MUSIC AS AN ADJUNCT TO TEMPERATURE BIOFEEDBACK IN THE REDUCTION OF MUSIC PERFORMANCE ANXIETY

A THESIS

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COLLEGE OF HUMANITIES AND FINE ARTS

BY

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We hereby recommend that the Thesis prepared under our supervision by Kristi Annette Stadum, R.M.T. entitled "Music as an Adjunct to Temperature Biofeedback in the Reduction of Music Performance Anxiety"

be accepted as fulfilling this part of the requirements for the Degree of Master of Arts

Committee:

Chairman

Accepted:

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INTRODUCTION

Performance anxiety is one of the most destructive elements in the performing arts, be it acting, dancing, singing, making a speech or playing an instrument. Most artists consider some performance anxiety to be normal. For musicians, however, admitting to stage fright is usually shameful (Havas, 1974). Their performance is viewed as an extension of themselves. If they fail to do well, their self worth may be reduced. Both failure and anxiety may become associated with performance.

One may ask, "What does performance anxiety have to do with music therapy?" Since anxiety is an emotion which can be debilitating if extreme, the music therapist is usually concerned with assessing the anxiety of his/her clients. The music therapist can observe the outward behavioral signs of anxiety but is also concerned with the effect of anxiety on the psychological state of the individual and the physiological symptoms which result from arousal of the sympathetic nervous system.

Understanding performance anxiety and exploring ways to reduce it with music may enhance our knowledge of similar situational anxiety states. As a musician and a therapist, the music therapist should have empathy for a performer's values. Realizing the emphasis placed on successful stage appearances, the therapist has a feel for the amount of

stress a musician must go through. As a result of understanding the musician's situation, the therapist is able to communicate effectively with the musician. If the methods used to reduce performance anxiety for the musician are effective, the music therapist has something to offer to the musician.

Although sensitivity and imagination are characteristics of artists, serious musicians tend to be self demanding, and generally enjoy competition. They strive for perfection and mastery. Sometimes the mechanics of performance get in the way of the esthetic beauty of communicating a message. Liszt bemoaned the overemphasis on mechanical virtuosity instead of integral artistry (Havas, 1974, p. 8).

The arts capture the invisible currents which rule our lives (Brooks, 1968). They allow expression of our emotions, and help give meaning to our existence. All of life is a search for meaning. Music is a special medium in our search because of its power to produce emotional responses. A song comes to mind from the movie "Fame" which sums up the essence of the unifying element in music. The song is "I sing th body electric" and it states that "In time, we will all be stars." It emphasizes the value of every single human being.

Statement Of Purpose

The purpose of this study was to determine whether visual temperature biofeedback could significantly reduce

music performance anxiety, and to further determine if sedative music would enhance visual temperature biofeedback in the reduction of music performance anxiety.

RELATED LITERATURE

The human organism is a fascinating thing. Internally the body is kept in a relatively constant equilibrium. Five decades ago, the coordination of physiological states to maintain steady states was designated homeostasis by Walter Cannon (1932). He discovered that the autonomic nervous system is influenced by our emotional reactions and plays a role in internal adaptation to stress.

One emotion reflecting adaptation to stress is anxiety. The nature of anxiety is complex. Spielberger (1973) differentiated anxiety as an emotional state and as a trait. Anxiety when viewed as an emotional state is associated with an activation of the autonomic nervous system. It is characterized by subjective, consciously perceived feeling of tension, and apprehension. State anxiety is acute or short-term. A more long-term or chronic type of anxiety is trait anxiety. Trait anxiety seems to be a proneness towards anxiety. It is a disposition which is reactive and remains latent until activated by a danger situation. What is common to all anxiety is its unpleasant nature and its similarity to fear.

Research on anxiety has focused on transitory anxiety states and identification of specific conditions which evoke them. Although anxiety usually involves activation of the sympathetic nervous system, an anxiety state is essentially defined by an individual reporting feeling anxious in a given situation. How he reacts emotionally to the situation must in part be determined cognitively (Lazarus, 1977). The intensity and duration of the anxiety state depend upon the amount of threat the individual perceives and the persistence of the belief that the situation is dangerous (Spielberger, 1973).

