AN ABSTRACT OF THE THESIS OF

Jan Louise Irving for the degree of Doctor of Philosophy in Education presented on October 30, 1995. Title: The Effect of PACE on Self-Reported Anxiety and Performance in First Year Nursing Students.

Abstract approved: __________________________________________

Thomas P. Evans

The purpose of this study was (a) to determine the effect of a four-step learner readiness profile: positive, active, clear, and energetic (PACE) on self-reported anxiety in first year nursing students before skill performance tests, and (b) to determine the effect of PACE on the performance of first year nursing students on skill tests. The subjects consisted of 27 first year nursing students enrolled at Chemeketa Community College in Salem, Oregon.

Two multiple baseline designs across subjects were employed. Volunteers were randomly divided into three subject groups. Baseline data were collected on 5 skill tests for Group 1, 8 skill tests for Group 2, and 11 skill tests for Group 3. The treatment variable, PACE, was implemented once the baseline was established for self-reported anxiety and performance.

Findings indicated that PACE was an effective treatment for reducing self-reported anxiety by first year nursing students before skill performance on tests. The students also demonstrated an increased percentage of successful skill performance tests after completion of PACE.

It was concluded that PACE was an efficient and effective method for reducing self-reported anxiety and for increasing skill performance test success in first year
nursing students enrolled at Chemeketa Community College, Salem, Oregon. It was recommended that PACE be implemented in the first year of the nursing program.
The Effect of PACE on Self-Reported Anxiety 
and Performance in First Year 
Nursing Students

by

Jan Louise Irving

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Dean of Graduate School

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Jan Louise Irving, Author
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CHAPTER I

INTRODUCTION

Students have historically experienced stress in nursing programs. The need to lower this anxiety in this group of students has been documented in numerous studies (Bell, 1991; Charlesworth, 1981; Lewis, Gadd & O'Connor, 1987; Lindop, 1991; Russler, 1991; Speck, 1990; Stephens, 1992; Wernick, 1984; Windsor, 1987). Activities inherent within nursing programs are known to be anxiety producing and include the academic testing of both theory and skill performances, clinical experiences, frequent faculty evaluations, changing of clinical sites, hospital nursing personnel, and instructors to name a few (Blainey, 1980; Garrett, Manuel, & Vincent, 1976; Joachim & Thorne, 1980; Meisenhelder, 1987; Windsor, 1987).

A pattern of nursing student anxiety emerges from a review of the literature. Anxiety builds as the complexity of the skills and theoretical content increase throughout the program. An anticipated reduction in anxiety is common towards the end of a nursing program (Lindop, 1991; Windsor, 1987). Contributing to this finding are the possible factors of a decrease in requirements to learn new skills and theoretical content, a reduced fear of failure or error in the clinical area, increased confidence, and a feeling of successfully accomplishing a career goal.

Nursing faculty have over the years studied various anxiety reduction techniques, yet none have successfully helped students cope with the anxiety-provoking events of nursing education nor have they been practical for the clinical setting. These
techniques include stress management (Charlesworth, 1981; Russler, 1991), imagery (Speck, 1990; Stephens, 1992), relaxation (Charlesworth, 1981; Russler, 1991; Summers, Hoffman, Neff, Hanson & Pierce, 1990; Wernick, 1984), stress inoculation (Mandering & Yonkman, 1985), and music (Summers et al., 1990). A quiet space, special equipment, and/or adequate time of 15 to 45 minutes for a technique to take effect are most often required. In contrast, practical and appropriate coping strategies would include reasonable time requirements; unlimited, on-demand accessibility; practicality; ease of use; zero equipment demands; and appropriateness for both educators and students in any educational setting. None of the reviewed strategies included these qualities. For this reason nursing faculty continue to view anxiety as a variable worthy of study (Beck & Srivastava, 1991; Charlesworth, 1981; Russler, 1991). Add as well, budgetary constraints and capped enrollments and student retention is an even greater concern (Abdur-Rahman, Femea, & Gaines, 1994; Wold & Worth, 1990). An inevitable threat to retention arises when students are stressed and anxious beyond their ability to cope.

Evidence indicates that high anxiety in nursing students is more often attributed to the clinical component rather than the theoretical component of programs (Bell, 1991; Blainey, 1980; Erler & Rudman, 1993; Lindop, 1991; McKay, 1978). Anxiety is a variable which nursing educators view as needing attention throughout the students’ program (Lindop, 1991; Windsor, 1987).

The amount of anxiety most nursing students cope with at some time during their nursing program varies depending on individual resources to meet the demands. An individual’s ability to cope with stressors requires external support, internal psychological resources, and available, appropriate coping strategies (Lazarus & Folkman, 1984).
Anxiety occurs when distress, the negative aspect of stress, exceeds an individual’s means of dealing with it, in turn threatening one's self-esteem or sense of security. One's ability to meet real or perceived values and goals as set by self or others remains uncertain. The anxiety persists as long as the individual's perception of the threat remains. Its intensity is proportional to the severity of the perceived individual threat. Physiological changes are evidenced which include increased heart rate and blood pressure, muscle tension or weakness, perspiration, and the emotional expressions of nervousness, fear, and/or worry (Lazarus & Folkman, 1984).

As a subjective emotional response to an external stressor, anxiety is associated with feelings of uncertainty and helplessness (Beck & Emery, 1985; Townsend, 1993). Low levels of anxiety serve as motivators and thus enhance performance and learning. Problems occur only when the level of anxiety escalates to the point where it interferes with performance and learning.

Peplau (1963) has described four levels of anxiety: (a) mild, (b) moderate, (c) severe, and (d) panic. Mild anxiety rarely interferes with performance and actually sharpens the senses for productivity. Learning is enhanced as awareness of the environment is heightened. Physical characteristics include slight restlessness and irritability, but they are rarely experienced as distressful. Moderate anxiety is characterized by a reduced attention span and ability to concentrate, as well as to a diminished perceptual field. The autonomic responses include increased heart and breathing rate, increased perspiration, abdominal distress, increased muscular tension, restlessness, and increased rate of speech, volume, and pitch. The moderately anxious person is less alert to events occurring within the environment.

Severe anxiety has a stronger autonomic response than the moderate level. A person's attention span is very limited, concentration is lacking, and there tends to be
an over focus on specific details or extraneous factors. At the panic level of anxiety, a person may have hallucinations and wild actions or extreme withdrawal.

Learning is inhibited at the severe and panic levels of anxiety. Although learning occurs at the moderate level, it does not do so optimally because the body's autonomic response decreases one's ability to concentrate. At the mild level of anxiety, learning is enhanced and a person is able to function optimally.

Cattell and Scheier (1958) made the first distinction between trait and state anxiety. Spielberger (1966; 1972) further developed this distinction. According to Spielberger (1983), trait anxiety refers to a more or less constant anxiety-proneness in an individual. In contrast, he defines state anxiety as a transitory emotional state which fluctuates over time and which is characterized by feelings of tension, apprehension, nervousness, worry, and an arousal of the autonomic nervous system.

Individuals high in trait-anxiety perceive threats more often and more severely than individuals low in trait-anxiety. Coping strategies are ineffective in reducing trait anxiety. State anxiety, in contrast, may be reduced through effective coping strategies.

In distress, the indexing and retrieval capacities of the brain are reduced. The brain's short-term memory is also inhibited (Caine & Caine, 1990, 1991; Sylwester & Cho, 1993; Sylwester, 1994). Miller's (1956) seminal work on memory further concludes that immediate memory is limited to between five and nine chunks of information, depending on the size of the chunks. Any factor negatively affecting short-term memory has considerable consequence to learning. Task-irrelevant cognitive activities are among the negative factors and they do impair the quality of performance by limiting the capacity of working memory (Eysenck, 1979). Anxiety falls into the category of task-irrelevance and is in direct contrast to enthusiasm and alertness (Caine & Caine, 1991). Pagana (1989) specifically addresses threat and challenge as they affect learning and
expands upon the theory that anxiety downshifts learners. Downshifted learners cannot take charge of their own learning and become dependent on external factors (Caine & Caine, 1991). Individuals experiencing this downshift, however, can adapt to their distress by using appropriate coping skills to either reduce or avoid becoming anxious.

A White House Taskforce was formed in 1990 to address the issue of innovations in education which look at brain-based learning. Early in the 1990s, The National Learning Foundation identified educational kinesiology as one of the top ten successful whole-brain learning innovations and has included it in their Agile Learner training materials (Messier & Engel, 1993). The Foundation is a network of leaders across disciplines which makes leading-edge learning methods and tools available to schools, educators, and corporations. They are currently piloting the Agile Learner program in preparation for nationwide training. One part of the program's goal is to produce learners who are self-managed team players who effectively cope with personal and workplace stress.

The Educational Kinesiology Foundation was established in 1987 by Dr. Paul Dennison, an educator. His background in curriculum development and experimental psychology at the University of Southern California provide the foundation for his observations and resultant connections between physical movements and academic achievement. Dennison has been using the movements in education since 1969.

Hannaford (1993), a neurophysiologist and educator, has described the physiology behind the various aspects of educational kinesiology. Her work relates the physiological benefit of each movement to learning and assists educators on how and when to use the movements. Both educators and students learn the purpose of each movement for prescriptive application and/or for taking self-responsibility in coping, learning, and learning readiness (Dennison & Dennison, 1989b; Hannaford, 1993).
Purpose of the Study

This study is concerned with the influence of a four-step learner readiness profile: positive, active, clear, and energetic (PACE) on state anxiety in nursing students before skill performance tests and in their performance on these same skill tests. PACE is a four-step preactivity of educational kinesiology movements, PACE increases learner readiness (Dennison & Dennison, 1989a). An increase in learning readiness should reflect as reduced anxiety in nursing students. As anxiety decreases, learner performance should increase. Used alone or before other educational kinesiology movements as a readiness process, PACE impacts both the physical and emotional aspects of learning (Dennison & Dennison, 1989a).

As PACE is an acronym for positive, active, clear, and energetic, being in PACE means that the subject has enough water in his/her body to make the necessary electrical connections for thinking, that there is enough oxygen for clear thinking, that the right and left sides of the brain are communicating, and that the frontal lobe is connected to the limbic and occipital areas of the brain. Taken in isolation, the four letters of the acronym present a four-step learner readiness profile. The first step, energetic, reflects that there is enough water in the body to make the electrical connections needed for learning. The second step, clear, reflects the oxygenation of the brain through the carotid arteries and the state of the subject's wakefulness. The third step, active, reflects the ability of the subject for lateral thinking or the crossing of the midline, a side to side brain connection. The fourth step, positive, reflects the connection between memory, reasoning, and the senses, which are front to back brain connections.
If PACE does increase learner readiness, then a decrease in state-anxiety should be anticipated in settings which are known to be anxiety provoking. Educators are being encouraged to use innovations which promote a state of whole-brain learning and reduce anxiety in the academic setting. It is generally accepted that a reduction in anxiety makes learning less painful. Educational kinesiology is one of the innovative tools promoting the goal of anxiety reduction in an academic setting.

**Physiology of PACE**

The first step, energetic, is based on the fact that water is the keystone for proper nerve function and learning. Since the human brain uses 20 percent of the body's energy (Hole, 1993) and the eyes use 25 percent of the body’s energy (Liberman, 1991) water for learning seems evident. Not only does water ready the human engine for learning, but it keeps it going. It is essential for the dissolving of body salts which maintain proper electrolyte activity in the human system and thus assists in the transport of oxygen to maintain the sodium-potassium pump. Water increases the affinity of hemoglobin to carry oxygen by 100 to 1,000 times (Colombo, Rau, & Parsegian, 1992; Pennisi, 1991).

A functioning electrical system implies energy, and the human body is an electrical system. The human nervous system requires water to transfer communications between dendrites and for dendritic growth. Water is an essential in the chemical bonds producing adenosine triphosphate (ATP). The process of forming ATP involves oxidation of hydrogen atoms from water molecules and the bonding of phosphate to adenosine diphosphate (ADP). ATP is the energy that is required for cellular activity and muscle movement (Hole, 1993). Water is required for the brain to process stored and new information, both of which are influenced by the availability of electrolytes as
cell membrane polarity changes occur. Efficient thinking and focused attention are promoted by drinking water.

The function of the brain is altered by foreign chemicals and imbalances in required water, salts, and neurotransmitters. The regular drinking of water is important to humans since the human body cannot store appreciable amounts of water, has a limited range of water levels, and excretes excess water (Hole, 1993; Teyler, 1978; Tortora, 1990).

Indoor environments cause measurable decreases in body fluid levels. As a result, the average learner is dehydrated in the educational environment (Dennison & Dennison, 1989b; Hannaford, 1993; Ward & Daley, 1993). This dehydration can lead to poor performance. It is recommended a person drink 8-15 glasses of water a day depending on body size, weather, and activity level. It is my experience that students in an academic setting drink very little water during the 3 hour blocks of nursing lectures. Also, students drink considerable amounts of carbonated and caffeinated beverages. Any drink besides water must first be metabolized before being accessible to the brain. Plain water at near body temperature is immediately available for use (Hannaford, 1993).

The second step, clear, is the activation of two acupressure points called the kidney 27 points. These points are located between the first two ribs near the sternum and above the carotid arteries. The massaging of these points increases oxygenation to the brain through the carotid arteries. The brain uses about one-fifth of the body's oxygen in order to support its complex functions (McCrone, 1991). The kidney 27 points are also related to lung and brain function. These acupressure points affect a specific cell within the nerve cell, the glial cells, which support, nourish and generate
the body's nerve growth factor, thus influencing the repair of damaged neurons and the development of new ones (Restak, 1988).

The second part of this step is holding one's hand over the navel area to bring attention to the gravitational center. This focused attention stimulates the semicircular canals which in turn stimulate the reticular activating system (RAS) in the brain stem. The RAS then creates a state of wakefulness through the neocortex. The light massaging of the kidney 27 points while simultaneously bringing attention to the navel area assists learners by increasing the oxygenation of the brain, promoting a state of wakefulness and alertness, and promoting dendritic growth.

The third step, active, is a lateral crossover movement called cross crawls. This action stimulates both cerebral hemispheres, thus increasing the myelination of motor and sensory fibers across the corpus callosum. Cross crawls originated in the 1930s and were used in educational settings in the 1960s (Delacato, 1963). The most common cross crawl is to touch one elbow to the opposite knee (Brewer & Campbell, 1991). This activity may be done sitting or standing. The more the person turns the upper body in the direction the elbow is moving the more the semicircular canals are activated. It is the movement of the crystals of calcium carbonate in the canals which activates the reticular activating system, which in turn activates the neocortex to an alert state. Cross lateral movements integrate the left and right hemispheres. The brain has a normal 90 minute cycle during the day which shifts from the extremes of either right and left sided dominance into an integrated state in the middle (Block, Arnott, Quigley, & Lynch, 1989; Jensen, 1994; Kennedy, Ziegler & Shannahoff-Khalsa, 1986). Cross crawls assist the learner to be in an alert state and to move more freely between the right and left hemispheres.
The fourth and last step is positive. In a position called hook-ups, a person first crosses his/her legs at the ankles and then simultaneously crosses his/her arms with hands interlocked and brought up to their chest. The tongue is on the roof of the mouth with the tip touching just behind the front teeth. The second phase of hook-ups is to uncross both arms and legs, put fingertips together, and the tongue remains in the same position (Dennison & Dennison, 1989b; Hannaford, 1993). The tongue thereby accesses an acupressure point on the roof of the mouth which activates the frontal lobe (motor cortex), parietal lobe (sensory cortex) and the limbic system. The sphenoid bone is in direct contact with the tongue tip position and is thus connected to the mid-brain organs, which are part of the limbic system. The activation of these three areas, frontal lobe, parietal lobe, and limbic system, connects memory, emotions, and higher reasoning centers. In working with over 5,000 students, Hannaford (1993) found that hook-ups consistently aid in the focusing and relaxing of the survival reflex so that learning can occur. Students who are hyperactive typically have a reduced frontal lobe activity (Zametkin, Nordahl, Gross, King, Semple, Rumsey, Hamburger, & Cohen, 1990). During times of stress, the limbic system and survival centers of the brain are more active, thus making it harder to connect with the frontal lobe. Hook-ups assist the learner to make choices from an integrated state rather than from a survival or emotional state, the result being an increased focus, relaxation, and ability for rational thinking.

In summary, PACE assists the learner physiologically by increasing cerebral blood flow and electrical activity to the whole brain resulting in an alert state and a brain which is activated for reasoning. Control of and improvement in one’s behavior, focus, and memory also results. These simple movements take less than ten minutes, require only water, and may be done in any setting.
Theoretical Framework of the Study

The theoretical framework for the study is drawn from a critical review of the existing research on educational kinesiology, anxiety and nursing students, and anxiety and performance in educational settings. The emphasis is on nursing students. The following is a summary of the theoretical framework for this study:

1. State anxiety appeared to be positively correlated with trait anxiety (Burton, 1971; Donat, 1983; King, Heinrich, Stephenson, & Spielberger, 1976; Lamb, 1973; Leherissey, O'Neil, Heinrich, & Hansen, 1973; O'Neil, 1972; Powell & Verner, 1982; Russler, 1991; Weinberg & Ragan, 1978). In addition, trait anxiety is not effected by coping strategies, so there is probably little an educator can do to influence a student's trait anxiety. State anxiety appeared to be the most appropriate focus for an educational investigation.

2. State anxiety appeared to be negatively correlated to academic performance (Alpert & Haber, 1960; Dobson & Markham, 1992; Donat, 1983; Friend, 1982; Kanekar, 1977; King et al., 1976; Mandler & Sarason, 1952; Matthews & Burnett, 1989; McCann & Meen, 1984; O'Neil, 1972; Tennyson & Woolley, 1971). Students with higher state anxiety scores tended to be more at risk for lower academic performance.

3. Student anxiety seemed to be higher in the nursing skills laboratory and in the clinical components of nursing programs rather than in other anxiety provoking situations (Beck & Srivastava, 1991; Pagana, 1989; Pagana, 1990; Parkes, 1985; Sellek, 1982; Windsor, 1987).

4. The nursing skills laboratory was more stressful for students than the clinical component of the nursing program (Megel, Wilken, & Volcek, 1987).
5. Anxiety tends to increase as the complexity of skills and the theoretical content increase throughout the program. A reduction in anxiety occurs at the end of a nursing program (Lewis et al., 1987; Lindop, 1991; Windsor, 1987). Studying students in consecutive terms before the last term would suggest therefore that the anxiety level would increase during the investigation and thus reflect a more accurate degree of anxiety reduction.

6. The majority of stress reduction techniques require unmanageable timeframes and are short-lived or have no significant effect on state or trait anxiety (Berger & Owen, 1982; Charlesworth et al., 1981; Howell & Swanson, 1989; Johnson & Spielberger, 1968; Speck, 1990; Stephens, 1992; Summers et al., 1990; Wernick, 1984).

7. Educational kinesiology investigations suggest that the educational kinesiology activities reduce anxiety and have a resultant improvement in motor and academic performance, and/or classroom and home behavior (D. H. L. Carroll, 1992; L. Carroll, 1992; Cox, 1992; Gardner & Gardner, 1992; Hannaford, 1992; Khalsa, Morris, & Sifft, 1988; McGovern, 1992; Primost & Shar' abi, 1992; Sifft & Khalsa, 1991; Whetton, 1992).

