975.
- Bounds, William G., William H. Cormier, and Schuyler W. Huck, Reading Statistics and Research, New York, Harper and Row Publishers, 1974.
- Chobanian, Aram, Heart Risk Book, New York, Bantam Books, 1982.
- Everly, George, and Daniel Girdano, Controlling Stress and Tension, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1979.
- Frederick, A. B., Relaxation: Education's Fourth "R," Washington, ERIC Clearinghouse on Teacher Education Publishers, 1979.
- Friedman, Meyer, and Ray H. Roseman, Type A Behavior and Your Heart, Greenwich, Connecticut, Fawcett Crest Book, 1974.
- Gorsuch, Richard L., Robert E. Lushene, and Charles D. Spielberger, STAI Manual, Palo Alto, California, Consulting Psychologists Press, Inc., 1970.
- Jacobson, Edmund, Progressive Relaxation, Chicago, University of Chicago Press, 1974.
- Pelletier, Kenneth, Mind as Healer/Mind as Slayer, New York, Delta Books, 1977.
- Ravin, Abe, The Clinical Significance of the Sounds of Korotkoff, United States of America, Merck, Sharp and Dohme Publishers, 1972.
- Schwartz, Jackie, Letting Go of Stress, New York, Pinnacle Books, 1982.
- Selye, Hans, The Stress of Life, New York, McGraw Hill Book Company, 1978.

Selye, Hans, Stress Without Distress, New York, Signet Books, 1974.

Articles

- Allen, Roger, "Controlling Stress and Tension: Biomedical and Psychometric Evaluation of Programs at the University of Maryland," The Journal of School Health, 51 (May, 1981), 360-364.
- Beall, B. Sue, George T. Jessup, and Glen E. Richardson, "The Effects of a High School Stress Management Unit on Students' Heart Rate and Muscle Tension," The Journal of School Health, 52 (April, 1982), 229-233.
- Beiman, Irving, and others, "Progressive and Self-Induced Relaxation Training: Their Relative Effects on Subjective and Autonomic Arousal to Fearful Stimuli," Journal of Clinical Psychology, 37 (April, 1981), 309-315.
- Benson, Herbert, John Peters, and Ruane K. Peters, "Daily Relaxation Response Breaks in a Working Population: Effects on Blood Pressure," American Journal of Public Health, 67 (October, 1977), 954-959.
- Benson, Herbert, Ruane K. Peters, and Douglas Porter, "Daily Relaxation Response Breaks in a Working Population: Effects on Self-Reported Measures of Health, Performance and Wellbeing," American Journal of Public Health, 67 (October, 1977), 946-952.
- Beutler, Larry, Edward A. Charlesworth, and Sheila Murphy, "Stress Management Skills for Nursing Students," Journal of Clinical Psychology, 37 (April, 1981), 284-290.
- Biskin, Bruce H., "Multivariate Analysis in Experimental Leisure Research," Journal of Leisure Research, 15 (April, 1983), 344-358.
- Blanchard, B. Everard, "The Effects of Music on Pulse Rate, Blood Pressure and Final Exam Scores of University Students," The Journal of School Health, 49 (October, 1979), 470-471.
- "Brainswitch for Stress," Science Digest, 90 (July, 1982), 91.

- Burnish, Thomas, Randy Frost, and David Holmes, "Effects of Instructions and Biofeedback on EEG-Alpha Production and the Effects of EEG-Alpha Biofeedback Training for Controlling Arousal in a Subsequent Stressful Situation," Journal of Research in Personality, 14 (June, 1980), 212-223.
- Cacha, Frances B., "Teacher Burnout: Causes and Solutions," Kappa Delta Pi Record, 18 (Fall, 1981), 26-27.
- Colligan, Michael, Joseph J. Hurrell, and Michael J. Smith, "Occupational Incidence Rates of Mental Health Disorders," Journal of Human Stress, 3 (September, 1977), 34-39.
- Cunningham, D. A., John H. Howard, and P. A. Rechnitzer, "Work Patterns Associated with Type A Behavior: A Managerial Population," Human Relations, 30 (September, 1977), 825-836.
- DeVries, H., "Physical Education, Adult Fitness Programs: Does Physical Activity Promote Relaxation?", Journal of Physical Education and Recreation, 46 (February, 1975), 53-54.
- Domitor, Paul J., Barbara Goldman, and Edward J. Murray, "Effects of Zen Meditation on Anxiety Reduction and Perception Functioning," Journal of Counseling and Clinical Psychology, 47 (June, 1979), 551-556.
- Dougherty, John D., "Cardiovascular Findings in Air Traffic Controllers," Aerospace Medicine, 38 (January, 1967), 26-30.
- Feltz, Deborah L., and Daniel M. Landers, "Stress Management Techniques for Sport and Physical Education," Journal of Physical Education and Recreation, 51 (February, 1980), 41-43.
- Gardner, M. J., Aubrey Kagan, J. N. Morris, D. C. Pattison, and P. A. B. Raffle, "Incidence and Prediction of Ischaemic Heart Disease in London Busmen," Lancet, 2 (September, 1966), 553-559.
- Germerath, Stephen, "Stress and Tension Control Lessons as Part of Health Education," Health Education, 8 (May/June, 1977), 20.
- Greenberg, Jerrold S., "Stress, Relaxation and the Health Educator," The Journal of School Health, 47 (November, 1977), 522-525.