Cognitive evaluation of a situation as dangerous or threatening can be related to performance anxiety. Appley (1962) suggested "threat perception" plays an essential role in anxiety (Lazarus & Monat, 1977). In significant stage appearances, fear of failure is a direct threat to the performer's self-esteem and could give rise to anxiety. A performance is an expression and an expression of one's self. The performer's feelings of value depend upon his success experience. If the performer fails to meet his own standards, his self-esteem decreases and anxiety may suffocate him with a fear of becoming nothing (May, 1950).

There are several accepted methods for reduction of anxiety. Wolpe (1967) developed systematic desensitization to reduce neurotic anxiety responses. This procedure involves

deep muscle relaxation and presentation of a graded series of anxiety producing stimuli. Wolpe's approach implies that anxiety is a conditioned response to specific stimuli. If the bond between these stimuli and anxiety is weakened by responses incompatible with anxiety, as in relaxation, this is called reciprocal inhibition (Lazovick & Lang, 1960). Systematic desensitization has been useful in reducing fear of snakes (Lang et al., 1965) and in reducing trait anxiety in a group of chronically anxious college students (Paul & Shannon, 1966).

Another technique used to reduce anxiety is autogenic training. Johannes Schultz, a German psychiatrist, developed autogenic training as a system of self-regulation (Schultz & Luthe, 1969). "At the core of autogenic training is heaviness and warmth of extremities, regulation of cardiac activity and respiration, abdominal warmth and cooling of the forehead" (Schultz & Luthe, 1969, p. 6). An increase in peripheral hand temperature is associated with autogenic training (Tarler-Benlolo, 1978). Autogenic training promotes an inward focus.

A common way to reduce anxiety is through relaxation. One of the most popular relaxation training procedures is progressive relaxation. It was developed by Edmund Jacobson (1938). Progressive relaxation involves tensing and relaxing different sets of muscle groups. An individual is taught to recognize the presence of muscle contraction and to relax the tension away.

The basic premise for these anxiety reduction techniques is to promote an affect directly opposite from anxiety. Their purpose is to create a relaxation response. Jacobson (1938) found that subjects find it impossible to be emotional and relaxed at the same time. "It seems that an emotional state fails to exist in the presence of complete relaxation of the peripheral parts involved" (Jacobson, 1938, p. 218). There is much support for the concept that anxiety and relaxation are mutually exclusive. Mendelson (1962) proposed that in order to relieve a person of anxiety an alternate affect had to be embraced.

Self regulation of hand temperature has been found to be an indicator of relaxation. It has been proven that the sympathetic nervous system controls varying degrees of constriction of the blood vessels (Andreassi, 1980; King & Montgomery, 1980). Since temperature is a useful index for blood flow, it seems that temperature biofeedback could be a tool in anxiety reduction. When a person learns to control vasodilation, it promotes relaxation.

Biofeedback is viewed as an active learning situation in which a person receives information about his bodily processes. With feedback from specific physiological processes and appropriate motivation, a person can modify and control once considered "involuntary" or "automatic" functions. In temperature biofeedback, a person receives feedback of his peripheral

body temperature. In most instances he tries to increase blood flow to his hands to increase his hand temperature. This takes concentration and motivation.

Temperature biofeedback has been used to reduce migraine headache activity (Silver et al., 1978; Diamond et al., 1978; Gold, 1978; Gainer, 1978), as an experimental approach in behavioral management of Raynaud's phenomenon (Jacobson et al., 1973; Graham, 1955), and combined with autogenic training as an aid in anxiety reduction (Green et al., 1974). Bongar (1978) discovered that as subjects raised their hand temperatures, lower levels of muscle tension and systolic blood pressure were achieved. This supports the generalization of the relaxation response facilitated by temperature biofeedback. According to Green et al. (1974), subjects who are able to raise their finger temperature to between 95°F and 96°F report a pleasant state of relaxation. Boudewyns (1976) also confirmed that an increase in finger temperature correlated with relaxation.

It appears that short-term temperature biofeedback training is equally effective to long-term training. Researchers have found that subjects are able to learn to control their finger temperature within three or four sessions (Keefe & Gardner, 1979; Taub & Emurian, 1976). No significant improvement in finger temperature control was noted with training of a longer duration.