8. No investigation has isolated the impact of the four-step preactivity for all educational kinesiology activities referred to as PACE. If PACE has been part of any treatment variable, it has not been clearly described in the studies reviewed. Several studies used one or more aspects of PACE: Hook-ups were used in three studies (D. H. L. Carroll, 1992; Khalsa et al., 1988; Sifft & Khalsa, 1991), brain buttons were used in one study (D. H. L. Carroll, 1992), cross crawls were used in two studies (D. H. L. Carroll, 1992; Khalsa et al., 1988), and water was not a documented part of any study.
9. The physiology behind the PACE movements is directly couched in the disciplines of human physiology and applied kinesiology (Dennison & Dennison, 1989b; Hannaford, 1993).

Research Hypotheses

The null hypotheses are:

1. There is no significant difference in self-reported anxiety between nursing students who complete the PACE process prior to a skill performance test and the self-reported state anxiety of students who do not complete PACE.

2. There is no significant difference in performance between students who complete the PACE process and students who do not complete PACE.

Assumptions

1. Evidence for supporting validity and reliability was not provided in most investigations using instruments measuring state anxiety.

2. Self-reporting data has been shown to be an accepted form of data collection in multiple baseline designs.

3. Students will honestly document their feelings before each skill performance test.

4. The nature of the existing investigations in educational kinesiology suggest the need for a study on the effect of PACE on self-reported anxiety.

Limitations

The study is limited to the 1994 class of first year nursing students in the Associate Degree Nursing Program at Chemeketa Community College, Salem, Oregon.
Delimitations

This study is not intended to be an evaluation of student performance or the nursing program. No attempt will be made to evaluate students or faculty based on the self-reported data.

Definition of Terms

1. **Anxiety** refers to a form of stress or distress. It is a fight or flight, emotional, reactive response to a stressor. It is a one-sided, lateralized, rigid, stuck, externally controlled, incomplete, downshifted brain response. It is the inability to isolate environmental stimuli. It occurs when the nervous system loses its flexibility and is unable to shift between the lower brain areas and the cerebral cortex. It is identified physiologically by elevated blood pressure, increased pulse rate, muscle tension or weakness, and/or perspiration. It is expressed by an inability to control feelings and thoughts and thus consciousness.

2. **Downshifting** refers to a reaction to threat manifested by a constricting of brain function. The individual literally shifts down from the neocortex (upper or thinking brain) to the more automatic limbic system (middle or feeling brain) and reptilian complex (lower or survival brain). The outcomes of downshifting are a sense of helplessness and a narrowing of the perceptual field.


4. **Neurotransmitter** refers to any number of chemicals that modify or result in the transmission of nerve impulses between synapses. They are released from synaptic knobs into synaptic clefts. They bridge the gap between the presynaptic and
postsynaptic neuron. Each synaptic knob may store as many as 10,000 neurotransmitter molecules and may be either excitatory or inhibitory.

5. **PACE** refers to an acronym, positive (hook-ups), active (cross crawls), clear (kidney 27 points), and energetic (water), the four states necessary for whole brain learning (Dennison & Dennison, 1989a).

6. **Skill performance test** refers to a weekly return demonstration of a clinical skill which is evaluated by nursing faculty according to a standard list of performance criteria. All critical elements of the performance test must be successfully completed in order for the student to satisfactorily pass the skill performance test and thus be eligible to use the skill in a clinical setting. Failure to complete skill performance tests in a timely manner can result in failure in the nursing program.

**Methodology**

The research design used in this study consists of two multiple-baselines across subjects for both performance and self-reported feelings of anxiety. The sample was composed of 27 students enrolled in the first year of a nursing program. The students were given an informed consent sheet and asked to volunteer for the study (see Appendix B for sample consent form). The subjects were randomly assigned to three treatment groups. The scores of the winter term skill performance tests and subjects' self-reported feelings before each skill performance test were used as baselines. The first group was given the PACE treatment before their skill performance tests starting the second week of spring term while Group 2 and Group 3 baselines were simultaneously monitored. Once a change was noted in Group 1, Group 2 started the treatment phase while Group 3's baseline was monitored. The process was repeated for Group 3.
Each skill has an individual skill checklist (see Appendix C for a sample of a skill checklist and Appendix D for a list of skills). The skill checklist is a detailed listing of the performance-based outcomes for a specific skill. Students earn a pass or fail score on each skill performance test. Data was quantified.

All first-year students, participants and non-participants self-reported their feelings on a copy of the weekly skill checklist just before each skill performance test. The self-reported data was quantified for self-reported feelings of anxiety. The feelings of anxiety were identified by a list of textbook signs and symptoms associated with the concept of anxiety.

Outline of the Remainder of the Thesis

The remainder of the study is organized in the following manner. Chapter II presents a review of the related literature. It is divided into three sections (a) anxiety and nursing students, (b) anxiety and performance, and (c) educational kinesiology. Chapter III presents the methodology of the study. Chapter IV reports the analysis and interpretation of the study findings. Chapter V presents a summary, conclusions, and recommendations for future practice and research.
CHAPTER II

REVIEW OF THE LITERATURE

This chapter is a critical review of 64 research reports focusing on anxiety and nursing students, anxiety and performance, and educational kinesiology conducted between 1952 and 1993. It is organized into five sections. Section one focuses on anxiety and nursing students. It includes 19 research reports. Section two is devoted to 33 research reports on the relationship of anxiety and performance. Section three focuses on 12 research reports using educational kinesiology. The fourth section is a summary of the conclusions drawn from the critical review. The fifth section is a historical review of the multiple baseline design and the use of self-reporting for data collection.

Anxiety and Nursing Students

Nineteen investigations were identified which focused on anxiety and nursing students (Beck & Srivastava, 1991; Bell, 1991; Charlesworth, Murphy, & Beutler, 1981; Erler & Rudman, 1993; Howell & Swanson, 1989; Lewis, Gadd, & O'Connor, 1987; Lindop, 1991; Megel, Wilken & Volcek, 1987; Pagana, 1989; Pagana, 1990; Parkes, 1985; Phillips, 1988; Russler, 1991; Sellek, 1982; Speck, 1990; Stephens, 1992; Summers, Hoffman, Neff, Hanson, & Pierce, 1990; Wernick, 1984; Windsor, 1987).

Charlesworth, E. A., Murphy, S., and Beutler, L. E. (1981) studied the effectiveness of a 10-session stress management program which included progressive relaxation, deep muscle relaxation, visual imagery, autogenic training, and modified desensitization. Two clinical groups of nursing students (N = 28) served as subjects.
The control and experimental groups were assigned to different instructors. No mention was made of randomization. The experimental group experienced the treatment in 1-hour sessions biweekly for 5 weeks with daily practice at home. The State-Trait Anxiety Inventory (STAI) was administered to measure the dependent variable. Stress levels were measured three times before treatment as well as before the midterm and final examinations. The data were analyzed using a t-test. The reported findings indicate a significant difference in the experimental group on the mean trait anxiety scores between the pretest and posttest scores ($p < .05$). No significant difference in state anxiety was reported. Subjects commented that progressive relaxation took too much time to implement prior to a testing situation and that it would be of value to look at stress situations beyond test settings.

Selleck (1982) investigated aspects of student nursing environments to identify satisfying and anxiety-creating incidents. A convenience sample of subjects included 65 nursing students, 13 at the end of their first year and 26 each at the end of the second and third years. This qualitative study used interviews on focused critical incidents developed by Flanagan. No information was reported on the process nor was the triangulation of data sources included in the report. The data richly described the interview information, which the investigator analyzed by using frequencies. It was reported that the clinical setting was the dominant source of anxiety (24.6%), with stress increasing as the program progressed. Both informal and formal evaluation provoked the second highest anxiety incidents (20%).

Wernick (1984) studied the effect of stress management on the attrition of practical nursing students from two consecutive classes ($N = 130$). The first class received no intervention and served as the control group. The second class received stress management training. Subjects were randomly assigned to one of five treatment
the first class had a significantly greater number of students receiving governmental support. Otherwise, the two groups were demographically similar. Data were analyzed using chi-square analyses. Reported findings indicated that attrition from personal reasons was reduced from 52.3% in the control group to 29.2% in the experimental group \((p < .05)\). It was reported that academic reasons had no significant effect on attrition.

Parkes (1985) used a qualitative approach to study stressful episodes reported by first-year student nurses \((N = 150)\). The investigator employed three stress intervention treatments: (a) increased rehearsal in classroom teaching, (b) stress management training including both internal and external support, and (c) psychological support during training. The findings were supported with rich interview descriptions. No triangulation data were given nor was information reported on the interviewers and their training. Reported findings indicated that 97% of the subjects recounted stressful episodes in nursing school. The largest cluster was fear of caring for a dying patient \((29.6\%)\). The second largest cluster included fear of failing, insecurity about professional competence, and concern with being observed by instructors \((19\%)\). First-year students were identified as more vulnerable and inexperienced, with stress increasing as situational demands increased.

Megel, M. E., Wilken, M. K., and Volcek, M. K. (1987) investigated first-year nursing students' performance while administering injections during laboratory and clinical practice \((N = 35)\). The STAI was administered to the volunteers before skill performance in the laboratory and clinical settings. A teacher-made skill checklist was used to determine the number of errors in the procedure. Researchers reported content validity for the skill checklist by using documented resources on the injection skill, interrater reliability of 100% between faculty using the skill checklist, and internal
consistency of the STAI using values provided in the instruments' documentation (Cronbach's alpha .93 for state anxiety, and .90 for trait anxiety). The data were analyzed using frequency of errors and a correlation was calculated between performance errors in the laboratory and clinical setting, age of student, and days between having done the skill in the laboratory setting. Significant findings were not found between errors in the laboratory and the clinical setting. State anxiety was significantly lower in the clinical setting ($M = 39.717$) than in the laboratory setting ($M = 42.942$). Trait anxiety scores stayed about the same ($M = 38.457$) in the two settings. STAI scores did not relate to age or the number of days between having done the skill in the laboratory and the clinical setting. It was reported that mean anxiety scores of the subjects were similar to scores in the documentation for college students under low stress conditions.

Lewis, L. L., Gadd, H. F., and O'Connor, K. (1987) investigated the relationship of anxiety and the recall of information during the interval between clinical orientation and the first day of patient care. The research design was pretest-posttest. Sophomore nursing students ($N = 90$) were split into two laboratory groups. The two groups had separate orientations with different faculty members. One group had a 1-day interval between orientation and patient care, and the other group had a 6-day interval. Instruments used were the STAI and a teacher-made recall quiz. Data were analyzed using ANOVA and Pearson coefficient of correlation. No significant difference was reported between the groups on pretest STAI scores and the post-orientation quiz. Two null hypotheses were incorrectly reported as accepted. The group with a 1-day interval had a significantly lower state anxiety score between pre and posttests ($p = .045$). Subjects with a 6-day interval had a significantly greater state anxiety score between pretests and posttests ($p = .004$). Investigators reported their subjects' STAI scores as
having a higher mean than those reported in the instrument’s documentation for college students.

Windsor (1987) studied nine last semester, volunteer nursing students. The purpose of the study was to better understand learning in a clinical setting from a student perspective. A naturalistic inquiry methodology design was used which included thick descriptions of repeated interviews; using member checks for confirming data collected; triangulation with nonhuman sources; and an outside reviewer. It was reported that: (a) students remembered being very nervous before clinical experiences, but not in the last term; (b) nervous instructors are terrible for students, since students are anxious enough; and (c) students found it necessary to be flexible and learn to think on their feet.

Phillips (1988) studied 34 second-year nursing students to see if modified-group testing and collaboration reduced student anxiety and increased retention of materials. The design was a one-shot case study. A t-test and Wiley rank sum test were used to analyze the data. The reported findings indicated that modified-group testing and collaboration resulted in a difference of higher grades and improved attitude ($p < .01$). The investigator also reported that on a teacher-made, self-reporting anxiety form, 97% of the students stated their anxiety level as significantly lowered by the treatment.

Howell and Swanson (1989) investigated the relative influence of self-concept, study and test-taking skills, cumulative grade point average, and cognitive interference on test anxiety in junior baccalaureate, volunteer nursing students ($N = 57$). The instruments included the Test Anxiety Scale (TAS), Cognitive Interference Questionnaire (CIQ), Self-Concept of Ability Scale (SCAS), and Brown’s Effective Study Test (BEST). The TAS was reported as having a test-retest reliability coefficient greater than .80. The scores on the CIQ correlated to .47 with scores on the TAS. The
BEST had a test-retest reliability coefficient of $r = .80$, as determined by Brown in 1975. The SCAS was reported as having internal consistency reliability coefficients of $r = .82$ for males and $r = .77$ for females, as determined by Patterson in 1967; and test-retest correlations of $r = .75$ for females and $r = .75$ for males, as determined by Brookover in 1967. Data were analyzed using the Pearson coefficient of correlation and multiple linear regression. Reported findings indicated that study skills and test-taking skills did not contribute significantly to the variance of test anxiety and that academic self-concept and grade point average accounted for 59% of the variance in test anxiety ($p < .0001$).

Pagana (1989) investigated the use of the Clinical Stress Questionnaire (CSQ) to assess the stress in nursing students' clinical experience. Stress was perceived as being threatening or challenging. Subjects were nursing students ($N = 261$) who were from seven different schools in their first medical-surgical clinical experience. The investigator reported the use of a factor analysis to establish construct validity for the items selected. Concurrent validity was reported as established by comparing the scores on the threat and challenge scales with the coding of open-ended questions. An inter-rater reliability of .89 was reported for coding. Internal consistency was determined and reported as a Cronbach's alpha coefficient of .85. The data were analyzed using a t-test. Students were reported as significantly more challenged than threatened ($p = .01$). Common stressors identified were fear of the unknown, uncertainty, and the frequently mentioned threat of the clinical instructor.

In 1990, Pagana studied the stressful nature of the clinical experience on nursing students. Subjects were 261 first term medical-surgical students in seven different schools. The instruments used were the CSQ, Hardiness Test, and Norbeck Social Support Questionnaire (NSSQ). The CSQ was reported as having alpha
coefficients of .85 for the challenge scale and .84 for the threat scale. Construct validity was reported as established through a previous factor analysis in 1987. The Hardiness Test was reported as having internal consistency coefficients in the .90s for hardiness, .70s for commitment, and an overall stability in the .60s over a 2-week period on control and challenge scores. The NSSQ was reported as having a test-retest reliability of .85 to .92 and an internal consistency of .89 to .97, as found by Norbeck in 1981. Pagana added two items to the NSSQ and did not include further testing of the instrument. Data were analyzed using Pearson's coefficient of correlation, multiple analysis of variance (MANOVA), and multiple regression. The reported findings indicated quite a bit of stress in clinical experiences ($p < .001$), with stress being a better predictor of threat ($p < .001$, $r = .58$) than challenge ($p = .008$, $r = .15$). No significant relationship was found between total social support and the variables threat and challenge.

Speck (1990) investigated the effect of guided imagery on first-year nursing students performing their first injection. The subjects were from two randomly selected laboratory sections ($N = 26$). The instruments used were STAI and Biodot stress dots. The investigator did report an inter-rater reliability for reading Biodots as 80.8% and 88.1%. The data were analyzed using analyses of covariance (ANCOVA) with the trait anxiety scores as the covariate. Kruskal-Wallis was performed on the Biodot stress dots. The reported findings revealed no significant difference with the Biodot stress dots ($p = .6777$), and no significant difference with performance ($p = .130$) or performance scores ($p = .774$). A significant difference was reported for lowered anxiety levels with guided imagery ($p = .0008$).

Summers, S., Hoffman, J., Neff, E. J. A., Hanson, S., and Pierce, K. (1990) studied the effect of 60 beat per minute music on test-taking anxiety. The subjects were
45 junior nursing students in two different nursing courses. One course served as the control and the other the experimental group. The 60-beat-per-minute music was played during one theory test to the experimental group. The control group had a similar test without music on the same day. The design was a one-shot case study. The instruments used were the STAI, the TAS, and self-reported pulse rate (PR). Coefficient alpha reliabilities of state anxiety (.948), trait anxiety (.940), and test anxiety (.973) were reported from the instruments' documentation. The data were analyzed with MANOVA and descriptive statistics. The reported finding was that there was no significant difference between any of the variables as a result of the treatment.

Beck and Srivastava (1991) studied the perceived level and sources of stress in baccalaureate nursing students. The subjects were 67 generic students and 25 registered nurse (RN) students in different nursing courses ($N = 92$). The instruments used were the General Health Questionnaire (GHQ) and the Stress Inventory (SI). The GHQ was reported as having reliability and validity established by Banks in 1983. The SI was reported as not being tested for reliability. It was stated that the face and content validity of the SI had been established by a panel of experts, and that the categories for the qualitative section were developed by Firth (1986) and Frances and Naftel (1983). The reported findings stated that the most frequent stress events were academic work and clinical experiences. The mean general health scores were above the normal range for all students, and generic students had a higher amount of stress than the RN students who had previously completed a basic program ($p = .05$).

Bell (1991) investigated the effect of a preclinical skill evaluation on the level of anxiety in clinical experiences. The subjects consisted of 30 volunteer junior nursing students enrolled in their first clinical course. The criterion instrument was the STAI. Reliability was reported from the information in the STAI manual. Data were analyzed
using a t-test. Reported findings indicated less anxiety in preclinical and clinical experiences in the experimental group \( (p < .05) \). No significant difference was reported between the performance skills of the two groups. Both had the highest anxiety level at the preclinical measurement and the lowest related to future performance.

Lindrop (1991) studied the effect of stress on nursing students \( (N = 413) \). A self-made 144 item questionnaire was developed by the investigator. The data were analyzed using ANOVA and Tukey-B multiple comparison test. The findings reported general agreement among the subjects that stressful situations exist in education \( (p < .05) \). Examinations were more stressful to second and third year students \( (p < .05) \). Stress increased as the training progressed \( (p < .05) \). Stress was present in the clinical area \( (p < .05) \).

Russler (1991) investigated the effectiveness of multidimensional stress management training for first-year nursing students \( (N = 57) \) who were randomly assigned to the groups. The instruments STAI, Reported Emotional Survey, Ways of Coping, and Cooperation Self-Esteem Inventory were administered. The investigator reported reliability information from all four instruments' documentation. The reported findings revealed that stress management training/relaxation had no significant effect on the subjects' anxiety. Subjects with low self-esteem tended to have higher anxiety \( (r = -.54) \), and subjects with high trait anxiety experienced higher levels of state anxiety \( (r = .48) \).

Stephens (1992) studied the effect of imagery on nursing students' anxiety. First-year nursing students \( (N = 159) \) were randomly placed in an imagery or control group. The criterion instrument was the STAI. Validity and reliability information were reported from the instrument’s documentation. Data were analyzed using ANCOVA, with the pretest state anxiety score as the covariate. The reported findings stated that
the imagery treatment significantly reduced state anxiety \( p < .05 \). No significant difference was found between the imagery/relaxation group and the imagery-only group. Relaxation did not increase the effectiveness of the imagery and the groups did not differ significantly on test performance.

Erler and Rudman (1993) studied the effect of laboratory intensive care simulation on reducing the anxiety of nursing students before their intensive care clinical training. Preestablished clinical groups \( N = 50 \) served as subjects. The instrument used was the STAI. Investigators compared the normed reliability coefficients to those found in their study. Cronbach's alpha coefficients for state and trait anxiety were reported at .73 for the control group and .73 for the treatment group. A \( t \)-test was used to analyze test scores. Reported findings indicated no significant difference between the pretest and posttest scores of the control or the experimental groups.