- Griffin, Patricia, and Carol Klun, "Laboratory Stress: What Causes It?", American Journal of Medical Technology, 46 (July, 1980), 490-494.
- Hales, Diane, "Psycho-Immunity," Science Digest, 89 (November, 1981), 12-14.
- Hancock, Trevor, "Beyond Health Care," The Futurist, 16 (August, 1982), 4-13.
- Holmes, David S., "Meditation and Somatic Arousal Reduction," American Psychologist, 39 (January, 1984), 1-10.
- "Holmes Scale," Family Health, 11 (January, 1979), 32.
- Holmes, Thomas, and Richard H. Rahe, "The Social Readjustment Rating Scale," Journal of Psychosomatic Research, 11 (1967), 213-218.
- Houston, Kent B., and Mark S. Pittner, "Response to Stress, Cognitive Coping Strategies, and the Type A Behavior Pattern," Journal of Personality and Social Psychology, 39 (January, 1980), 147-157.
- Ivancevich, John M., and Michael T. Matteson, "Stress and the Medical Technologist: A General Overview," American Journal of Medical Technology, 48 (March, 1982), 163-168.
- Kamholtz, J. Dennis, "The Effects of a Stress Reduction Workshop on Undergraduate College Level Students Possessing Type A Behavior Pattern," Health Education, 13 (November/December, 1982), 42-45.
- Katkin, Edward S., "The State-Trait Anxiety Inventory," The Eighth Mental Measurements Yearbook, edited by Oscar K. Buros, Highland Park, New Jersey, The Gryphon Press, 1978, pp. 1088-1096.
- Keller, Steven, and others, "Suppression of Immunity by Stress: Effect of a Graded Series of Stressors on Lymphocyte Stimulation in the Rat," Science, 213 (September, 1981), 1397-1399.
- LaGrand, Louis E., "Reducing Burnout in the Hospice and the Death Education Movement," Death Education, 4 (Spring, 1980), 61-75.

- Macek, Catherine, "Of Mind and Morbidity: Can Stress and Grief Depress Immunity?", J.A.M.A., 248 (July, 1982), 405-407.
- Miller, Donna M., and Jean M. Williams, "Administration: Stress and How to Manage It," Physical Educator, 39 (October, 1982), 116-120.
- Prager-Decker, Iris J., "The Efficacy of Muscle Relaxation in Combating Stress," Health Education, 11 (January/February, 1980), 40-42.
- Rapley-Evans, Suzanne, "The Signs of Stress," Corporation Fitness and Recreation, 2 (February/March, 1983), 18-24.
- Reed, Michael, and Carl Saslow, "The Effects of Relaxation Instructions and EMG Biofeedback on Test Anxiety, General Anxiety, and Locus of Control," Journal of Clinical Psychology, 36 (July, 1980), 683-690.
- Richter, Judith M., and Rebecca Sloan, "A Relaxation Technique," American Journal of Nursing, 79 (November, 1979), 1960-1964.
- Riley, Vernon, "Psychoneuroendocrine Influences on Immuno-competence and Neoplasia," Science, 212 (June, 1981), 1100-1109.
- Rogers, Donna Ann, "Stress and Job Satisfaction of Clinical Laboratory Scientists," American Journal of Medical Technology, 49 (March, 1983), 183-188.
- Russek, H. I., "Stress, Tobacco, and Coronary Heart Disease in North American Professional Groups," J.A.M.A., 192 (April, 1965), 189-194.
- Sachs, Michael, "Running Therapy: Change Agent in Anxiety and Stress Management," Journal of Physical Education, Recreation, and Dance, 153 (October, 1982), 44-45.
- Schuler, Randall S., "Stress Management for College Administrators," Educational Record, 62 (Summer, 1981), 14-18.
- Shulruff, Faith, "Getting at the Roots of Laboratory Stress," Medical Laboratory Observer, 15 (April, 1983), 115-122.

Shumate, Michael, and Everett Worthington, "Imagery and Verbal Counseling Methods in Stress Inoculation Training for Pain Control," Journal of Counseling Psychology, 28 (January, 1981), 1-6.

Stillman, Stephen M., and Betsi L. Strasser, "Helping Critical Care Nurses with Work-Related Stress," The Journal of Nursing Administration, 10 (January, 1980), 28-31.

"Stress May Damage Cell Immunity," Science News, 113 (March, 1978), 151.

Swogger, Glenn, "Toward Understanding Stress: A Map of the Territory," The Journal of School Health, 51 (1981), 29.

"Timex Healthcheck," The Canadian Nurse, 79 (September, 1983), 3.

Unpublished Materials

Caplan, R. D., "Organizational Stress and Individual Strain: A Social-Psychological Study of Risk Factors in Coronary Heart Disease Among Administrators, Engineers, and Scientists," unpublished doctoral dissertation, School of Education, University of Michigan, Ann Arbor, Michigan, 1972.

Reiter, Marion A., "Effects of a Physical Exercise Program on Selected Mood States in a Group of Women Over Age 65," unpublished doctoral dissertation, School of Education, Columbia University Teachers College, New York, New York, 1981.

Wisdom, Barry Lee, "An Empirical Investigation of Sources and Patterns of Stress Among Hospital Administrators," unpublished doctoral dissertation, School of Education, University of Arkansas, Fayetteville, Arkansas, 1981.

Zentner, Rod William, "Psychological Effects of a Running Program," unpublished doctoral dissertation, School of Education, University of Oregon, Eugene, Oregon, 1981.