King (1980) notes several weaknesses of temperature biofeedback. These include small magnitude changes in peripheral temperature (King, 1980; Keefe & Gardner, 1979; Surwit et al., 1976), temperature reduction being influenced by room temperature (Keefe, Surwit and Pilon, 1980), and ambivalence as to whether voluntary control has really been achieved (Kaplan & Crawford, 1979). Two studies with migraine sufferers have shown that keeping record of headache activity was equally effective to biofeedback in reducing frequency of headaches (Jessup, 1979; Kewman, 1980). This supports the hypothesis that there is a cognitive element in self regulation. Biofeedback facilitates self awareness of bodily processes.

Temperature biofeedback seeks to combat vasoconstriction associated with anxiety. Anxiety when associated with arousal of the sympathetic nervous system causes a decrease in hand temperature. Forsyth (1974) pointed out that hand temperature, given constant environmental temperature and control of artifacts, provides an excellent indicator of arousal. Finger blood volume as a physiological indicator of emotional arousal is not new. Several investigators have found significant finger temperature decreases in various stressful social situations involving cognitively induced anxiety (Crawford, 1977; Boudewyns, 1976; Newton, Paul & Bovard, 1957; Graham, 1955; Mittleman & Wolff, 1939). Generally, the literature

shows that induced stress results in a decrease in finger temperature.

In addition to temperature biofeedback, music has a potential use in anxiety reduction. Soothing or sedative music may enhance the relaxation response. E. Thayer Gaston defined sedative music as music "of a sustained nature with strong rhythmic and percussive elements largely lacking" (Gaston, 1951, p. 143).

Several researchers have examined the influence of both sedative and stimulative music upon physiology. In terms of galvanic skin response, the human organism reacts in a significantly different manner to stimulative and sedative music (Shrift, 1954; Zimny & Weidenfeller, 1963). Taylor (1973) suggested that the terms "sedative" and "stimulative" should refer to the response of the listener rather than the qualities of the music.

Stephens (1974) asserted that the classical studies using physiological measures to determine music's influence on state anxiety have been limited to a laboratory setting. In a clinical study with alcoholics, she examined the influence of background music paired with relaxation therapy. After each relaxation session there was a consistently lower score for the music group than for a group with no music. In a similar clincal study, Campingha (1980) used sedative music to reduce the anxiety state of psychiatric patients.

Their blood pressure was significantly lowered by exposure to sedative music. From these studies one can conclude that soothing music has been effective in reducing state anxiety.

Studies have been conducted to determine the influence specific kinds of music on state anxiety. Sad music (Biller, Olson, and Breen, 1974), semiclassical music (Candler, 1978), and group sing-a-longs followed by verbal discussions (Flaherty, 1979) were found to be effective in reducing state anxiety. Rohner & Miller (1980) noted a trend for sedative music to decrease state anxiety. Music may be a vehicle for emotional release and could act as an anxiety reducing agent.

Music has been used to facilitate a relaxation response when paired with biofeedback. Harrell and Stewart (1980) found piano music and electromyogram biofeedback combined superior to piano music alone or electromyogram biofeedback alone in reducing muscle tension. Epstein (1974) used music as a reinforcer with electromyogram biofeedback and discovered that music promoted a reduction of muscle tension and a decrease in headache activity. Music facilitated relaxation.

Studying individuals in actual life situations has increased our understanding of anxiety. The specific situations being examined in this review of literature are test anxiety, speech anxiety, and music performance anxiety.

According to Spielberger & Sarason (1973) these are social anxieties. It is important to compare these situation specific anxieties and examine techniques commonly used to reduce the anxiety state.

A situation in which a person is likely to experience anxiety is taking an examination. In describing test anxiety, Liebert and Morris (1967) defined two separate components: cognitive concern about the performance and physiological arousal. These two components are common to most anxiety reactions.

Test anxiety has been reduced with electromyogram biofeedback paired with relaxation (Grouling, 1977), systematic desensitization (Romans, 1977), temperature biofeedback (Scheider, 1976; Curtis, 1976), and background music (Stanton, 1975). Hughes (1978) compared systematic desensitization to temperature biofeedback in the reduction of test anxiety and found no significant differences between the two treatments.