Summary

All 19 studies used a convenience sample of nursing students. Seven investigations (Bell, 1991; Charlesworth et al., 1981; Erler & Rudman, 1993; Lewis et al., 1987; Phillips, 1988; Speck, 1990; Summers et al., 1990) used natural groupings of clinical or laboratory groups. One potential bias in not randomizing the subjects was that nursing students often select their own clinical or laboratory groups and have input on the courses they take. There could be a tendency for students who like to work together to enroll for the same group. This could lead to a skewed grouping of students. Students' preferences for certain faculty members and unequal numbers of academically and/or clinically weak and strong students could also influence groupings.
Seven investigations (Beck & Srivastava, 1991; Howell & Swanson, 1989; Lindop, 1991; Megel et al., 1987; Pagana, 1989; Pagana, 1990; Sellek, 1982) used the total population of nursing students in their convenience sample. Three investigations (Russler, 1991; Stephens, 1992; Wernick, 1984) randomly assigned the convenience sample into groups.

The research designs used in the 19 studies were diverse. Three of the 19 studies were qualitative in nature (Parkes, 1985; Sellek, 1982; Windsor, 1987). Four studies (Beck & Srivastava, 1991; Lindop, 1991; Phillips, 1988; Wernick, 1984) were one-shot case studies. Eight investigations (Bell, 1991; Charlesworth et al., 1981; Erler & Rudman, 1993; Lewis et al., 1987; Russler, 1991; Speck, 1990; Stephens, 1992; Summers et al., 1990) used the pretest-posttest design with nonrandom samples. Four investigations (Howell & Swanson, 1989; Megel et al., 1987; Pagana, 1989; Pagana, 1990) were correlational.

The STAI was used in nine investigations (Beck & Srivastava, 1991; Charlesworth et al., 1981; Erler & Rudman, 1993; Lewis et al., 1987; Megel et al., 1987; Russler, 1991; Speck, 1990; Stephens, 1992; Summers et al., 1990). Only three investigations (Bell, 1991; Erler & Rudman, 1993; Megel et al., 1987) reported instrument reliability. The reliability coefficients ranged from .71 to .93. Two studies (Speck, 1990; Stephens, 1992) addressed validity and reliability based on information provided in the STAI documentation developed by Spielberger (1983).

The criterion instruments used in the remaining investigations had less documentation for reliability and validity than those which included the STAI. Six investigations (Lewis et al., 1987; Lindop, 1991; Megel et al., 1987; Pagana, 1989; Pagana, 1990; Phillips, 1988) used teacher-made tests or questionnaires. Pagana was the most thorough in reporting reliability and validity information.
Overall, the designs employed in the quantitative studies were weak in internal and external validity because of the lack of randomization of subjects as well as in the selection of research designs. Most investigators provided minimal to no information on reliability and validity for their studies. If information was provided, it was usually based on the instrument's documentation from earlier studies.

A number of summary statements are suggested from the reported results of the 19 investigations. First, the laboratory and clinical component of the nursing program are stressful and anxiety provoking for nursing students (Beck & Srivastava, 1991; Bell, 1991; Lewis et al., 1987; Parkes, 1985; Sellek, 1982; Windsor, 1987). Second, three investigations (Lewis et al., 1987; Lindop, 1991; Windsor, 1987) found anxiety increases as the complexity of skills and theoretical content increased, with a reduction of anxiety noticed somewhere in the final term toward the end of the program. Third, anxiety is reduced by imagery (Speck, 1990; Stephens, 1992), stress management (Charlesworth et al., 1981; Wernick, 1984), and modified testing (Phillips, 1988). Fourth, music is not shown to significantly reduce the anxiety of nursing students during test-taking (Summers et al., 1990). Fifth, there appears to be no significant increase in performance noted in clinical performance and/or academic skills of nursing students after the introduction of the stress reduction techniques (Bell, 1991; Lewis et al., 1987; Megel et al., 1987; Speck, 1990; Wernick, 1984).

Anxiety and Performance

Thirty-three research reports were identified which investigated the effects of anxiety on a variety of performance tasks. These include investigations by Allen (1970); Alpert and Haber (1960); Anson, Bernstein, and Hobfoll (1984); Bailey (1984); Basler, Fisher, and Mumford (1976); Berger and Owen (1982); Burton (1971); Dendato and
Diener (1986); Dobson and Markham (1992); Donat (1983); Eysenck (1985); Fehring (1983); Friend (1982); Head (1984); Hollingsworth (1975); Hussian and Lawrence (1978); Jacobs and Suess (1975); Johnson and Spielberger (1968); Kanekar (1977); King, Heinrich, Stephenson, and Spielberger (1976); Lamb (1973); Leherissey, O'Neil, Heinrich, and Hansen (1973); Mandler and Sarason (1952); Matthews and Burnett (1989); McCann and Meen (1984); O'Neil (1972); Powell and Verner (1982); Sarason (1961); Stoner and Spencer (1986); Stoudenmire (1972); Tennyson and Boutwell (1973); Tennyson and Woolley (1971); Weinberg and Ragan (1978).

Mandler and Sarason (1952) investigated the extent to which anxiety responses are evoked using Kohs Block Design #16 and the impact of anxiety on performance and learning. Subjects were sophomore and junior college students \((N = 33)\) who were stratified by high and low anxiety scores on a researcher-constructed questionnaire. Students were then randomly divided into success, failure, and neutral groups. They were given six trials of the Kohs Block Design #16. Instruments used were a 67 item teacher-made questionnaire, sample design #2 of the Wechsler-Bellevue Modification, and a specially prepared Digit Symbol Test. Investigators reported an attempt to establish the face validity of the questionnaire by rating each subject's behavior without knowledge of their questionnaire score. They reported agreement as significant \((p < .001, r = .59)\). Data were analyzed by means of a chi-square test. The high anxiety group was reported as having significantly lower performance scores \((p = .05\) to \(.17)\). The low anxiety failure group scored significantly higher than the high anxiety failure group \((p = .03)\). Providing feedback related to failure in the low anxiety group increased performance \((p = .02)\). In the high anxiety group the same feedback reduced
performance. Overall, the low anxiety group performed better than the high anxiety group \( (p = .08) \).

Alpert and Haber (1960) investigated the effect of anxiety on academic achievement of 283 male psychology students in three different terms. The instruments used were high school grade point average, Taylor’s Manifest Anxiety Scale (MAS), Welsh Anxiety Index (AI), Freeman Anxiety Scale (AS), TAS, and Achievement Anxiety Test (AAT). The investigators reported that correlation of the general anxiety scales ranged between .32 to .39, of the specific anxiety scales between .40 to .64, and that test-retest reliabilities on the AAT were .83 and .87. The specific anxiety scales employed were the TAS and the AAT. Data were analyzed using correlations and factor analysis. The reported findings indicated that specific anxiety scales significantly measured different factors \( (p < .01) \). Increased anxiety was negatively correlated with achievement \( (r = -.37, p > .01) \). Course grades and grade point average were negatively correlated with the specific anxiety scales \( (r = -.32 \text{ for the TAS}, r = -.25 \text{ on the debilitating scale}, r = -.21 \text{ for the facilitating scale of the AAT}, \text{all at a significance level of } p < .05) \). It was concluded that the correlations were not high enough to justify the position that poor performance was a result of anxiety.

Sarason (1961) studied the effects of anxiety and threat on the performance of a difficult task. The task was something an average person should have been able to do successfully. Threat was administered through instructions in the booklet that accompanied the task. The threat was a stated time limit. The psychology students \( (N = 191) \) were stratified into high, middle, and low anxiety groups using the TAS. There was no mention of randomization. The criterion instruments included the TAS, Lack of Protection Scale (LP) and MAS. Data were analyzed using ANOVA. It was reported that only the interaction between test anxiety and instruction was significant.
(p < .01). Under the threat condition, the middle and low anxious students performed at a higher level than high anxious students. Under the nonthreat condition, the high anxious students performed better than the low and middle anxious students.

Johnson and Spielberger (1968) investigated the effects of a 10 minute relaxation training on state and trait anxiety of 46 white female psychiatric patients who met the criteria of not being diagnosed with chronic brain syndrome or having a mental age of less than 9.5. The criterion measures used were the MAS, Affective Adjective Check List (AAACL), Biographical Inventory, blood pressure (BP), and heart rate (HR). Data were analyzed using Pearson coefficient of correlation and ANOVA. The design was a pretest-posttest which was repeated 6-10 days after the initial testing. The reported findings indicated that relaxation significantly reduced systolic BP (p < .001), HR (p < .001), and the scores on the AACL (p < .05). There was no significant reduction in state or trait anxiety scores.

Allen (1970) investigated the effect of three conditions of test administration on trait and state anxiety. The three conditions were regular administration, test worth 10% of the subject's grade, and taking an important test as though a failing student. The subjects included 25 volunteers in a psychology class. The instruments administered to the subjects were the STAI, TAS, AAT, Anxiety Differential (AD), PR, and palmar sweat print (PSP). Investigators reported inter-rater reliabilities for the PSP as being from .883 to .982. Data were analyzed using ANOVA. Reported findings revealed no significant difference between age, sex, and score. Trait anxiety scores were stable over three situations with a test-retest correlation ranging from .71 to .83. State anxiety scores significantly increased when the examinations were worth 10% of the grade (p < .01) and during the role playing of the poor performing student (p < .001). Test-retest scores for state anxiety ranged from .22 to .47.
Tennyson and Woolley (1971) investigated the interaction of anxiety on performance at two levels of task difficulty in reading poetry. College students (N = 29) were randomly selected from a general psychology class. The scores on the STAI and measures of BP were used as the criterion measures. Data were analyzed by means of ANOVA. Reported findings indicated that (a) state anxiety increased when doing a difficult task as opposed to a pretask activity (p < .01); (b) state anxiety decreased after doing an easy task (p < .01); (c) the low state anxiety group made fewer errors than the high state anxiety group on the difficult task (p < .05); and (d) the high state anxiety group made fewer errors than the low state anxiety group on the easier tasks (p < .05).

Burton (1971) investigated the effects of state and trait anxiety on the achievement, motivation, and skill attainment of 212 college women enrolled in a beginning bowling and riflery class. The criterion instruments included the STAI and Achievement Motivation Scale. Data were analyzed using factor analysis. It was reported that no significant relationship was found between skill attainment, anxiety, and achievement. Increased trait anxiety was found to be inversely related to the need to achieve through one's own effort (r = -.23 and p < .05 for riflery and r = -.34 and p < .01 for bowling). Increased levels of state and trait anxiety was shown to relate to a decrease in performance for the riflery subjects (r = -.35 and p < .01 for state, and r = -.23 and p < .05 for trait). A significant positive correlation was reported between state and trait anxiety, which supported the theoretical conceptualization of state and trait anxiety as separate and related constructs (r = .50, p < .01).

Stoudenmire (1972) investigated the effects of muscle relaxation training on state and trait anxiety in introverts and extroverts. The subjects included 36 psychology students who scored high on the trait anxiety and were then stratified into extroverts
and introverts. Instruments used were the STAI, Multiple Affect Check List, MAS, and Neuroticism on the Eysenck Personality Inventory (EPI). Data were analyzed using a t-test to compare the difference between the pretest and posttest scores. Reported findings indicated that state anxiety was significantly reduced by relaxation training of 15 to 45 minutes for the introverts, but not the extroverts \((p < .05)\). Relaxation training did not significantly decrease trait anxiety scores of either the introverts or extroverts.

O'Neil (1972) investigated the effects of stress on state anxiety and performance in computer-assisted learning of 583 volunteers in an introduction to psychology class. The subjects were stratified into the upper and lower 20\% of score for both trait and state anxiety \((N = 73)\). The instrument used was a modified short version of the STAI for state anxiety only. The modification consisted of 5 items selected from the 20 items in the original STAI form. Data were analyzed using ANOVA. The reported findings showed that for the high trait anxiety subjects, stress produced a greater increase in state anxiety than in nonstress conditions \((p < .01)\). For the low trait anxiety subjects, the increase in anxiety was about the same under stress and nonstress conditions \((p < .01)\). No significant differences were found between the trait anxiety and performance scores for each group. The high state anxiety subjects made significantly more errors than the low state anxiety subjects \((p < .01)\).

Lamb (1973) investigated the effects of two stressors on state anxiety for public speaking students who were either in the upper or lower 25\% on trait anxiety \((N = 49)\). The stressors were giving a speech and blowing up a balloon until it popped. The criterion measures included the STAI, Speech STAI, and HR. Data were analyzed using ANOVA. The reported findings stated that high trait anxiety subjects had significantly greater state-anxiety scores than the low trait anxiety subjects in the prespeech phase \((p < .001)\). During the postspeech phase, there was no difference in
the state anxiety scores. In the physical stress phase, there was a significant increase in state anxiety for the high trait anxiety subjects \((p < .001)\). Subjects with high speech trait anxiety had significantly greater increases in state anxiety scores than those with low trait anxiety scores during the speech \((p < .001)\).

Leherissey, B. L., O'Neil, H. F., Jr., Heinrich, D. L., and Hansen, D. N. (1973) investigated the effects of anxiety on subject matter familiarity and how program length affected achievement in computer-assisted learning. Four versions of the same computer program in both a short and long form were tested. One hundred forty-eight undergraduate college students were stratified into high and low trait anxiety groups. They were then divided into text only, fill-in-the-blank, multiple choice, and short answer groups with different program lengths. The criterion instrument was a modified short form of the STAI for state anxiety only. Data were analyzed using ANOVA. It was reported that high trait anxiety subjects had higher state anxiety scores during performance than did the low state anxiety subjects \((p < .001)\). The low state anxiety subjects made more correct responses than the medium or high state anxiety subjects \((p < .10)\). High state anxiety score were associated with the difficult rather than easy sections of learning materials \((p < .001)\). Trait anxiety was not found to be related to learning time \((p < .001)\). High trait anxiety subjects performed better in the modified multiple-choice and short answer responses than the reading text only and fill-in-the-blank responses. Achievement was not found to be significantly related to program length.

Tennyson and Boutwell (1973) investigated pretask and within-task anxiety and their effect on predicting performance on matching pictures and crystal samples. The subjects included 105 randomly selected undergraduate psychology students. The instruments used were the STAI and MAS. Data were analyzed using ANOVA. State
anxiety levels were reported as significantly increased during the tasks for high and low anxiety subjects ($p > .05$).

Jacobs and Suess (1975) investigated the effects of four primary colors on the state anxiety of 40 undergraduate volunteer psychology students. The instrument used was the STAI. Data were analyzed using ANOVA. The findings indicated that (a) blue and green were significantly different than red and yellow ($p < .025$); (b) an increase in anxiety was associated with red ($M = 42.70$) and yellow ($M = 41.10$); and (c) a reduced anxiety was associated with green and blue ($M = 30.47$).

Hollingsworth (1975) investigated the effects of performance goals and anxiety on learning a gross motor task. Ninety junior high students were selected from a total population of 240. They were stratified into the upper and lower quartiles of trait anxiety. The subjects were taught how to juggle and were divided into a control group and two treatment groups, one receiving verbal encouragement and the other a performance goal. The instrument used was the STAI. Data were analyzed using ANOVA and Pearson coefficient of correlation. In reported findings, no significant difference was found between the three groups either on state anxiety or in performance between high and low trait anxiety subjects. A -.76 correlation was reported between performance on task and low state anxiety.

Basler, M. L., Fisher, A. C., and Mumford, N. L. (1976) investigated the effect of anxiety on gymnastic performance. Female varsity gymnastic members served as subjects ($N = 18$). The criterion measures were PR, Palmar Sweat Index (PSI), STAI, and performance as scored by judges. Investigators reported reliability information as determined by Spielberger in the STAI manual. Reliability coefficients were included and found to range from .86 to .88. Factor analysis was used to analyze the data. Reported findings indicated that there was no significant correlation between
performance and the STAI scores. PR was found to be inversely related to performance ($r = -.28, p < .05$).

The causal influence of trait and state anxiety on academic achievement was investigated by King, F. J., Heinrich, D. L., Stephenson, R. S., and Spielberger, C. D. (1976). The subjects included 83 undergraduate statistics students in two separate classes. The data were gathered by means of the STAI. Investigators reported the trait test-retest reliability as ranging from .83 to .88. The state test-retest reliability ranged from .46 to .69. Data were analyzed using the frequency of change product moment technique by Yee and Gage (1968). It was found that (a) trait anxiety was a causal influence on state anxiety and achievement ($p < .05$); (b) state anxiety exerted a causal influence on achievement ($p < .05$); (c) trait anxiety was stable over time; (d) state anxiety means were higher than trait anxiety means; and (e) increased state anxiety was a cause of decreased performance.

Kanekar (1977) investigated the effect of anxiety and intelligence on the academic performance of 172 undergraduates. The subjects were divided into low and high intelligence groups. Instruments used were MAS and Set II of Raven's Advanced Progressive Matrices (RAPM). Data were collected by administration of MAS and RAPM. Product-moment correlations were used to analyze the data. It was reported that no significant differences in performance were found related to sex or anxiety, and that a negative correlation was found between anxiety and academic performance for the low intelligent subjects ($r = -.39, p < .01$).

Weinberg and Ragan (1978) investigated motor performance by having students throw tennis balls at a target under three levels of trait anxiety and stress. Stress levels involved three different types of feedback related to the subjects' placement in the normed percentiles. Ninety subjects were selected out of 420 male undergraduates.
There were 30 students in each of three stratified group: (a) high anxious, (b) moderate anxious, and (c) low anxious. The instrument used was the STAI. Data were analyzed by means of an ANCOVA with the initial STAI scores as the covariate. The high stressed group was found to have significantly higher state anxiety than the low stressed group ($p < .01$). The moderate stressed group had significantly higher state anxiety than the low stressed group ($p < .01$). No significant difference was found between the moderate and high stressed groups on state anxiety. The low stressed subjects performed significantly lower on ball throwing than did the moderately stressed subjects ($p < .01$). The low stressed subjects performed significantly lower on ball throwing than did the high stressed subjects ($p < .05$). The high stressed subjects performed lower on ball throwing than did the moderately stressed subjects ($p < .07$). Overall, high trait anxiety subjects had higher state anxiety scores.

Hussian and Lawrence (1978) investigated the effect of stress inoculation training on test state and trait anxiety of 48 undergraduates who were high on test anxiety. They divided into four groups: (a) test-specific stress inoculation, (b) generalized stress inoculation, (c) discussion, and (d) control. The data were gathered by administering the STAI and the Fear Survey Schedule. A MANOVA was used to analyze the data. The findings indicated that stress inoculation significantly decreased state anxiety ($p < .05$) and trait anxiety ($p < .005$). The stress inoculation training and the discussion groups had significantly lower anxiety than the control group ($p < .05$).

Friend (1982) investigated the effects of subjective workload and time urgency on stress and performance on 39 students in a management training program. The instruments used were a modified short form of the STAI for state anxiety, a teacher-made 80-item questionnaire, and self-reporting data. Investigators reported reliability information given in the STAI documentation and other research by Caplan on the
short scale. Internal consistency was reported at .73 on the short form for state anxiety. The subjective workload also had reliability information from an earlier researcher who documented an internal consistency reliability of .80. At the end of the course, subjects were given all the instruments in this one-shot case study. It was reported that (a) performance was a function of a lower state anxiety \( (p < .05) \); (b) a higher time urgency was a function of reduced performance \( (p < .05) \); and (c) increase in subjective workload was a function of decreased performance \( (p < .05) \).

Powell and Verner (1982) investigated the effect of anxiety on the performance of first time volunteer parachutists \( (N = 15) \). The criterion measures were HR, performance ratings, and the STAI. Data were analyzed using a stepwise multiple regression. The reported findings showed state anxiety and fear as significantly related \( (r = .71) \). State and trait anxiety had a significant correlation of .61. Higher levels of anxiety were associated with poorer performances. Performance was negatively correlated with HR \( (r = -.38) \), state anxiety \( (r = -.49) \) and estimated fear \( (r = -.70) \).

Donat (1983) investigated whether a score on a multidimensional measure of trait anxiety could supplement the ability of individual dimension scale scores in predicting state anxiety responses to dimension-congruent stress. Female volunteers enrolled in an introductory psychology class served as subjects \( (N = 140) \). The criterion measures included the STAI, Stimulus-Response General Trait Anxiety, and HR. Data were analyzed using ANOVA. It was reported that an increase in trait anxiety increased state anxiety \( (p < .01) \) and HR \( (p < .001) \). An increase in trait anxiety caused a decrease in performance \( (p < .05) \). Subjects with moderate general trait anxiety performed better than those with low general trait anxiety \( (p < .05) \).

Fehring (1983) investigated the effects of biofeedback-aided relaxation on the psychological stress symptoms of 98 college students. Subjects were randomly assigned
to a biofeedback and relaxation, relaxation, or control group. The STAI and Profile of Mood Status were used to gather data. The data were analyzed using ANOVA. The results showed that state anxiety decreased with biofeedback and aided relaxation ($p < .05$). No significant difference was noted between on state anxiety scores between the relaxation and the control group.

Head (1984) investigated the effects of trait anxiety and student objectives on state anxiety and college academic performance. One hundred thirty-five college undergraduates were stratified into high, high average, average, and low in trait anxiety by means of the Test Anxiety Inventory (TAI). Subjects in the treatment groups were given real objectives and the control groups were given placebo objectives. The instruments used were the TAI, STAI, and a 42-item teacher-made recognition test. The investigator reported reliability information for the TAI and the STAI from the instruments' documentation and from the recognition test as having a .80 alpha coefficient. An ANOVA was used to analyze the data. The reported findings stated that the treatment of real objectives over placebo objectives had no significant effect on the level of trait anxiety. The state anxiety means in the high trait anxiety group were significantly higher than the state anxiety means of the low anxiety groups during all three stages of input, processing, and output ($p < .05$). The TAI means for females were not significantly higher than for males, nor was there any significance difference as a result of using objectives with the recognition test.

Bailey (1984) investigated the relationship of state and trait anxiety on the BP of 71 black females. The criterion measures used were the STAI, and anthropometric and environmental variables including height, weight, marital status, age, and BP. Data were analyzed using ANCOVA, with the pretest scores serving as the covariate. Reported findings stated that a higher state anxiety was found in females who were
single parents living alone rather than living with relatives ($p < .05$). A significantly higher state and trait anxiety was reported for with unemployed females ($p < .007$, $p < .001$). No significant difference was found between BP and STAI scores.

Anson, Bernstein, and Hobfoll (1984) investigated the relationship between anxiety and performance in two ego threatening situations, one where candidates were interviewed for medical school and the other where they were taking medical school examinations. Three hundred twelve medical school candidates and 48 first semester medical students served as subjects. The instruments used were the Hebrew version of the STAI, interview ratings of performance, and a teacher-made examination. Data were analyzed using ANOVA and Person's product-moment correlation. Reported findings revealed no significant difference between interview performance and the STAI scores. Trait anxiety was found to significantly correlate in a negative direction with grades ($r = -.36$, $p < .05$).

McCann and Meen (1984) investigated the effect of anxiety on performance and academic achievement in 222 high school students. Data were collected by administration of the Raven's Progressive Matrices, Canadian Lorge-Thorndike intelligence tests, and STAI. A negative correlation was reported between anxiety and ability ($r = -.16$, $p < .02$). A positive correlation was found between ability and achievement ($r = .48$, $p < .001$). Anxiety and intelligence did not significantly correlate.

Eysenck (1985) investigated the effect of anxiety on the cognitive-task performance of 32 undergraduates. After stratification by high and low trait anxiety, subjects were given a 30 minute task and either low or high incentive. Data were obtained by administering the STAI and was analyzed by means of ANOVA. It was reported that the speed of performance significantly increased as a function of practice for all groups ($p < .001$). The effect of anxiety on more complex problems was
significant at the .001 level. Low anxiety subjects performed significantly faster under high incentive than low incentive conditions at the .01 level. Subjects high with trait anxiety also had much higher levels of state anxiety than those low in trait anxiety ($p < .001$). High anxiety subjects were slower than low anxiety subjects at performing the task ($p < .025$).

Stoner and Spencer (1986) investigated the effects of age and sex differences on state-trait anger, anxiety, and curiosity. The subjects included 150 community-living volunteers, aged 21 to 83, who were recruited from many civic and social organizations. The design was a one-shot case study. The instrument used was the State-Trait Personality Inventory. Data were analyzed using ANOVA. It was reported that women showed higher trait anxiety than men ($p < .05$), and there was no significant interaction between sex and age.

Dendato and Diener (1986) investigated the effectiveness of cognitive/relaxation therapy and study-skills training on anxiety and performance of 45 test-anxious students. The subjects scored above 50 on the TAI. The STAI and the TAI were administered to the subjects. Data were analyzed using ANCOVA, with the covariate being a combination of pretest scores on the STAI and the TAI, as well as sex and psychology class membership. It was reported that study skills training alone was not significantly effective in reducing anxiety or improving performance ($p < .001$). Relaxation/cognitive therapy was found to be significantly effective in reducing anxiety ($p < .01$). Relaxation/Cognitive therapy did not increase performance ($p < .05$).

Berger and Owen (1987) investigated the effect of swimming on reducing the anxiety of 52 volunteers in beginning and intermediate swimming classes. The instruments used were STAI, Cognitive-Somatic Questionnaire, and EPI. Data were analyzed using ANOVA. Swimming was shown to significantly decrease state anxiety.
(\(p > .00005\)). Females and males had no significant difference in the benefit of swimming on state anxiety. Swimming had no significant long-term anxiety reducing benefit (\(p < .53\)).

Mathews and Burnett (1989) investigated the effect of anxiety on the achievement of 55 sixth and seventh grade students. Data was collected by means of the STAI for children and the Cognitive Abilities Test. Data were analyzed using Pearson's product-moment correlations. It was reported that except for verbal classification, all of the verbal subtests scores correlated negatively with state and trait anxiety (\(p < .05\)). Scores on quantitative battery and figure analogies were negatively correlated with both state and trait anxiety (\(p = .05\)). Figure analogies and the total nonverbal battery were significantly correlated in a negative direction with state anxiety (\(p < .05\)). Equation building and figure classification scores were significantly correlated in a negative direction with trait anxiety (\(p < .05\)).

Dobson and Markham (1992) investigated the effect of anxiety on eyewitness' memory of 120 undergraduate psychology students who had scored high or low on the TAS. The subjects were shown an event, given a test activity, and retested on their memory of the event. They were then divided into four groups: anxiety instructions at encoding and retrieval, anxiety at encoding only, anxiety at retrieval only, and control. The instruments used were the TAS, a teacher-made questionnaire, and a 30-item teacher-made test. Data were analyzed using ANOVA. It was reported that low anxiety was associated with more correct responses than high anxiety when anxiety arousing instructions were given at both the encoding and retrieval (\(p < .05\)). Low anxiety was associated with higher performance when given ego-threatening instructions (\(p < .05\)). No significant difference was found in high anxiety subject performance with the anxiety-arousing or control instructions.
Summary

All 33 studies were quantitative in nature, although the subjects were selected from a convenience sample in all cases. Twenty-seven investigators (Allen, 1970; Alpert & Haber, 1960; Basler et al., 1976; Berger & Owen, 1987; Burton, 1971; Dendato & Diener, 1986; Dobson & Markham, 1992; Donat, 1983; Eysenck, 1985; Fehring, 1983; Head, 1984; Hussain & Lawrence, 1978; Jacobs & Suess, 1975; Kanekar, 1977; King et al., 1976; Lamb, 1973; Leherissey et al., 1973; Mandler & Sarason, 1952; McCann & Meen, 1984; O'Neil, 1972; Powell & Verner, 1982; Sarason, 1961; Stoner & Spencer, 1986; Stoudenmire, 1972; Tennyson & Boutwell, 1973; Tennyson & Woolley, 1971; Weinberg & Ragan, 1978) used college students selected from a specific course. Other populations used included medical school students (Anson et al., 1984), black clinic patients (Bailey, 1984), psychiatric patients (Johnson & Spielberger, 1968), management training students (Friend, 1982), and elementary and secondary students (Hollingsworth, 1975; Matthews & Burnett, 1989).


The majority of studies used the STAI as the primary measurement tool. Three investigations referred to reliability scores which ranged from .83 to .84 on trait anxiety and .46 to .69 on state anxiety (Basler et al., 1976; Head, 1984; King et al., 1976). Nineteen of 33 investigations stated that they used the STAI, but with no supporting data for reliability or validity (Allen, 1970; Anson et al., 1984; Bailey, 1984; Berger & Owen, 1987; Dendato & Diener, 1986; Donat, 1983; Eysenck, 1985; Fehring, 1983; Hollingsworth, 1975; Hussian & Lawrence, 1978; Jacobs & Suess, 1975; Lamb, 1973; Leherissey et al., 1973; O'Neil, 1972; Powell & Verner, 1982; Stoudenmire, 1972; Tennyson & Boutwell, 1973; Tennyson & Woolley, 1971; Weinberg & Ragan, 1978).

Three investigations reported using a modified short form of the STAI for state anxiety only (Friend, 1982; Leherissey et al., 1973; O'Neil, 1972). This form selected five items out of the original 20 items of the original STAI.
The MAS was found in four investigations (Johnson & Spielberger, 1968; Kanekar, 1977; Stoudenmire, 1972; Tennyson & Boutwell, 1973). Other instruments included the AI and AS used by Alpert and Haber (1960); STAI for children used by Matthews and Burnett (1989); TAI used by Dendato and Diener (1986) and Head (1984); and Speech STAI used by Lamb (1973); TAS used by Alpert and Haber (1960), Dobson and Markham (1992), and Sarason (1961); and AAT used by Allen (1970), and Alpert and Haber (1960). Teacher-made tests were used in two investigations (Anson et al., 1984; Head, 1984). Except for the AAT, validity and reliability were not mentioned in the research reports.

Four investigations used physiological measurements (Allen, 1970; Bailey, 1984; Basler et al., 1976; Donat, 1983). Allen (1970) and Basler et al. (1976) reported interrater reliability using respectively the PSP and PSI.

The findings generated by this body of literature as related to anxiety and performance again must be weighed against the limitations of the designs. The findings suggest that students who are low in trait anxiety, generally performed better than students with high trait anxiety scores. Opposing this generalization are Hollingsworth (1975) and O’Neil (1972), who both reported no significant difference between low and high trait anxiety and subject performance. O’Neil (1972) used the modified short version of the STAI, while Hollingsworth used the original version. Neither reported information on reliability or validity. Seven investigations reported subjects with high trait anxiety scores as also tending to have higher state anxiety scores on the STAI (Donat, 1983; Head, 1984; King et al., 1976; Leherissey et al., 1973; O’Neil, 1972; Tennyson & Woolley, 1971; Weinberg & Ragan, 1978). Donat (1983) and O’Neil (1972) found a positive relationship between trait and state anxiety \((p < .01)\). King et al. (1976) concluded that anxiety can be more efficiently measured using only the state
anxiety measurement, since the trait anxiety factor is reflected in the state anxiety score. Eysenck (1985) found that regardless of trait anxiety scores, state anxiety differed significantly using the STAI. Tennyson and Boutwell (1973) found that high state anxiety subjects made fewer errors on easier tasks than the low state anxiety subjects \((p < .05)\), whereas the low state anxiety group made fewer errors on the difficult tasks than the high state anxiety subjects \((p < .05)\). Overall high state anxiety as associated with more errors on difficult tasks was further supported by Eysenck (1985), Hollingsworth (1975), Leherissey et al. (1973), O’Neil (1972), and Tennyson and Woolley (1971).

Several investigations compared STAI scores to other variables including age, sex, workload, employment status, and marital status. Allen (1970), Berger and Owen (1982), Kanekar (1977), Megel et al., (1987), and Stoner and Spencer (1986) reported no significant differences in the variables of sex and age on state anxiety. Stoner and Spencer (1986), however, reported that women tended to have higher trait anxiety scores than males \((p < .05)\) yet the scores were proportional in gain and drop. Bailey (1984) found that unemployment significantly increased STAI score \((p < .001)\), as did single parents living alone rather than with family members \((p < .05)\). Friend (1982) also reported increased time urgency and subjective workload as having a negative impact on performance \((p < .05)\).

High state anxiety scores were found to decrease performance in 17 investigations (Alpert & Haber, 1960; Burton, 1971; Dobson & Markham, 1992; Donat, 1983; Eysenck, 1985; Friend, 1982; Head, 1984; Hollingsworth, 1975; Kanekar, 1977; King et al., 1976; Mandler & Sarason, 1952; Matthews & Burnett, 1989; McCann & Meen, 1984; O’Neil, 1972; Powell & Verner, 1982; Sarason, 1961; Tennyson & Woolley, 1971). These findings suggested that state anxiety impaired performance.
Eysenck (1985) further found that anxiety impaired working memory, which in turn reduced the amount of attentional focus which is available for performance on cognitive tasks.

There were several questionable design issues besides the lack of randomization. Basler (1976) used repeat testing in order to desensitize the subjects to the STAI, yet failed to account for the interaction of the test and the scores. Lamb (1973) used the blowing up of a balloon until it popped to create state anxiety. It is difficult to understand how this form of state anxiety related to the academic setting. Bailey (1984) made the assumption that federally funded subjects have more support and therefore a lower state anxiety. There was no research provided to support that conclusion.

Anxiety reducing techniques used by these investigators had varying degrees of effectiveness. Berger (1987) suggested that swimming reduced state anxiety \((p < .001)\), but did not have a long term effect \((p < .53)\). Johnson and Spielberger (1968) indicated that relaxation reduced state anxiety \((p < .001)\). Fehring (1983) found biofeedback with relaxation reduced state anxiety \((p < .05)\), but no significant difference was found when relaxation was used alone. Dendato and Diener (1986) indicated that study skills with relaxation reduced state anxiety \((p < .01)\), but study skills alone were not significant. Hussian and Lawrence (1978) suggested that stress inoculation and discussion groups reduced state anxiety \((p < .05)\), but these groups met for 50 minutes once a week. Jacobs and Suess (1975) indicated that the colors blue and green reduced state anxiety \((p < .025)\).

**Educational Kinesiology**

Twelve research reports included components of educational kinesiology in an academic setting. These include D. H. L. Carroll (1992), L. Carroll(1992), Cox (1992),

Khalsa, Morris and Sifft (1988) investigated the effect of educational kinesiology on the static balance of 30 matched pairs of learning disabled students. Subjects were matched pairs of 7 to 11-year-olds by age and sex. Assignment was made by pairs to one of three groups: (a) control, (b) movement, or (c) repatterning. Dennison's Laterality Repatterning (DLR) was done once only. Both the repatterned and movement groups experienced 6 weeks of movement five times a week for 10 minutes a day. The educational kinesiology movements chosen for research were hook-ups, positive points, cross crawls, and thinking caps. A pretest-posttest design with a control group was used. The criterion measure was static balance using the Modified Stork Stand Test. Data were analyzed using ANOVA. It was reported that there were no significant differences between the three groups in pretest scores. The treatment effect was significant ($p = .0001$). The length of balance improvement for the control group was .3 seconds, the movement group 4.9 seconds, and the repatterened group 7.6 seconds. Educational kinesiology movements and repatterning were reported as a most effective tool for improving the static balance of learning disabled children in elementary school.

Spalding (1990) studied the effect of educational kinesiology movements on eye and/or muscle strain generated by the use of computer video display terminals. Ten adult subjects were reported as equally divided between male and female and salaried and non-salaried. A one-shot case study design was accompanied by a daily log of participants' observations. Instruments included self-made questionnaires of physical symptoms and a daily journal for recording participant's physical symptoms and use of
the movements. Validity information for the physical symptoms questionnaire was reported as established by numerous research studies on computer operators. Participants were instructed to use the movements for 5 minutes every hour. The movements allowed were neck rolls, arm activation, the owl, double doodles and 11 educational kinesiology vision exercises. Data were analyzed using a t-test. The researcher reported a reduction in eyestrain ($p < .007$) and muscle related stress ($p < .02$). No significant improvement was reported in other physical symptoms as a result of the movements.

Sifft and Khalsa (1991) studied the effect of repatterning and seven educational kinesiology movements on 60 college students' response times to a visual stimulus. Subject volunteers, 30 men and 30 women, were randomly assigned to three groups: (a) control, (b) movement, and (c) repatterned with movements. Movements used were lazy 8's, calf pumps, hook-ups, positive points, balance buttons, earth buttons, and thinking caps; movement timing was reported as taking about 5 minutes to complete. A pretest-posttest design with a control group was used. The Lafayette 4-choice visual reaction time apparatus with a .001 second digital clock was used for the testing. Data were analyzed using ANOVA. Findings revealed no significant differences for sex ($p > .05$), with men performing faster than women on both the pretest and posttest, but with a similar rate of improvement. A single session of educational kinesiology movements significantly reduced the response times to a visual stimulus in college students ($p < .01$). The repatterned group decreased their response time by 25.31 milliseconds or 6%. The movement group decreased their response time by 15.94 milliseconds or 3.5%. The control group decreased their response time by 5.3 milliseconds or 1%. The reported conclusion was that educational kinesiology movements can increase performance after only one exposure.
D. H. L. Carroll (1992) studied the effect of nine educational kinesiology movements on students' recognition and reproduction of letters or numbers, their auditory and visual discrimination of sounds and words, and/or their ability to match and reproduce designs. The movements included: brain buttons, earth buttons, space buttons, thinking caps, lazy eight's, elephant, hook-ups, cross crawl, and DLR. The study covered a 10 week period with 22 first graders doing the movements for 15 minutes per day. Subjects had no prior experience with the movements. A one-shot case study design was used with a convenience sample of one classroom of first graders. The criterion instrument was a teacher-made test which had been developed over the years to assess students' skills on the recognition and reproduction of letters and numbers, the auditory and visual discrimination of sounds and words, and the matching and reproducing of designs. Results showed that 20 students with letter reversals on the pretest made no letter reversals on the posttest. Nineteen students with number reversals on the pretest made no errors on the posttest. All students improved in their auditory discrimination ability. The investigator concluded that because reversals are a sign of stress in the learner, educational kinesiology movements are a way to reduce stress in the students' physiology, thus freeing the learner to achieve.