In addition to test anxiety, research of situational anxiety has also encompassed speech anxiety. Heart rate biofeedback has been used a great deal in the reduction of anxiety associated with giving a speech. Since heart rate is generally faster when a person is in an anxiety state, it is an easily perceived physiological cue of anxiety. Brown (1977) believes that heart rate is one of the easiest physiological functions to control. Gratchel et al. (1977)

found that combining muscle biofeedback with relaxation effectively reduced heart rate before giving a speech. Learned control of heart rate deceleration significantly reduced speech anxiety. Lomas (1937) suggested that the best way to cope with anxiety about giving a speech was adequate preparation. Inadequate preparation could cause stage fright.

Stage fright is common to speakers and musicians. Being on a stage can cause a feeling of unpleasantness. Thus, the nervousness felt before a stage appearance is sometimes labeled performance anxiety. Performance anxiety appears to be an emotional state. It is relatively short-term, and is specific to a given stress situation.

It seems that the more important the performance, the more tension a person will feel. Piperek (1970) measured performance anxiety among members of the Vienna Symphony Orchestra. He found a positive correlation between the amount of muscle tension and importance of the person's contribution to the total performance (Appel, 1976, p. 3).

Several techniques have been used to reduce music performance anxiety. To this author's knowledge, biofeedback has not been documented as an aid in music performance anxiety reduction. Most of the methods used to reduce performance anxiety incorporate relaxation or cognitive re-evaluation of the threatening situation. A few focus on studying the actual music structure. Wardle (1974) found systematic

desensitization and relaxation equally effective in decreasing heart rate in high school instrumental students during performance. Lund (1972) compared systematic desensitization to insight therapy in the reduction of music performance anxiety. He discovered that both methods aided instrumentalists in reducing performance errors, but insight therapy had a more lasting effect. Apparently, systematic desensitization is very effective in reducing situational anxiety. Appel (1976), in a study with adult pianists, found systematic desensitization more effective than music analysis in increasing performance quality and decreasing anxiety.

Some authors suggest that performance anxiety is a result of conditioning. Performers concern themselves with both rational and irrational fears which accompany music performance. According to Wardle (1975), fear has become a conditioned part of music performance. He pointed out that experimental research on performance is minimal. He also stressed that a reduction of anxiety does not automatically mean the performance will improve, but it could free some inhibitions and allow for more effective use of already acquired skills.

Although the reduction of anxiety led to improved performance for adult pianists (Appel, 1976, Kendrick, 1979), such a relationship has not always been supported. There is a need to define the relationship between anxiety and perfor-

mance more clearly. Lazarus (1977) suggested that the stress felt by the performer and the quality of performance may have a curvilinear relationship.

Reducing negative thoughts about performance (Kendrick, 1979), increasing a sense of mastery (Hutterer, 1980), and increasing playing ability (Waite, 1977) have all been effective in the reduction of music performance anxiety. Attitude and preparation seem to influence performance anxiety. McNabb (1951) seemed to feel that the most powerful weapon in overcoming performance anxiety was preparation. Besides adequate preparation, stage fright can be overcome if a performer learns to relax, forgets the audience, ignors interruptions, and focuses his attention on the job being done.

STATEMENT OF PROBLEM

The problem of this study was to determine whether visual temperature biofeedback, and visual temperature biofeedback combined with sedative music were significantly different in reducing music performance anxiety.

Hypotheses

1. Subjects receiving visual temperature biofeedback will not be able to raise their finger temperatures.
2. Subjects receiving visual temperature biofeedback while listening to sedative music will not be able to raise their finger temperatures.

3. Increases in finger temperatures will not be significantly different for subjects receiving visual temperature biofeedback and subjects receiving visual temperature biofeedback with sedative music.

4. Visual temperature biofeedback, visual temperature biofeedback with sedative music, and a no contact control will not be significantly different in decreasing performance anxiety as measured by STAI anxiety scores and pulse rate.

Definition of Terms

1. Anxiety: A state of being that is a

> transitory emotional state or condition of human organism which is characterized by subjective, consciously perceived feeling of tension, apprehension, and heightened autonomic nervous system activity (Biller, Olson, & Breen, 1974, p. 69).

2. Performance Anxiety: state anxiety associated with stage appearance.

3. Sedative Music: "Music derived from a montonously regular accented type of rhythm in which there is little or no variation" (Gaston, 1951, p. 42). In this study, sedative music will have a metranome marking of less than 70 beats per minute.