L. Carroll (1992) studied 10 second and third graders in a special day class over 8 months to determine the effect of DLR and four other educational kinesiology movements on word recognition, hand-eye coordination, and self-esteem. All four movements were done daily and used on special occasions, such as calming students before a test. Data were gathered by administering the Wide Range Achievement Test, Slosson Drawing Coordination Test, and Draw-A-Man. It was reported that all students showed improvement, with an average .6 grade level gain on the Wide Range Achievement Test. This score was reported to be beyond the expected progress for
Special Education students. The students showed an increase in both attention to
details and spatial relationships as a result of the movements.

Cox (1992) studied the impact of educational kinesiology, Char-L Intensive
Phonics (CIP), and a math and thinking skills module on 23 students in grades one
through four during a summer school remedial program. The study was carried out for
4 weeks for 1 hour twice a week. Math and thinking skills modules were reported as
being alternated with the educational kinesiology movements and CIP activities.
Instruments used were the Slosson Reading and Mathematics Forms A and B. Students
were reported as having an average gain of 1.05 reading grade equivalent and a .73
math grade equivalent. Both gains were reported as being greater than expected after
48 hours of instruction.

Eyestone (1992) studied the effectiveness of using the symbols, "X" and "II,"
both parts of DLR, as tools for screening individuals for further testing or intervention.
Subjects were at-risk populations in personal self-help resources, being intellectually
handicapped, or in juvenile detention centers, including a teen mother and chemical
and/or alcohol dependency programs. A muscle response test was used to indicate
stress while looking at one of the two symbols at a time. The findings stated that 998
out of 1026 participants in the at-risk groups tested as one-sided versus whole brain
processors. In the not-at-risk group only 38 out of 407 participants tested as one-sided
processors. Eyestone concluded that a high correlation exists between those testing as
one-sided processors and participants in programs oriented to stress, addictions,
delinquency, or learning handicaps.

Gardner and Gardner (1992) studied 23 youth aged 12 through 15 during a
14-day wilderness program. A one-shot case study design was used. Criterion measures
included the Nelson-Denny Comprehensive Reading Test, Wide Range Reading Test
on Vocabulary, Nothside Learning Lab, and an observational non-standardized measure. Educational Kinesiology activities were reported as being taught and used as the only intervention beyond the standard program. No information was given on which activities were used nor on their frequency or duration. Findings reported an average reading gain of .77 months and an average mathematics gain of .62 months.

Hannaford (1992) studied the benefit of educational kinesiology movements several times a day for a few minutes throughout the entire school year on 19 fifth graders in Certified Special Education. The design was a one-shot case study. The instrument used was the Brigance Inventory of Basic Skills for Reading, Reading Comprehension, and Mathematics. It was reported that as a result of the treatment all students gained one to 2 years of academic growth. Also, reported was an increase in relaxed learning and enjoyment of the learning process for all students.

McGovern (1992) studied the possibility of including educational kinesiology in the curriculum for learning disabled students. Twelve key students and 21 teachers in 10 schools served as subjects. No details were reported on the selection process of the 12 key students out of a 600 student population. The educational kinesiology movements were demonstrated and discussed with parents and educators as to their relevance to academic and daily activities. Criterion measures included: (a) teacher observations and checklists related to student's behavior, attitude, productivity, organization, ability to settle and focus, and work skills; (b) Beery Developmental Test of Visual Motor Integration, Motor-Free Visual-Perception Test; (c) feedback from parents and student surveys. Thirteen teachers reported observed improvements in printing and spacing of work, increased focus during group times, increased self-awareness, calmer, happier, and less moody students, increased confidence in spelling, mathematics, and writing, and improved organization. Five teachers noted no changes
in key students stating the cause as a shortness of the investigation time frame. All teachers indicated interest in a future use of the movements. Other findings reported included: (a) some children felt unable to participate due to parental beliefs about acupressure; (b) all students can benefit without singling out specific students; (c) any age student has the ability to benefit if there is a willingness to change; and (d) some educators and parents remain skeptical about such programs.

Primost and Shar'abi (1992) studied the effects of educational kinesiology on the academic and social skills of 12 high school students. No details were given as to the specific movements used, but it was implied that the four step preactivity movement PACE was used. The investigator reported seeing each pupil for six or more 45 minute weekly sessions. Each student was diagnosed in a variety of learning areas by a school psychologist. Students completed a questionnaire to self-report areas of difficulty. No details were provided on the instruments used in this study. It was reported that 7 out of 12 students benefited noticeably from the movements as observed by teachers, parents, and students. Anecdotal notes on each student were reported in terms of "great improvement in reading ability"; "improvement at home"; "very great improvement"; "no conclusions as yet."

Whetton (1992) investigated the effects of educational kinesiology, yoga, and aerobic exercise on 12 remedial high school students. The subjects were randomly assigned to a treatment or control group. Each group had a daily 20 minute exercise period for 4 weeks. The control group individually contracted on how the 20 minutes were to be used. The design was pretest-posttest with a control group. Criterion measures included reading fluency, reading comprehension, time spent on task and hyperactive behavior. Findings revealed that the educational kinesiology group had a 60% improvement on reading comprehension, a 30% to 60% average improvement of
time on task per day, and a great reduction in hyperactive behaviors. All students spoke of feeling changed. The aerobic exercise and yoga groups showed only small progress in reading comprehension. The yoga group had a reduction in hyperactive behaviors. The control group had no observable changes. Whetton then withheld the educational kinesiology movements for 8 weeks and found that the time on task decreased from 85% to 60%. Movements were then reintroduced and time on task increased to 85%. After 4 years of treatment, the total reading gain was reported to be 5.6 years. The mathematical gain was reported to be 4.6 years. The comprehension gain was reported to be 7.6 years. The spelling gain was reported to be 4.3 years. Negative statements to self and others were reduced by 95%. Positive statements to self and others were increased by 70%. Coordination improved in seven students, enabling them to rejoin their appropriate age level physical education class. Hyperactivity became nonexistent.

Summary

The reported findings from these 12 studies suggest that the educational kinesiology movements reduced anxiety in the academic setting; increased time on task, organization, physical response rate on visual stimuli, and balance; and increased performance in academic areas such as reading, mathematics, and writing. The investigations suggest that the movements do not hinder learning or impair motor skills.

These findings, however, must be weighed against questionable research practices. It cannot be assumed that the use of a standardized instrument or a commonly used instrument results in data from which valid inferences can be made. It is the researchers' responsibility to provide information on the reliability and validity process. It cannot be concluded therefore, that the reported results are totally attributable to the educational kinesiology movements.
Three investigations, McGovern (1992), Primost and Shar' abi (1992), and Whetton (1992) used observation data. All three investigations lacked a detailed description of the data collection process. A description of the validation process was not reported.

Investigations by six researchers reported using the educational kinesiology movements, but did not explain which of the movements were used and in what combinations. (D. H. L. Carroll, 1992; Gardner & Gardner, 1992; Hannaford, 1992; McGovern, 1992; Primost & Shar' abi, 1992; Whetton, 1992). One investigator, Cox (1992), alternated educational kinesiology movements and CIP within a math and thinking skills module, thus making it impossible to determine what caused the difference in the posttest scores. Five investigators provided detailed descriptions of the educational kinesiology movements, duration, and frequency (L. Carroll, 1992; Eyestone, 1992; Khalsa et al., 1988; Sifft & Khalsa, 1991; Spalding, 1990). Educational kinesiology involved more than just random movements, no sex differences were noted, and there was no increase in anxiety noted by the researchers.

Overall Critical Review Summary

The critical review of 64 research reports led to a number of conclusions.

1. The majority of investigations in this critical review were quantitative. Only three investigations (Parkes, 1985; Sellek, 1982; Windsor, 1987) were qualitative.

2. It was common practice to use a convenience sample of students. Seven investigators of anxiety (Beck & Srivastava, 1991; Howell & Swanson, 1989; Lindop, 1991; Megel et al., 1987; Pagana, 1989; Pagana, 1990; Sellek, 1982) used total populations of nursing students enrolled at the investigations sites. Of the convenience samples, subject randomization was reported in only 13 investigations (Dendato &

3. It was common practice in the educational kinesiology research reports to have multiple independent variables which were not clearly defined. This made it impossible to attribute the results to a single variable.

4. Most investigators using instruments in their research made no mention of information concerning reliability and/or validity. Only 14 investigations (Allen, 1970; Alpert & Haber, 1960; Basler et al., 1976; Bell, 1991; Erler & Rudman, 1993; Friend, 1982; Head, 1984; King et al., 1976; Megel et al., 1987; Pagana, 1989; Pagana, 1990; Speck, 1990; Stephens, 1992; Summers et al., 1990) provided information on reliability and/or validity.

5. Five investigators (Friend, 1982; Megel et al., 1987; Speck, 1990; Stephens, 1992; Summers et al., 1990) reported information on reliability and/or validity as provided in the original instruments' documentation rather than from the data of the individual research reports.

6. When addressed, validity was supported using a content, construct and/or concurrent validity (Megel et al., 1987; Pagana, 1989; Pagana, 1990), or other research findings in the field of study (Megel et al., 1987; Spalding, 1990).

7. Four investigations (Friend, 1982; Leherissey et al., 1973; O'Neil, 1972; Pagana, 1990) altered instruments without reporting efforts to establish reliability and validity for the altered version.

8. The most frequently used instrument for measuring state and trait anxiety was the STAI. Out of the 51 anxiety studies, 31 investigations included the STAI as one of the instruments.
9. Anxiety seemed to increase as the task difficulty increased (Leherissey et al., 1973; Lewis et al., 1987; Lindop, 1991; Tennyson & Woolley, 1971; Windsor, 1987).


13. It was common in the nursing student and anxiety investigations for the investigators to study sources of nursing student stress and stress reduction treatment variables. All the investigators included in their reports the assumption that anxiety negatively effects academic and clinical performance.

14. Student anxiety seemed to be most present in the nursing skills laboratory and clinical components of nursing programs (Beck & Srivastava, 1991; Pagana, 1989; Pagana, 1990; Parkes, 1985; Sellek, 1982; Windsor, 1987).

15. The nursing skills laboratory was more stressful for students than the clinical component of the nursing program (Megel et al., 1987).


17. The majority of investigations researching the variable of sex and age found no difference in state anxiety associated with these variables (Allen, 1970; Berger
18. Performance did not appear to significantly increase in clinical experiences and/or academic skills following the application of stress reduction techniques: relaxation, biofeedback, 60 beat per minute music, imagery, preclinical simulation, or study skills (Bell, 1991; Dendato & Diener, 1986; Erler & Rudman, 1993; Russler, 1991; Speck, 1990; Stephens, 1992; Summers et al., 1990; Wernick, 1984).

19. The majority of stress reduction techniques required unmanageable time frames and were short-lived or had no significant effect on state or trait anxiety (Berger & Owen, 1987; Charlesworth et al., 1981; Howell & Swanson, 1989; Johnson & Spielberger, 1968; Speck, 1990; Stephens, 1992; Summers et al., 1990; Wernick, 1984).

20. Five anxiety reducing techniques were identified which resulted in a significant reduction in state anxiety: (a) modified testing (Phillips, 1988), (b) stress inoculation (Hussian & Lawrence, 1978), (c) biofeedback and relaxation (Fehring, 1983), (d) swimming (Berger & Owen, 1987), and (e) relaxation with introverts (Stoudenmire, 1972).


22. None of the educational kinesiology studies isolated the impact of the four-step preactivity, PACE. If PACE was part of any treatment variable, it was not
clearly described in these studies. Several studies used one or more aspects of PACE:
Hook-ups were used in three studies (D. H. L. Carroll, 1992; Khalsa et al., 1988; Sifft & Khalsa, 1991), brain buttons were used in one study (D. H. L. Carroll, 1992), cross
crawls were used in two studies (D. H. L. Carroll, 1992; Khalsa et al., 1988), and water
was not a documented part of any study.

Multiple Baseline Design

Multiple baseline designs were first introduced into the literature of applied
behavioral analysis by Baer, Wolf, and Risley (1968). Multiple baseline is an
experimental design well suited to the practical requirements of applied behavioral
analysis (Tawney & Gast, 1984). It lends itself to program efficiency measures. No
withdrawal of the treatment is required. The design is easy to conceptualize and
implement and thus allows teachers and parents to do research (Murphey, Bryan,
1980).

Applied behavioral research has distinguishable characteristics (Kazdin, 1982;
Twaney & Gast, 1984): (a) the subject and/ or society benefit from the treatment, (b)
the treatment focuses on measurable behaviors, (c) the behavioral effect of the
treatment is believable, (d) the research design and procedures are described in enough
details for easy replication of the study, (e) terminology used to describe the
intervention is conceptually consistent with the literature, (f) the effects of the
treatment are sufficient enough to be of practical value to the subject, and (g)
behavioral change is maintained over time. The goal of applied behavioral analysis is to
use a treatment technique designed to change behavior in a measurable and
accountable manner. This analytical behavioral application is a self-examination, self-
evaluation, discovery-oriented research procedure (Baer, Wolf, & Risely, 1968).
Multiple baseline designs have been widely used in educational settings. There are three variations of the multiple baseline designs. The first looks at three or more different behaviors of a subject under the same condition. The second looks at three or more different conditions associated with the same subject behavior. The third looks at three or more subjects with the same behavior under the same conditions.

In a multiple baseline design across subjects, a particular behavior is common to all subjects. This behavior is observed and baseline data is collected. Once the behavior for each subject is stable, a baseline is established. The treatment is then applied to one subject group while baseline conditions remain the same for the other subject groups. Subjects receiving the treatment are expected to show a change in behavior while the baseline groups are expected to remain unchanged. Once a change in the first treatment group is established and the baseline remains constant, the treatment is given to the second subject group. The second treatment group is also expected to show a change in behavior while the third subject group remains unchanged. Once the second group shows an established change, the third subject group receives the treatment. A change in behavior is expected in the third group once it has received the treatment.

Data inferences are based on the performance analysis of three subjects. A subject may be an individual or a group. Multiple baseline design requires simultaneous data collection from the three subjects. A constant baseline serves as the control for the design. A comparison of performance across behaviors for the three subjects is an essential aspect of the design. Results are plotted on a graph to assist in organizing the data collection process and to provide a detailed numerical summary and description of the data (Tawney & Gast, 1984).
Self-Reporting Data Collection

Self-reporting is a common technique for data collection in multiple baseline designs (Kirby, Fowler, & Baer, 1991). Self-reporting refers to the instances in which the individual notes his/her own behavior. The form of noting the behavior may vary from casual observation to complex methods of recording. In the 1970s, self-reporting was discovered as a useful way of favorably changing behavior (Hayes & Cavior, 1977; Maletsky, 1974). There are mixed views on whether self-reporting has the capacity to function as a behavioral change technique (Burg, Reid, & Lattiaamoaore, 1979; Rosenbaum & Drabman, 1979). Self-reporting may have a reactive effect on the target behavior being observed, and so behavior actually changes as a result of the self-reporting. This adds a possible extra level of rigor to this study. The activity of self-reporting feelings on a weekly basis may heighten student awareness of anxiety and thus motivate the student to lower that anxiety through other variables.

Kazdin (1975, 1994) noted several disadvantages associated with relying on external evaluation methods. Due to the complexity of the classroom setting, a great deal of behavior may go unnoticed by the observer. Self-reporting is a method of teaching students how to evaluate their own behaviors and performance and to use appropriate interventions. Students are thus assisted and encouraged in developing their own academic strategies and skills, and in taking self-control in situations requiring behavioral change (O'Leary & Drabman, 1971; O'Leary & O'Leary, 1976).

Self-perception of one's emotional state is an important factor in any attempt to reduce personal anxiety. Since anxiety is a highly personal emotional response to a stressor, a student's perception of that anxiety is more important than that of an outside observer who is simply attempting to note anxious behaviors for them. A
person's own languaging is equally more reflective of that individual's internal state than any languaging which an outside observer might express. In the self-regulated learner model of Weinstein (1992), a student's need for knowledge about self is emphasized as crucial. This includes the ability to assess one's emotional state and to know strategies for learning which include anxiety reduction techniques.

In self-reporting behaviors, notations are made with no observer judgment and minimal interference. Students need the ability to evaluate and report personal behaviors on a recording device (Rosenbaum & Drabman, 1979).

The subjects for this study had previously taken course work in psychology, anatomy and physiology and nursing theory. The nursing theory covered the physiological, emotional, social, and cultural effects of stress as well as the emotional response of anxiety in patients and their caregivers. Subjects had also been taught to assess anxiety in themselves and others and to use coping techniques to deal with anxiety. All subjects were capable of self-reporting their feelings and of recording those feelings in a written format. Allowing students an open-ended self-reporting format had the advantage of not putting words or ideas in subjects' minds and thus permitting them to interpret their own experience.

Chapter Summary

This chapter provides a critical review and analysis of research on anxiety and nursing students, anxiety and performance, and educational kinesiology in academic settings. A list of conclusions are drawn from the critical review and analysis. It concludes with a brief overview of multiple baseline design and self-reporting as a method for data collection.
CHAPTER III

METHODOLOGY

This chapter describes the methodology used in this study. It consists of the following sections: (a) multiple baseline design across subjects, (b) selection of sample, and (c) research procedures.

Multiple Baseline Design Across Subjects

Multiple baseline designs were first introduced into the literature by Baer, Wolf, and Risley (1968). Three basic variations of the multiple baseline designs exist. The first variation measures across three or more subject behaviors under the same conditions. The second measures across three or more conditions where both subject and behavior remain constant. The third measures across three or more subjects with the behavior and condition remaining constant.

The research design of this study used variation three with two multiple baseline designs across subjects for self-reporting and performance (Borg & Gall, 1989; Borg, Gall & Gall, 1993; Tawney & Gast, 1984). The subjects were randomly divided into three groups. The target behavior was self-reported anxiety related to weekly skill performance tests and to subjects' performance scores on these tests. The condition was the weekly skill performance tests. The treatment variable was completion of the four steps of PACE before the skill performance tests.

A multiple baseline design was selected as the best design for this study because the selection process for admitting candidates to the nursing program provides a homogenous sample population. The high academic standards required by nursing programs exists to ensure public safety and quality care. A narrow distribution of
performance in the clinical experience and academic testing is therefore realized. Any analysis by a parametric statistical method would have violated the assumption of normal distribution (Borg & Gall, 1989).

It was pointed out in the critical review of the literature that inadequate supporting data for reliability and/or validity was characteristic of all the instruments measuring anxiety in nursing students. The most widely used instrument, which measured state anxiety, used the reliability and validity information from a previous version to support the new version of the instrument (Dreger, 1978; Katkin, 1978; Spielberger, 1983). Any given instrument must be tested for reliability and include an argument for validity (Borg & Gall, 1989).

Internal validity was determined in this design according to steps suggested by Baer, Wolf, and Risley (1968): (a) the subjects were selected on a functionally related target of behaviors, (b) the target behavior of each subject group was measured to show baseline stability within the investigation's time limit, (c) each subject was trained by the investigator to do the PACE process, (d) the treatment variable was applied to the first subject group until a change was noticed while Group 2 and Group 3 simultaneously served as baseline controls, (e) once a change was again noticed, treatment was applied to the second group while Group 3 served as the baseline control.

Experimental control is demonstrated when there is a positive change in both level and trend after introduction of the treatment variable. Any covariation in subjects who have not had the intervention threatens the demonstration of control. It is preferable in multiple baseline designs to have similar subjects so that the treatment variable equally affects each subject group in turn (Tawney & Gast, 1984).

The significance of the treatment variable's effect is based on practical importance, specifically, the power to change behavior sufficiently enough to be
important. Baer, Wolf, and Risley (1986) suggest asking the question, "How much did the behavior need to be changed?" The opinion of experts in the area under study helps establish realistic criteria for treatment effectiveness. Another practicality in using a multiple baseline design is that it is easy to explain to nonresearchers and that the results are documented in a way which tell their own story (Kazdin, 1982). This design provides flexibility in disseminating the investigation results to researchers and nonresearchers in a nonthreatening way.

Since few well designed studies exist in the critical review of the educational kinesiology literature, it was important to select a design which was well suited to the classroom. This design does not require a statistician to interpret the results. Educators might be encouraged by these factors and so consider adding their own contributions to the research base. The simplicity of this design encourages its use as a model for replication in future educational kinesiology research.

**Advantages**

Advantages of the multiple baseline design are as follows:

1. It is a better match for the many practical demands of applied settings than a withdrawal or reversal design (Tawney & Gast, 1984).

2. It is unnecessary to reverse or withhold the treatment variable to demonstrate experimental control when using this design (Baer, Wolf, & Risley, 1968; Kazdin & Kopel, 1975).

3. It eliminates the problem of having to reverse the behavior and hence avoids the ethical issues which accompany a reversal design (Borg, Gall, & Gall, 1993).

4. Experimental control with this design can be achieved without the subjects returning to the baseline condition (Tawney & Gast, 1984).
5. Multiple baseline allows for the evaluation of treatments designed to make permanent changes (Tawney & Gast, 1984).

6. The simultaneous measurement of several targeted behaviors, conditions, or individuals/groups required for this design promotes more naturalistic conditions for subjects (Baer, Wolf, & Risley, 1968; Kazdin, 1982, Tawney & Gast, 1984).

7. The internal validity of this design is established by simultaneously collecting performance and self-reporting data across three or more subjects. Baseline changes are clearly evident from the application of the treatment (Tawney & Gast, 1984).

8. The interrater reliability of the two instructors who determined the participant outcomes on the skill performance tests was 100%. All failures were further discussed by these testers. A skills lab coordinator was available for possible cases of varying evaluations.

Limitations

The limitations of multiple baseline design are as follows:

1. Prolonged baseline conditions are required (Tawney & Gast, 1984).

2. A prolonged baseline may result in the negative effect of boredom, fatigue, and/or competitive responding by the subjects (Tawney & Gast, 1984).

3. A prolonged baseline may be considered unethical as a result of the postponement of the treatment for latter groups (Tawney & Gast, 1984).

4. A prolonged baseline may be considered unethical as a result of a delayed intervention on behaviors requiring immediate attention (Tawney & Gast, 1984).
5. The problem of subject retention is more likely to be strained when the multiple baseline uses individuals rather than group subjects.
6. This design has low external validity because the findings cannot be generalized beyond the subjects in the investigation (Tawney & Gast, 1984).

Appropriateness of the Design

The multiple baseline design across subjects is appropriate for this investigation for the following reasons:

1. The sample population is homogenous.
2. It is not financially or logically feasible to obtain subjects by true random sampling.
3. No instrument measuring anxiety has adequate evidences for establishing reliability and validity for nursing students.
4. All subjects are exposed to the same conditions, the skill performance tests.
5. Anxiety is a common response among subjects being evaluated in a nursing program.
6. Experimental control is demonstrated by measuring anxiety and performance in three concurrent subjects.

Selection of Sample

The sample is composed of 27 volunteer first year nursing students at Chemeketa Community College, Salem, Oregon. Randomly assigned to three treatment groups, each group was viewed as a single subject. Scores were measured as group mean percentages.
Research Procedures

The research procedure involved six phases: (a) preparation, (b) baseline measurements, (c) training of PACE, (d) intervention, (e) interobserver reliability, (f) skill testing, and (g) procedural integrity.

Preparation

The investigator informed the entire nursing faculty of the research investigation. The study design was explained. The nursing faculty were not informed of the experimental variable or the subject groups. They were, however, informed to be unconcerned should they observe students doing different movements during theory or in the clinical component of the program. The nursing faculty was told that the investigator was studying the impact of a new treatment on anxiety.

During the skills lab theory class at the beginning of spring term, first year nursing students were given a verbal invitation to participate in the research investigation. Each student was also given a written consent form describing the study (see Appendix B for details on the written consent form). Students returned the signed forms in order to participate in the investigation. All students were encouraged to participate, but no pressure was exerted by the investigator or nursing faculty for students to participate or to continue participating. Volunteers were notified of their groups, the date, place, and time of the PACE training sessions, and the location in which to PACE before their skill performance test.

Baseline

Baseline measurements for the skill performance tests were determined by using the self-reported feelings of anxiety and skill performance test scores from winter term.
Five technical-motor skills from winter term were used to establish the baseline for Group 1. Nine technical-motor skills from spring term were used for the remainder of the study. The performance-based outcomes for each performance test were developed by the total nursing faculty. Agreement among faculty members assured that each outcome was appropriate for the skill and level of the students. Performance-based outcomes for each skill had been earlier developed by nursing faculty after reviewing current literature and clinical practice on each skill. The major components required to safely complete each skill and a detailed skill checklist outlining these components became part of the skills lab syllabus.

A 90-minute theory class and demonstration of each skill was presented by the skills lab coordinator. Performance-based outcomes were identified for each skill on the corresponding skill checklist. The criteria for successful completion of each skill performance test was listed on the skills checklist. Each performance test included a new technical-motor skill and/or level of performance.

In comparison to previous first-year classes, an exceptionally high failure rate and level of anxiety was reported for this class by faculty. The nursing faculty and first year students eagerly supported this investigation, recognizing the need for anxiety reducing strategies.

Training of PACE

The training of PACE was done by the investigator, a teacher certified by the Educational Kinesiology Foundation. Identical 30-minute training sessions were held the given week any one of the three groups started the treatment variable, PACE. On week two of spring term, the first subject group started the treatment variable before each skill test. The fifth week of the term, Group 2 started the treatment. The eighth
week of the term, Group 3 joined in using the treatment. The time available within spring term allowed for a total of nine performance tests.

If the investigation had extended treatment into the first term of the subjects' second year in the program, other variables might have influenced the data, summer break being one of them. Some students use their nursing skills during this time, whereas others may choose to work in non-nursing jobs or not at all.

A training session was held just prior to the treatment phase for each group. A brief reminder was given prior to that session. Only students in the group to be trained were allowed in the training session. Training sessions included watching the first 15 minutes of the *Education In Motion* videotape (Hannaford, Shaner, & Zachary, 1993). This section focused on explaining and modeling the four steps of PACE. Students practiced PACE after watching the videotape. Student questions were answered by the investigator. The process for doing PACE prior to each skill performance test was reviewed. Each group was reminded not to discuss the treatment with other peers until all treatment groups had been trained.

**Intervention**

The room designated as the PACE room was available because the second year nursing students normally using it were not given skill performance tests during spring term. The room was separated from the first year student practice area yet close enough to be convenient to the subjects. It was quiet. One window in a door could be covered with a shade in case privacy was desired.

PACE was done 10-15 minutes before each skill performance test. The time varied slightly according to when students arrived in the PACE room and the completion of their practice time. Students were assigned a weekly 1 hour skill test time
at the beginning of the term. Rescheduling occurred as individual student needs arose. Subjects, therefore, might complete PACE individually or in small groups. PACE was supervised at all times by the investigator.

Each PACE session was done in the same format. Subjects drank six ounces of pre-measured, room-temperature distilled water from paper cups. Subjects massaged their brain buttons for 30 seconds with a firmness suitable to them while simultaneously holding the opposite hand over the navel. They then cross crawled for 3 minutes. The first phase of hook-ups lasted for 3 minutes and the last phase for 1 minute.

After completing PACE, subjects walked to the skill performance testing room. Some subjects used the restroom before entering the testing area. Slight schedule variations occasionally allowed for unsupervised time between the completion of PACE and the skill performance testing.

Interobserver Reliability

Two experienced nursing instructors were previously trained for evaluating and administering student skill performance tests. These two nursing instructors and the skills lab coordinator had worked together for 5 years in the skills lab. The lab coordinator was in charge of communicating with first year nursing instructors on students' skill performance in the skills laboratory, and was in charge of developing and maintaining skills syllabi as well as being the demonstrating instructor for all skills taught and tested.

Each term, the nursing instructors and skills lab coordinator weekly verified their agreement on the passing criteria for each skill. The skills lab coordinator served as an outside observer as needed. Agreement was computed by dividing the number of
pass agreements by the number of pass agreements plus disagreements and multiplying by 100. Agreement was 100%.

Skills Lab Performance Testing

Both instructors attended the skills lab theory class and participated in a weekly preparation meeting with the skills lab coordinator. During this meeting, the skill of the week was discussed and the performance-based outcomes for the specific skill, as well as the criteria for successful completion of the skill, were reviewed. At the beginning of the term, a skills lab syllabus was purchased by students containing performance-based outcomes to be tested during the skill performance tests.

Failures on the skill performance tests greatly impact academic standing in the nursing program. After the second failure, a student moves to academic probation. On the third failure, the student may be dismissed from the nursing program. Since a failure in skill performance testing is directly tied to academic standing, most students are serious in their attempts to pass the individual skill performance tests.

Two identical skill performance testing areas were set up a single room. This room was used for all first year student skills performance testing during the 1994-1995 academic year. The only changes occurring in the room during the investigation originated from a need to meet the equipment requirements for a specific skill.

Upon arrival in the testing room and before each skill performance test, all students privately self-reported their feelings on their copy of the skills' checklist. Once students had completed their skill test, nursing instructors recorded a pass or fail on the individual skill checklist and on a master recording sheet.

During the last week of the study, students were individually asked by the investigator whether they had talked about the treatment with peers who had not been
trained on PACE. The responses were "No." The investigator also monitored the skill practice room hourly for any subjects publicly using the treatment outside the PACE room. Appropriately, none were observed.

Procedural Integrity

Procedural integrity was maintained while doing the four-step PACE process. The investigator monitored each step of the process, assuring that it was completed to the set criteria. In addition, the skill practice area was monitored to note if subjects were sharing PACE with nontreatment group members. Attendance was taken at each PACE training session and only those subjects directly involved were allowed to stay. During the last PACE treatment session, subjects were asked if they had shared the PACE treatment with any nontreatment classmates. No subject self-reported as having violated the investigator's request to not discuss the treatment with other peers until all treatment groups had been trained.

Overall, subjects followed through with their agreement to participate in the investigation. No pressure was exerted to encourage subjects to continue in the study. A list of subjects' names was posted at the beginning of the study for subjects to refer to as needed. When the research investigation was initially explained, however, subjects requested that the investigator do a one time reminder before each of the three training sessions. This reminder occurred once in a total class setting before each training session. Names were not called nor were individual subjects sought out and reminded that they had volunteered.

Subjects were free to withdraw from the study at any time. Both participants and non-participants interacted freely with the investigator. No feedback was received
by faculty or administration regarding student participation in the investigation or regarding the signing of the consent form.

Four subjects in Group 3 individually voiced concern about not getting the treatment before the last 3 weeks of the term. They thought it was a long time to wait before experiencing the possible benefits of the treatment. None of these subjects were in jeopardy of failing the nursing program. After discussion with the nursing faculty, it was decided to maintain the integrity of the research design and expose these four subjects to the treatment only as indicated in the design guidelines.

Most subjects arrived on time in order to complete PACE and kept the investigator informed of changes in their skill test schedule. The investigator received no feedback from the nursing faculty of subjects using the PACE movements in other nursing settings.

Analysis

The data were analyzed by plotting the mean percentage scores of each subject on a graph (Borg & Gall, 1989; Tawney & Gast, 1984). The horizontal line (X axis) represents the skill performance tests, a unit of time variable. The vertical line (Y axis) represents the target behaviors, which are self-reported anxiety and performance on the skill tests. Each data point is plotted separately on an appropriate graph and the data points are connected by lines. Transition from one phase of the study to another is indicated by vertical broken lines. The four phases in this study are baseline, subject one alone receiving the treatment, subject one and two receiving the treatment, and finally all three subject groups receiving the treatment.

The skill performance test scores were either a pass or a fail on the student's first attempt. Repeat attempts to pass the test were not calculated into the group mean
percentages. The group mean percentage for successful completion was quantified for each skill performance test.

According to Townsend (1993), it is very difficult to quantify or draw a precise line between normal and abnormal anxiety. Societal standards determine “normality”. This normal level of anxiety varies between regions of the country and across cultures. For nursing students, a mild to low level of anxiety is conducive to optimal performance and learning. A moderate to panic level hinders learning and performance. (Peplau, 1963).

Beck and Emery (1985) provide guidelines for when anxiety is considered abnormal or pathological. They are as follows: (a) the subject experiences a psychosomatic effect such as palpitations or stomach disturbances; (b) there is impairment of intellectual, social, or occupational function; (c) the response is disproportionate to the risk and severity of the threat; and (d) the response continues beyond the existence of a potential danger or threat.

The symptoms used to determine moderate to severe anxiety disorders in the Diagnostic and Statistical Manual of Mental Disorders (1987) provide additional criteria for evaluating the self-reporting data of the subjects' feelings before the skills performance tests. The autonomic hyperactivity symptoms include: (a) increased respirations or shortness of breath; (b) unsteady feelings or faintness; (c) palpitations or increased heart rate; (d) sweating; (e) nausea or abdominal distress; (f) flushes or chills; (g) dry mouth or difficulty swallowing; and (h) frequent urination. The symptoms of motor tension include: (a) trembling or feeling shaky; (b) restlessness; (c) muscle tension or aches; and (d) easy fatiguability. The cognitive symptoms include: (a) feeling keyed up or on edge, (b) difficulty in concentrating or the mind going blank, (c) irritability, and (d) difficulty sleeping.
The resultant heightened perception and increased alertness of mild anxiety enhances learning. This mild level is considered an acceptable anxiety before a testing situation. It is characterized by a slight increase in anxiety or nervousness without the symptoms which characterize the moderate to severe levels of anxiety. Any symptoms from the moderate to severe anxiety levels are considered to be unacceptable high anxiety. This study has two categories of anxiety: (a) low, which is no anxiety to mild anxiety, and (b) high, which is moderate to panic level anxiety. Since the low level is conducive to learning and performance, anything above it is problematic for both subject and educator in the educational setting.

Self-reporting data was quantified by using only signs of high anxiety as documented in the nursing textbooks and anxiety literature. Subjects who self-reported feelings of relaxation or mild anxiety as described in the literature were considered as being at an acceptable level of anxiety or nervousness, and thus in an appropriate state for testing. In this study, subjects using self-reported anxiety descriptors falling into the literature's moderate to severe categories were considered as high anxiety.

Chapter Summary

Chapter III was devoted to the methodology used in this study. It included the critical elements of a multiple baseline design and the process of using a treatment variable, PACE, in a nursing skill performance testing situation with skill performance scores and self-reporting feelings as the dependent variables.
CHAPTER IV

FINDINGS

This chapter provides the findings of the study. It consists of the following sections: (a) interobserver reliability, (b) effect of PACE on self-reported anxiety, and (c) effect of PACE on performance.

Interobserver Reliability

A concern to be equitable on the pass/fail criteria for all subjects taking the skill performance tests was primary. Before testing each skill, two nursing instructors doing the actual testing and a skills lab coordinator agreed 100% on the criteria for passing and failing each skill test. All failures were double checked against the evaluation criteria. The hazard of observer drift was reduced as the three nursing instructors involved with the skill testing consistently worked together and communicated with each other throughout the testing for each skill (Kazdin, 1982).

Interobserver agreement was also checked during the investigation. Two simultaneous evaluations of a given student resulted in 100% interobserver agreement. In the case of a skill test failure, the two instructors double-checked against the evaluation criteria. The skills lab coordinator was further available should consultation be needed on subjects who had failed. In this study, 100% agreement between the testing instructors did not necessitate further consultation with the lab coordinator.

The skills lab coordinator was occasionally consulted on a subject who failed. The skills lab coordinator would then review the student’s performance on the skill test either on videotape or by the review of notes of the nursing instructor doing the skill
testing. There was 100% agreement between the two nursing instructors doing the testing and the skills lab coordinator.

Level of Participation

The total number of subjects varied slightly on a weekly basis. Table 1 presents the subject variation of all three groups. The original base numbers of the three groups were almost equal. Once the groups had been randomly divided, four volunteers declined to participate. This left Group 2 and Group 3 with lower base numbers. One subject in Group 1 dropped out of the nursing program during skill 11 of the investigation. The number of subjects per group is not required to be equal in a multiple baseline design (Tawney & Gast, 1984).

Another variable influencing the base number of subjects per group arose because on some weeks a subject did not participate in the PACE treatment. Some subjects reported no reason for not participating and others reported reasons such as: (a) forgetting, (b) lack of time before the skill performance test, and (c) wanting to see what would happen without doing PACE. These were recorded as nonparticipants. Subjects volunteered, but were never asked for an explanation for not participating.

The last reason for the base number differences was that a few subjects did not complete all four steps of the PACE process. Any student not completely finishing all four steps was discounted for that week's group data.

In Group 1, the baseline phase participation is 100%. During the treatment phase participation ranges from 63.6% to 100% with a mean group percentage of 87.8%. The overall mean group percentage of participation for Group 1 is 92.2%. The largest factor reducing participation in Group 1 is the one student who did not PACE for 2 weeks and then dropped out of the nursing program on the eleventh skill test of
TABLE 1

A RECORD OF GROUP PARTICIPATION IN THE INVESTIGATION

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Baseline Phase</th>
<th></th>
<th>Treatment Phase</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1 2 3 4 5</td>
<td></td>
<td>6 7 8 9 10 11 12 13 14</td>
<td></td>
</tr>
<tr>
<td>Drop Outs</td>
<td>0 0 0 0 0</td>
<td></td>
<td>0 0 0 0 1 1 1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>Nonparticipants</td>
<td>0 0 0 0 0</td>
<td></td>
<td>0 0 1 1 3 1 0 0 0 1</td>
<td></td>
</tr>
<tr>
<td>Not Completing PACE</td>
<td>0 0 0 0 0</td>
<td></td>
<td>0 0 0 0 1 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>Percentage of Participation</td>
<td>100% 100% 100% 100% 100%</td>
<td></td>
<td>100% 100% 90.9% 90.9% 63.6% 81.8% 90.9% 90.9% 81.8%</td>
<td></td>
</tr>
<tr>
<td>Overall Group Percentages</td>
<td>Baseline range = 100%</td>
<td>Mean percent = 100% (n = 5)</td>
<td>Treatment range 63.6%-100%</td>
<td>Mean percent = 87.8% (n = 9)</td>
</tr>
<tr>
<td>Overall Mean Group Percentage of Participation</td>
<td>92.2% (n = 14)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 1

(Continued)

<table>
<thead>
<tr>
<th>Group 2</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1 2 3 4 5 6 7 8</td>
<td>9 10 11 12 13 14</td>
</tr>
<tr>
<td>Drop Outs</td>
<td>0 0 0 0 0 0 0 0</td>
<td>0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Nonparticipants</td>
<td>0 0 0 0 0 0 0 0</td>
<td>0 1 0 0 0 0</td>
</tr>
<tr>
<td>Not Completing PACE</td>
<td>0 0 0 0 0 0 0 0</td>
<td>0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>Total number of subjects</td>
<td>8 8 8 8 8 8 8 8</td>
<td>8 8 8 8 8 8 8 8</td>
</tr>
<tr>
<td># Participants/# in group base</td>
<td>8/8 8/8 8/8 8/8 8/8 8/8 8/8 8/8</td>
<td>8/8 7/8 8/8 7/8 8/8 8/8 8/8 8/8</td>
</tr>
<tr>
<td>Percentage of Participation</td>
<td>100% 100% 100% 100% 100% 100% 100% 100%</td>
<td>100% 87.5% 100% 87.5% 100% 100% 100% 100%</td>
</tr>
<tr>
<td>Overall Group Percentages</td>
<td>Baseline range 100%</td>
<td>Treatment range 87.5%-100%</td>
</tr>
<tr>
<td>Overall Mean Group Percentage of Participation</td>
<td>100% 100% 100% 100%</td>
<td>100% 87.5% 100% 87.5% 100% 100%</td>
</tr>
<tr>
<td>Group 3</td>
<td>Baseline Phase</td>
<td>Treatment Phase</td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Skill Test</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Drop Outs</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nonparticipants</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not Completing PACE</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number of subjects</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Percentage of Participation</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
| Overall Group Percentages | Baseline range 100%  
Mean percent = 100% (n = 11) | Treatment range 75%–87.5%  
Mean percent = 79.1% (n = 3) |
| Overall Mean Group Percentage of Participation | 95.5% (n = 14) |
the study. The second largest factor is nonparticipants from either forgetting because of scheduling changes or from lack of time. Two subjects at one point wanted to see what would happen without doing PACE after having done it for several weeks. Only one subject did not complete the hook-up part of PACE.

In Group 2, the baseline participation is 100%. During the treatment phase the participation ranges from 87.5% to 100% with a mean group percentage of 95.8%. The overall mean group percentage of participation for both baseline and treatment phases is 98.2%. One subject was a nonparticipant due to a schedule change. Another subject did not complete all four steps of PACE.

In Group 3 the participation during the baseline phase is 100%. During the treatment phase, participation for Group 3 ranges from 75% to 87.5% with a group mean percentage of 79.1%. The overall mean group percentage during the baseline and treatment phases of participation for Group 3 is 95.5%. On the first week of the treatment section, one subject drank only the water and then just wanted to talk through the other three steps. Another subject was unable to perform step three, the cross crawls part of PACE for 3 consecutive weeks. On week three of the treatment phase for Group 3, another subject was a nonparticipant.

The Effects of PACE on Self-Reported Anxiety

Table 2 presents individual group data noted by subject identification number self-reporting high and low anxiety before each skill performance test. Low anxiety is zero to mild anxiety, which is acceptable for optimal learning and performance. High anxiety is moderate to panic anxiety, which hinders learning and performance. Subjects who disqualified for any reason are separately noted. In Group 2, two subjects self-reported using deep breathing and relaxation techniques during the baseline phase.
### TABLE 2
SUBJECT GROUP DATA NOTED BY GROUP SUBJECT IDENTIFICATION NUMBER AND SELF-REPORTED LEVEL OF ANXIETY BEFORE EACH SKILL PERFORMANCE TEST

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1  2  3  4  5</td>
<td>6  7  8  9  10  11  12  13  14</td>
</tr>
<tr>
<td>Subjects Self-reporting High Anxiety</td>
<td>1, 2, 3, 4, 5, 6, 8, 9, 11</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9, 11</td>
</tr>
<tr>
<td>Subjects Self-reporting Low Anxiety</td>
<td>7, 10</td>
<td>9</td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Group 2</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Subjects Self-reporting High Anxiety</td>
<td>1, 2, 3, 5, 6, 7, 8</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>Subjects Self-reporting Low Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Subjects Self-reporting High Anxiety</td>
<td>2, 3, 5, 6, 8</td>
<td>1, 2, 3, 4, 5, 6, 8</td>
</tr>
<tr>
<td>Subjects Self-reporting Low Anxiety</td>
<td>1, 4, 7</td>
<td>7</td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Subject reported using additional relaxation techniques.
Each subject's self-reported data were analyzed according to the established criteria for low and high anxiety. Data were analyzed conservatively in order to avoid a Type I error. Only data which were clearly less than mild anxiety were recorded as low anxiety.

Information on Specific Subjects

In Group 1, subject number eight reported being very ill on week seven and later experienced the unexpected death of an immediate family member. This subject completed both skill tests 12 and 13 on the same day and reported feeling very behind, tired, stressed, and uptight. The death was out of town, and the subject missed classes for 1 week.

Also in Group 1, subjects 3 and 10 were experimenting with personal results of doing and not doing PACE before skills performance testing. They volunteered this information to the investigator.

In Group 2 and Group 3, no further self-reported information impacted the subjects' level of anxiety. All subjects in Group 2 and Group 3 participated in the investigation as designed.

Table 3 shows the actual number of subjects in each group self-reporting high or low anxiety for each performance skill test. The total number of subjects self-reporting high anxiety is noted out of the total group number for each skill performance test. The group mean percentages are calculated for each of the 14 skill performance tests.

The high anxiety, which was self-reported in Group 1 during the baseline phase, shows a range from 63.6% to 90.9%. The group mean percentage of high anxiety during the baseline is 81.8%. After the treatment was initiated, the range of high
### TABLE 3

**SUBJECT GROUP DATA NOTED BY SELF-REPORTED ANXIETY LEVEL BEFORE EACH SKILL PERFORMANCE TEST**

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Skill Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Anxiety</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Low Anxiety</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td># with High Anxiety/# in group base</td>
<td>9/11</td>
<td>10/11</td>
</tr>
<tr>
<td>Group Mean Percentages</td>
<td>81.8%</td>
<td>90.9%</td>
</tr>
<tr>
<td>Overall Group Percentages</td>
<td>Baseline range 63.6%-90.9% Mean percent = 81.8% (n = 5)</td>
<td>Treatment range 0%-10% Mean percent = 4.3% (n = 9)</td>
</tr>
<tr>
<td>Overall Mean Decrease</td>
<td>77.5% (n = 14)</td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>Baseline Phase</td>
<td>Treatment Phase</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Skill Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Anxiety</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Low Anxiety</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td># with High Anxiety/# in group base</td>
<td>7/8</td>
<td>8/8</td>
</tr>
<tr>
<td>Group Mean Percentages</td>
<td>87.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Overall Group Percentages</td>
<td>Baseline range 50%-100%</td>
<td>Mean percent = 76.5% (n = 8)</td>
</tr>
<tr>
<td>Overall Mean Decrease</td>
<td>63.8% (n = 14)</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 3
(CONTINUED)

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Skill Test</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Overall Group Percentages</td>
<td>Overall Mean Decrease</td>
</tr>
<tr>
<td></td>
<td># with High Anxiety/# in group base</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall Mean</td>
<td>Baseline 37.5%-87.5%</td>
<td>Treatment range =100%</td>
</tr>
<tr>
<td></td>
<td>Percentages</td>
<td>Mean percent = 67% (n = 11)</td>
<td>Mean percent = 0% (n = 3)</td>
</tr>
<tr>
<td>High Anxiety</td>
<td>5/8</td>
<td>62.5%</td>
<td>67% (n = 14)</td>
</tr>
<tr>
<td>Low Anxiety</td>
<td>3/8</td>
<td>37.5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>7/8</td>
<td>87.5%</td>
<td>0/7</td>
</tr>
<tr>
<td></td>
<td>4/8</td>
<td>50%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>6/8</td>
<td>75%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>5/8</td>
<td>62.5%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>6/8</td>
<td>75%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>3/8</td>
<td>37.5%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>6/8</td>
<td>75%</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>4/8</td>
<td>50%</td>
<td>0/6</td>
</tr>
</tbody>
</table>

Baseline range: 37.5%-87.5%
Overall Mean = 67% (n = 11)
Treatment range: 100%
Overall Mean = 0% (n = 3)
anxiety is 0% to 10%. The group mean percentage of high anxiety during the treatment phase was 4.3%. This is a 77.5% reduction in self-reported high anxiety.

In Group 2, the high anxiety, which was self-reported during the baseline phase, shows a range from 50% to 100%. The group mean percentage of high anxiety during the baseline is 76.5%. After the treatment was initiated, the range of high anxiety is 0 to 62.5%. The group mean percentage of high anxiety during the treatment phase is 12.7%. This is a reduction in self-reported high anxiety of 63.8%.

In Group 3, the high anxiety, which was self-reported during the baseline phase, shows a range from 37.5% to 87.5%. The group mean percentage of high anxiety during the baseline is 67%. After the treatment was initiated, the range of high anxiety is zero percent. The group mean percentage of high anxiety during the treatment phase is zero percent. This is a reduction in self-reported high anxiety of 67%.

Overall for the three groups, the mean group percentage of self-reported greater than slight anxiety ranged from 67% to 81.8% during the baseline phase. The mean group percentage of self-reported high anxiety after the treatment ranges from 0% to 12.7%. The overall group mean percentage of self-reported high anxiety during the baseline phase is 75.1% and in the treatment phase is 5.6%. Overall there is a 69.5% reduction in self-reported high anxiety in the total three group mean percentages during the treatment phase.

Summary of the Three Groups' Self-reporting Anxiety

The effects of the PACE treatment on the dependent variable of self-reported anxiety shown on Figure 1. During the baseline, subjects have an overall mean percentage of self-reported high anxiety of 75.1% with a range of 37.5% to 100%. The
SUMMARY GRAPH: LEVEL OF SUBJECT GROUP SELF-REPORTED ANXIETY

(The summary graph shows the level of subject group self-reported anxiety on 14 different skill performance tests. Data to the left of the broken lines record the baseline phase. Data to the right of the broken lines represent the treatment phase of the investigation.)
overall baseline through the three groups remained significantly higher in the amount of self-reported high anxiety than during the treatment phases. After the introduction of the treatment variable, a dramatic reduction in self-reported high anxiety is noted for all three subject groups.

The one exception to the noted pattern was during skill performance test 13 in Group 2. Four of the five subjects self-reporting high anxiety practiced the skill of the week and completed the four steps of PACE together. This group of four subjects were in an exceedingly high state of anxiety, reporting that they had been dreading this skill test all year because the previous class had reported an enormous failure rate on this particular test. Even though they reported feeling less anxious after doing PACE, they remained in a highly anxious state.

Even with the one high peak of anxiety in Group 2 during the treatment phase, the overall reduction of Group 2 mean percentage of self-reported high anxiety was 63.8%. The overall group mean percentage reduction of 69.5% for all three groups of self-reported high anxiety is significant. Except for the one peak in Group 2 during the treatment phase, the findings reflect that PACE did make a difference in lowering self-reported anxiety.

The Effects of PACE on Skill Performance Tests

Table 4 presents the number of subjects for each group passing and failing the 14 skill performance tests. Each subject was evaluated by one of the nursing instructors doing the skill testing. The nursing instructors used the established performance based outcomes for each skill as the criteria for each student passing or failing a given skill
TABLE 4

SUBJECT GROUP DATA NOTED BY SUBJECT IDENTIFICATION NUMBER
AND SUCCESSFUL OR UNSUCCESSFUL COMPLETION OF
EACH SKILL PERFORMANCE TEST

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10 11 12 13 14</td>
</tr>
<tr>
<td>Subjects Passing the Skill Test</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11</td>
<td>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11</td>
</tr>
<tr>
<td>Subjects Failing the Skill Test</td>
<td>1, 4, 5, 8, 9</td>
<td>7, 10</td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td>3 1</td>
</tr>
</tbody>
</table>

5 (No sleep for >24 hrs., very tired) 4 (ill but not high anxiety)
TABLE 4
(CONTINUED)

<table>
<thead>
<tr>
<th>Group 2</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Subjects Passing the Skill Test</td>
<td>1, 2, 3, 4, 5, 6, 7, 8,</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>Subjects Failing the Skill Test</td>
<td>6</td>
<td>3, 7, 8</td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Subjects Passing the Skill Test</td>
<td>4, 6, 7</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>Subjects Failing the Skill Test</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
</tr>
<tr>
<td>Subjects Disqualified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Subject reported using additional relaxation techniques.
performance test (see Appendix C for a sample skill checklist). Only the first attempt on a skill performance test was used in the data collection.

Table 5 shows the actual number of subjects in each group successfully passing and failing each skill performance test. The total number of subjects passing each skill performance test is noted out of the total group number for each test. The total number of subjects varies slightly on a weekly basis as described in Table 1. The group mean percentages were calculated for each of the 14 skill performance tests.

Group 1 has a group mean percentage range of passing on passing skill performance tests from 54.5% to 100% during the baseline phase and 85.7% to 100% during the treatment phase. The average group mean percentage of passing skill performance tests during the baseline phase is 87.2% and during the treatment phase is 97.1%. This is an increase in group mean percentage of 9.9% on passing skill tests.

Group 2 has a group mean percentage range of passing skill performance tests from 62.5% to 100% during the baseline phase and 100% during the treatment phase. The average group mean percentage of passing skill performance tests during the baseline phase is 84.3% and during the treatment phase is 100%. This is an increase in group mean percentage of 15.7% on passing skill tests.

Group 3 has a group mean percentage range of passing skill performance tests from 0% to 100% during the baseline phase and 100% during the treatment phase. The average group mean percentage of passing skill performance tests during the baseline phase is 69.3% and during the treatment phase is 100%. This is an increase in group mean percentage of 30.7% on passing skill tests.

Overall the three group mean percentages ranged from 69.3% to 87.2% during the baseline phase and 97.1% to 100% during the treatment phase. The increase in performance in group mean percentage ranges from 9.9% to 30.7% in all three groups.
### TABLE 5
SUBJECT GROUP DATA NOTED BY SUCCESSFUL PASSING AND FAILING OF EACH SKILL PERFORMANCE TEST

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1   2  3  4  5</td>
<td>6   7  8  9  10 11 12 13 14</td>
</tr>
<tr>
<td>Skill Test</td>
<td>1   2  3  4  5</td>
<td>6   7  8  9  10 11 12 13 14</td>
</tr>
<tr>
<td>Failed Skill Test</td>
<td>0  5  0  0  2</td>
<td>0  0  0  0  1  1  0  0  0</td>
</tr>
<tr>
<td>Passed Skill Test</td>
<td>11  6  11 11  9</td>
<td>11  11 10 10  6  8 10 10  9</td>
</tr>
<tr>
<td>Group Mean Percentages</td>
<td>100% 54.5% 100% 100% 81.8%</td>
<td>100% 100% 100% 100% 85.7% 88.8% 100% 100% 100%</td>
</tr>
<tr>
<td>Overall Group Percentages</td>
<td>Baseline range 54.5%–100% Mean percent = 87.2% (n = 5)</td>
<td>Treatment range 85.7%–100% Mean percent = 97.1% (n = 9)</td>
</tr>
<tr>
<td>Overall Mean Increase</td>
<td>9.9% (n = 14)</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 5
(CONTINUED)

<table>
<thead>
<tr>
<th>Group 2</th>
<th>Baseline Phase</th>
<th>Treatment Phase</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1   2   3   4   5   6   7   8</td>
<td>9   10  11  12  13  14</td>
</tr>
<tr>
<td>Skill Test</td>
<td>Failed Skill Test</td>
<td>Passed Skill Test</td>
</tr>
<tr>
<td></td>
<td>1   3   2   0   3   1   0   0</td>
<td>0   0   0   0   0   0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Mean Increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td>Baseline Phase</td>
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<tr>
<td>--------</td>
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<td>----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10 11</td>
</tr>
<tr>
<td>Skill Test</td>
<td>Failed Skill Test</td>
<td>Passed Skill Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5  8  3  1  2  0  1  0  2  1  4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3  0  5  7  6  8  7  8  6  7  4</td>
</tr>
</tbody>
</table>
on skill tests. The overall group mean percentage of increase on passing skill test performance is 18.7%.

Summary of the Three Groups’ Skill Test Performance

The effect of the PACE treatment on the dependent variable, performance on 14 skill tests is shown in Figure 2. During the baseline phases, subjects displayed a range of group mean percentages for successful skill tests completion from 0% to 100%.

Evidence of baseline and treatment stability is shown in the multiple baseline summary graphs in Figure 1 and Figure 2. Only in Figure 2 does Group 1 evidence a lower stability trend in the baseline phase. Group 2 and Group 3 show a more stable baseline trend in the same figure.

Figure 1 and Figure 2 show the PACE treatment yielding similar findings on self-reported anxiety and performance. The three subject groups independently replicated similar findings during the treatment phase.

During the treatment phases, subjects passed from 85.7% to 100% of skill performance tests. This shows a more stable pass rate after the treatment than during the baseline phase.

At first glance, the baseline group mean percentages do not appear exceedingly low nor does the treatment phase appear to make a dramatic difference. The findings, however, show an overall 18.7% increase in passing skill performance tests. Because of the importance of passing skill performance tests, an 18.7% increase in successful completions after doing PACE is considered a significant increase.
SUMMARY GRAPH: LEVEL OF SUBJECT GROUP SUCCESS ON SKILL PERFORMANCE TESTS

(The summary graph shows the level of subject group success on skill performance tests. Data to the left of the broken lines record the baseline phase. Data to the right of the broken lines represent the treatment phase of the investigation.)
Summary of Findings

In summary, the findings directly related to the hypotheses are as follows:

1. An overall 69.5% reduction in self-reported high anxiety is evidenced between subjects who completed the PACE process prior to a skill performance test and those who did not.

2. An overall 18.7% increase in passing skill performance tests is evidenced between subjects who completed the PACE process and those who did not complete PACE.

Findings Not Directly Related to the Hypotheses

A summary of the findings not directly related to the hypotheses are as follows:

1. PACE did not appear to reduce anxiety below the mild level in subjects who were ill, sleep deprived, or in bereavement.

2. Subjects not completing all four steps of the PACE process had less reduction in self-reported high anxiety and a lower rate of passing on the skill performance tests.

3. Several subjects transferred the use of PACE to other areas of their lives including home, work, testing, and clinical nursing experiences.

4. Nursing faculty referred nonparticipants who were having difficulty in managing their anxiety in the academic setting to the investigator.

5. After the last treatment group was trained, several nonparticipants inquired about the treatment variable.

6. One subject started using PACE before nursing theory tests and reported an increase in theory test scores from 74% to 86%. This subject had used
every test taking skill available and was in jeopardy of failing the nursing program.

Several other subjects in the treatment groups started doing PACE before tests once they had observed the above mentioned subject's marked improvement.

7. One anxious nonparticipant subject whose anxiety was negatively impacting performance in skill tests and nursing clinical was referred to the investigator by nursing faculty. This student was in jeopardy of failing the nursing program. The student was taught PACE. After doing the treatment, this student noted a decrease in anxiety before three different skill tests. This information was not calculated into the study data in order to maintain the randomization which had been established at the beginning of the study.

8. Subjects repeatedly expressed gratitude and appreciation for the assistance with anxiety reduction.

Chapter Summary

Chapter IV has been devoted to the findings of this investigation. It includes the analysis and the effect of the treatment variable PACE on two independent variables (a) self-reported anxiety before a skill performance test and (b) subjects successfully passing skill performance tests. It presents a summary of findings directly related to the hypotheses. A list of findings not related to the hypotheses are also presented.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter is organized into four sections. The first section provides a brief summary of the purpose, methodology, and results of the study. The second section provides conclusions from the study. The third section provides a discussion of the findings. The final section is devoted to recommendations and suggestions for future research and practice.

Summary of the Study

The purpose of this study was to: (a) determine the effect of PACE on nursing student self-reported state anxiety before skill performance tests and (b) determine the effect of PACE on nursing student successful completion of skill performance tests. The treatment variable was PACE and the dependent variables were self-reported anxiety and passing instructor constructed skill performance tests. The subjects of the study consisted of 27 first year nursing students at Chemeketa Community College.

A multiple baseline research design across subjects was used for this study. Subjects were randomly assigned to three different groups. Baseline data were comprised of the five winter term technical-motor skill tests for Group 1. Nine spring term technical-motor skills ended up being evenly divided between the three subject groups according to design guidelines. During spring term, the first subject group started the treatment on the second week. The second group started the treatment on the fourth week and the third subject group started the treatment on week seven.

Immediately before each skill performance test, subjects self-reported their feelings on a performance-based outcome sheet used for the skill being tested. Each
subject group received an orientation session at the beginning of the week during which they started the treatment. Once in the treatment phase and under the supervision of the investigator, subjects completed the four steps of PACE 10 to 15 minutes before each skill performance test. After completing PACE, subjects proceeded to the skill testing room where they recorded their feelings in writing before beginning their skill test.

The data collected for each subject group are graphically represented for both self-reported state anxiety before skill performance tests and for success in passing skill performance tests. The group mean percentages for both baseline and treatment phases were calculated and interpreted. Interobserver reliability of the nursing instructors doing the skill testing was established. The findings indicate that PACE does reduce the percentage of high anxiety self-reported before skill performance tests and significantly increases the percentage of those successfully passing skill performance tests.

Conclusion

The following conclusions are drawn from the findings of this study. First, the use of PACE before skill performance tests was effective in reducing self-reported high anxiety for first year nursing students at Chemeketa Community College. Second, the use of PACE before skill performance tests was effective in increasing subject success on skill performance tests for first year nursing students at Chemeketa Community College. In summary, it is concluded that subjects who perform PACE before skill performance tests significantly reduced self-reported high anxiety and increased success on skill performance tests of first year nursing students at Chemeketa Community College.
Discussions

This study is the seminal research on the treatment variable, PACE. It was conducted within the guidelines of applied behavioral analysis as outlined by Tawney and Gast (1984) and Baer, Wolf, and Risley (1968). Outcome objectives were identified before initiating the study and were conducted in natural settings which focused on socially important behaviors.

Applied behavioral analysis is directed towards treatment variables which effectively improve the behavior under study (Tawney & Gast, 1984). The analytical behavioral process in this investigation systematically applied the four steps of PACE to each subject group. It simultaneously evaluated whether the subjects reported any change in self-reported high anxiety before skill performance tests and whether their performance on the skill tests could be attributed to the process of the PACE application.

The PACE application took place in a nursing skills classroom and was designed to provide the least interference to both subjects and non participants. All students, participants and nonparticipants in the study, documented their feelings before each skill performance test. It became a normal part of the skill testing routine, further establishing a naturalistic setting.

A particular advantage to using nursing students as subjects is that all of them are specifically taught the skills of observation and noticing. Interestingly, however, only once in weekly self-reporting did two subjects independently employ stress reduction techniques while in the baseline phase. These techniques had been previously taught within the nursing education framework.
Participants in the study evidenced their support and acceptance of the study through an overall 95.5% participation rate. The PACE treatment took approximately ten minutes to complete; subjects seemed to enjoy it; and nursing instructors noticed enough significant differences from treatment use to anticipate future applications of PACE. The criteria of earlier investigations where nursing educators were looking for effective, feasible, and acceptable stress reductions techniques appears to be met by PACE. Subjects overall expressed appreciation and excitement over the benefit of reduced anxiety. Several subjects reported using PACE on their own initiative in other settings: (a) before theory tests, (b) in the nursing clinical setting, (c) at home during tense moments, and (d) at work.

The critical analysis of research on anxiety and nursing students, and anxiety and performance in Chapter II, revealed that the majority of investigations were quantitative and used a nonrandomized, convenience sample of students. The most widely used instrument to evaluate anxiety was the STAI, which lacked supporting evidence for reliability and validity. The majority of investigators using the STAI as their instrument of choice made no mention of reliability and/or validity.

This study was designed by using the critical review of the literature as a means for building on previous investigator's research design strengths and eliminating as much as possible the weaknesses. In this quantitative study, a randomized convenience sample was used. Two multiple baseline designs for self-reporting anxiety and performance across three subjects groups were employed. Because of the lack of supporting evidence for reliability and validity in the best of instruments referred to in Chapter II this design was selected. The reliability of the treatment variable was established because the behavior of each subject group changed dramatically and consistently after the application of the treatment variable. When comparing the baseline phase to the
treatment phase, the group mean percentages show an overall gain of 18.7% in passing skill tests and an overall reduction of 69.5% in self-reported high anxiety.

In the critical review of the educational kinesiology investigation, it was common to have multiple independent variables. In this study, PACE was the only treatment variable selected. The four steps of PACE were clearly defined. Only subjects completing all four steps according to defined criteria were used in the data analysis.

According to Campbell and Stanley (1963), internal validity is required in order to interpret study results. In this study internal validity was achieved by following multiple baseline guidelines (Baer, Wolf, & Risley, 1968; Tawney & Gast, 1984). The selection of the three subject groups were functionally independent of each other yet had similar behaviors. Both behaviors were measurable. High interobserver agreement existed. The treatment variable and conditions were clearly described for future replication. The baseline measurement of each subject was established. Each subject was trained on PACE. The treatment variable was applied to one subject group while monitoring the baseline of the other groups. Once a change in the treatment phase was noted, the treatment variable was applied to the next group. The treatment was initiated multiple times with similar effects on the behavior under investigation. In other words, this study applied the same procedure to similar subjects three times and yielded similar results.

Baer, Wolf, and Risley (1968) reported that a multiple baseline study must be: (a) applied, (b) behavioral, (c) analytical, (d) technological, (e) conceptually systematic, (f) effective, and (g) generalizable to some degree. These seven criteria were met in this study.
The applied criteria was met by having a close relationship between the behaviors under study and the subjects. The focus of the study was to improve the learning environment and performance for nursing students.

The behaviors of anxiety and performance were measurable meeting the behavioral criteria. The defined anxiety categories allowed for consistent analysis of the self-reported anxiety data. The performance-based outcomes on the skill checklists provided consistent criteria for evaluating the skill tests.

The analytic component is defined as the behavioral change being attributed to the treatment variable. This criteria was met by the three subject groups demonstrating a similar response of to PACE. The reduction in self-reported anxiety and the increase in performance on skill tests is attributed to the PACE treatment because of the change noted after the application of PACE.

Technology is defined as describing the study in enough detail so it can be replicated by other researchers. In this study the four steps of PACE are well defined and the methodology is described for replication.

The conceptual system is defined as designing a study which will assist in building a discipline rather than in isolated tricks. As seminal research on PACE, this study provides a foundation for future research.

The effective criterion requires that the treatment variable must produce some degree of success. Both performance and self-reported anxiety findings supported this criteria. Again the degree of success in the treatment variable is judged by individuals in the natural setting dealing with the behaviors under study. The nursing faculty at Chemeketa Community College agree the 69.5% reduction in self-reported anxiety and the 18.7% increase in successful performance on skill tests were significant.
The generalizable criterion is described as applying the treatment in a wide variety of settings. The more general the treatment the better. In this study PACE was only studied in one setting with first year nursing students before skill performance tests. Several subjects did suggest using PACE in other settings, which support the potential of generalization.

This study meets all seven of the criteria identified by Baer, Wolf, and Risley (1968). The change in the dependent variable was a direct functional relationship to the application of the PACE treatment, thus internal validity was established. The critical literature review in Chapter II also supports trait anxiety as being positively correlated with state anxiety, a state which appears to be negatively correlated to academic and gross-motor performance. And no differences in state anxiety related to the variables of sex and age. In this study the factors of age and sex were not used to stratify the sample population. In addition the sample was composed of a disproportionate number of female subjects, 81% female and 19% male. A positive correlation with state anxiety had already been established in research literature so trait anxiety was also excluded as a factor in this study.

The critical review of investigations provided supporting evidence that anxiety existed in nursing programs, was a concern to nursing educators, and that most stress reduction techniques did not significantly reduce anxiety. The majority of stress reduction techniques required unmanageable time frames and had short-lived or insignificant effects on anxiety. This was an appropriated topic of study, because nursing educators are still looking for techniques to reduce student anxiety which are acceptable to both student and educator.

Overall, subjects in this study self-reported high anxiety in the nursing skill laboratory before the treatment was introduced. That reduction of anxiety is important
in nursing students is further evidenced by the pattern of nursing student anxiety which emerged from the critical review of the literature. Several investigations focused on techniques such as imagery (Speck, 1990; Stephens, 1992), stress management (Charlesworth et al., 1981; Wernick, 1984) and modified testing (Phillips, 1988), all of which significantly reduced anxiety. The drawbacks of these techniques made them impractical or unattractive to users. None of the previous investigations in nursing used any aspect of educational kinesiology.

It was suggested in the literature review that the educational kinesiology activities reduced anxiety, which in turn resulted in an improvement in motor and academic performance. The significant decrease in self-reported high anxiety and increase in performance in this study parallels results suggested in the literature review. None of the reviewed studies, however, isolated the impact of PACE. Since parts of PACE were mixed with other treatment variables, no change in performance or anxiety could be attributed to any part of PACE.

The importance of a reduction in self-reported high anxiety and an increase in skill performance bears relevance to the subjects, nursing instructors, and society in general. Both behaviors were observable and measurable. In this study, each subject group demonstrated a clear reduction in self-reported high anxiety and an increase in performance as a direct result of the treatment variable, PACE. Both nursing faculty and first year nursing students accepted and supported the PACE intervention.
Recommendations

Future Practice

The results of this investigation suggest that PACE may be considered as an effective intervention (a) for reducing self-reported high anxiety before skill performance tests and (b) increasing success in skill performance tests for first year nursing students at Chemeketa Community College. On the basis of the data presented in this study, it is recommended that consideration be given to:

1. The use of PACE as an efficient and effective technique for reducing self-reported high anxiety in first year nursing students. Furthermore, PACE proved to be a positive experience for both the subjects, their instructors, and the investigator. Extensions of PACE to other nursing clinical components has the potential for reducing known anxiety in those areas (Beck & Sirvastava, 1991; Pagana, 1989; Pagana, 1990; Parkes, 1985; Sellek, 1982; Windsor, 1987).

2. Expanding the use of PACE to second year nursing students, particularly since anxiety tends to increase with time in the program (Lewis et al., 1987; Lindrop, 1991; Windsor, 1987).

3. Teaching nursing students at the beginning of their program the rationale and how and when to PACE.

4. Increasing the awareness of nursing faculty on the effect of PACE and the hows and whens of appropriately using it with nursing students and themselves.

5. Take students who cannot cross crawl in the allotted 3 minute time limit for this study and work with them long enough for cross crawls to flow. Then observe the effect on anxiety and performance.
6. Encourage students in a high anxiety state to drink more water, and lengthen the time employed for doing brain buttons, cross crawls, and hook-ups.

7. Add PACE as one more tool in the stress reduction toolbox of faculty and students.

**Future Research**

Based on the results of this study, the following is recommended for future research.

1. This study was conducted with first year nursing students in one community college in Oregon. Replication of the study needs to include both first and second year nursing students, other community colleges, and baccalaureate nursing programs.

2. The anxiety reduction technique of PACE needs to be investigated using other anxiety provoking situations in the nursing program such as studying for tests, before taking tests, and in the actual nursing practice.

3. The length of this study needs to be expanded over the 2 years of an entire nursing program. This would allow for longer baseline and treatment phases.

4. A study needs to be conducted on the various parts of PACE to determine if one is more effective than another and if the sum is greater than the parts.

5. A study needs to be conducted investigating student and community attitude toward PACE.

6. Studies need to be conducted across disciplines, ages, and settings.

7. A study needs to be conducted on the effect of talking during the hook-ups phase of PACE and the effect of this variable on anxiety and performance.
8. A study needs to be conducted and noted of the effect on anxiety and performance of drinking more water, lengthening the time employed for doing brain buttons, cross crawls, and hook-ups for highly anxious students.

9. A study needs to be conducted on allowing a student to cross crawl until it flows and then noting the effect on anxiety and performance.

10. A study needs to be conducted on why some groups are more effective than others in increasing performance on skill tests and reducing self-reported anxiety with PACE.

11. A study needs to be conducted as to why students occasionally did not use PACE.

12. A qualitative study needs to be conducted as to why students felt that PACE worked, including student perceptions of PACE.
REFERENCES


APPENDICES
APPENDIX A

HUMAN SUBJECT APPROVAL
November 4, 1994

Principal Investigator:

The following project has been approved for exemption under the guidelines of Oregon State University's Committee for the Protection of Human Subjects and the U.S. Department of Health and Human Services:

Principal Investigator: Steve Stoynoff

Student's Name (if any): Jan Irving

Department: Education

Source of Funding:

Project Title: Does "PACE" Reduce State Anxiety in Nursing Students?

Comments:

A copy of this information will be provided to the Chair of the Committee for the Protection of Human Subjects. If questions arise, you may be contacted further.

Redacted for privacy

Mary E. Nunn
Sponsored Programs Officer

cc: CPHS Chair
APPENDIX B

CONSENT FORM
INFORMED CONSENT DOCUMENT

FOR

PARTICIPATION IN AN EDUCATIONAL RESEARCH PROJECT

I understand that I am volunteering to participate in a research project that will be conducted at Chemeketa Community College in the nursing skills lab. This research study will involve watching a six minute video, drinking six to eight ounces of water, and doing a few gentle physical movements before check-off for all or part of the term, and identifying my feelings before and after each check-off Spring Term 1995. After the initial learning of the movements, the process should take about 15 minutes.

Refusal to participate will involve no penalty or impact my progression in the nursing program. I understand that I may withdraw from this research project at any time.

I understand that I will need to arrive 15 minutes before my scheduled check-off time during the study. My identity will remain confidential and no names will be used in the reporting of the results. The results of the research project will be shared with the nursing students at Chemeketa Community College at the conclusion of the study.

Questions about the research, my rights, or concerns during the research should be directed to Jan Irving at 399-2671.

I am willing to participate in this research study.

________________________________________
(Your Signature)
Skills Checklists

Date: ___________________________  Student: ___________________________
Observer: ________________________  Skill: Routine Trach Care
Time Limit: _______________________
Pass ______ No Pass ______

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<th>Critical Elements</th>
<th>Met</th>
<th>Not Met</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Incorporates Universal Precautions Throughout Procedures</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>II. Preliminary Steps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Checks physician's order</td>
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<td></td>
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</tr>
<tr>
<td>B. Washes hands prior to procedure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Assesses patient's respiratory status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Client's L.O.C.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2. Skin around trach</td>
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<td></td>
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<tr>
<td>3. Signs and symptoms of infection</td>
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<td></td>
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</tr>
<tr>
<td>4. Patency of the trach tube</td>
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<tr>
<td>5. Ability to communicate</td>
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<tr>
<td>6. Breath sounds</td>
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<tr>
<td>7. Ability to cough up secretions</td>
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<td>8. Signs and symptoms of labored breathing</td>
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<tr>
<td>D. Gathers equipment</td>
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</tr>
<tr>
<td>1. Trach kit</td>
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<td></td>
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<tr>
<td>2. Disposable sterile inner cannula</td>
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<tr>
<td>3. Suction equipment</td>
<td></td>
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<tr>
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<td></td>
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<tr>
<td>5. H₂O₂</td>
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<td></td>
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</tr>
<tr>
<td>6. Oral care supplies (for cleansing and suctioning)</td>
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<tr>
<td>7. Sterile normal saline</td>
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<td></td>
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</tr>
<tr>
<td>8. Sterile 10cc syringe</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9. Sterile saline for tracheal lavage</td>
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<td></td>
</tr>
<tr>
<td>10. Procedure glove for nondominant hand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Goggles</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>E. Prepares patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Explains procedure to patient</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Places patient in Mid-Fowler's position</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Provides patient privacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Provides means of communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Sets up supplies without contamination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Opens rinse basin and fills with rinse solution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Opens trach care kit and disposable inner cannula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Prepares sterile field and organizes supplies and equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Applies sterile glove to dominant hand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Connects catheter to suction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Lubricates suction tip</td>
<td></td>
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<td>III. Performance Steps</td>
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<tr>
<td>A. Performs tracheal suctioning (observing sterile technique)</td>
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<tr>
<td>1. Pneoproyterates patient</td>
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<td>2. Instills 2-5 ml sterile N.S. for tracheal lavage as needed</td>
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<td>3. Lubricates tip of suction catheter with N/S and, with the suction off, gently inserts it through the tracheostomy 4-5 inches</td>
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6568 SL BNA/HF 2/1/94
Skill: Routine Trach Care

<table>
<thead>
<tr>
<th>Critical Elements</th>
<th>Met</th>
<th>Not Met</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Rotates catheter 360° back and forth between gloved fingers as slowly withdraws catheter, applying intermittent suction</td>
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<td>5. Removes catheter within ten seconds</td>
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<td>6. Hyperinflates lungs by having patient take deep breaths or provides breaths per resuscitation bag</td>
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B. Performs nasopharyngeal or oropharyngeal suctioning
C. Deflates cuff with sterile syringe
D. With gloves used in suctioning, removes inner cannula and old dressing
E. Pours solutions
F. Removes sterile towel from kit and drapes across patient's chest just under trach stoma
G. Observes inside of cannula for crustations
H. Don sterile gloves
I. Cleanses trach stoma and outer trach flange with H2O2
J. Rinses all areas with normal saline
K. Inserts disposable sterile inner cannula
L. Places sterile dressing under flange and around stoma as ordered
M. Reinflates trach cuff
N. Changes trach ties using two-person technique
   1. Removes old ties
   2. Inserts one end of trach tie through flange eyelet and pulls ends so they are even
   3. Inserts one end through eyelet on other side of neck
   4. Pulls until only one finger can be inserted between the tape and the neck
   5. Ties tapes in a secure square knot
O. Assesses patient's respiratory status for response to trach care
   1. Evaluates secretions
   2. Evaluates for adverse effects of suctioning
   3. Checks respirations for decreased adventitious sounds
   4. Does mouth care as needed
   5. Leaves patient in a comfortable safe position
P. Performs oral care
Q. Disposes of supplies according to agency policy

IV. Documents Procedure
A. Appearance of trach stoma
B. Suctioning procedure and amount, consistency, and color of secretions suctioned
C. Type and size of catheter; amount and number of times suctioned
D. Tracheal lavage (if applicable) including amount of N/S instilled
E. Deflation and reinflation of cuff (if applicable)
F. Stoma care
G. Trach dressing and tie change
H. Respiratory assessments
I. Patient's tolerance of procedure

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APPENDIX D

LIST OF SKILLS
List of Skills

1. Injection equipment.
2. Subcutaneous injections.
3. Intramuscular injections.
4. Sterile gloving and dressing change.
5. Medication competency for one patient.
6. Catheterization.
7. Converting an intravenous line to an intermittent device.
8. Wound care.
10. Group medication administration.
11. Nasopharyngeal suctioning.
12. Intravenous tubing changes and fluid replacement.
13. Tracheostomy care.
14. Multiple injections.