4. Temperature Biofeedback: feedback a person receives regarding his/her body surface temperature.

5. Peripheral Temperature: skin temperature of the hands and fingers. In this study, skin temperature of the third digit of the dominant hand will be recorded in degrees Fahrenheit.
6. Pulse rate: pulse taken at the radial artery and measured in beats per minute.

Assumptions

For the purpose of this study the following assumptions will be made:

1. The anxiety state that an individual experiences can be measured by psychological and physiological criteria.
2. Music can affect the emotional status of an individual.
3. It is possible for an individual to regulate once thought involuntary reactions of the autonomic nervous system (i.e. hand temperature).

Limitations

1. Attribute variables such as the subject's socioeconomic status, educational, and previous musical knowledge will not be considered.
2. Control of outdoor temperature and temperature of the training room will be impossible.

Significance of the Study

The significance of this study lies in the power of sedative music to aid in the reduction of anxiety. If enhances commonly used methods of anxiety reduction or is

an anxiety reducing agent in itself, a skilled and knowledgeable music therapist has a powerful medium to work with in reducing situational anxiety.

This study attempts to determine the influence of sedative music combined with temperature biofeedback on an emotional reaction (anxiety) which is common to most people, and to determine whether it has a significantly different influence on performance anxiety than temperature biofeedback alone. If sedative music combined with temperature biofeedback is found to reduce anxiety associated with performance, the music therapist has an obligation to aid fellow professionals in the performing arts in the reduction of their performance anxiety.

METHOD

Subjects

The twenty-four vocal performers who served as subjects for this study were from North Texas State University and Texas Woman's University. Although the majority of subjects were voice students, eleven of the subjects were participants in the Texas Woman's University summer musical production "Stop the World, I want to get off." Of the twenty-four subjects, six were male and eighteen were female.

Design

The design of this study was Pretest-Posttest with random assignment to two treatment groups. A no contact control group was selected from subjects who could not participate in the biofeedback training but had volunteered for the study. The two treatments consisted of visual finger temperature biofeedback training and visual finger temperature biofeedback with sedative music. (A diagram of the design is in Appendix A.)

Statistics

An analysis of covariance was utilized to determine if the scores of the STAI anxiety scale and pulse rate are significantly different between the two treatment groups and the no contact control group. The analysis of covariance is sensitive to the initial differences between the groups

and adjusts the means on the dependent variable (posttest) on the basis of the covariate or pretest scores so that the groups are comparable. A significant F will be found if these adjusted means are far enough apart (Huck, Cormier, & Bounds, Jr., 1974). The .05 alpha level of significance was selected.

Apparatus

Two separate sets of biofeedback equipment were used in this study. An Autogen 2200 Thermistor was used at Texas Woman's University and a Coburn Thermistor at North Texas State University.

Music was tape recorded on a cassette tape for the biofeedback training with sedative music. (For a listing of music selections used in this study see Appendix B.) A portable Superscope cassette tape recorder was used. During the biofeedback training sessions the experimenter used a pencil and paper to record individual finger temperatures of the subjects in degrees Fahrenheit.

During the pretest and posttest performances the experimenter used a stop watch in order to take each person's pulse. A mechanical timer was used to time the performances.

The State-Trait Anxiety Inventory was used in this study to measure short-term state anxiety associated with performing. The State-Trait Anxiety Inventory has measures of state anxiety and more continuous or trait anxiety. The State-Trait

Anxiety Inventory (STAI)* was developed by Spielberger, Grousuch, and Lushene (1970) to provide a relatively brief and reliable self-report of state and trait anxiety (Spielberger, 1972). The state scale consists of twenty items based on a four point scale. The items are brief statements such as "I feel upset." The subject indicates how he feels at a particular moment in time by checking one of four alternatives: "(1) not at all," "(2) somewhat," "(3) moderately so," "(4) very much so," (Zuckerman & Spielberger, 1976, p. 135).

Low scores indicate states of calmness, intermediate scores indicate moderate levels of tension, and high scores indicate intense apprehension (Spielberger, et al., 1970). The range of possible scores is twenty to eighty.

The STAI has proven to be a reliable and valid instrument. Internal reliability has been tested by giving the inventory under varying conditions of psychological stress. The reliability coefficients ranged from ".83 to .92 for the state anxiety scale" (Spielberger, Gorsuch, and Lushene, 1970, p. 10). To test the validity, scores from the State Anxiety Scale were correlated with scores from other anxiety scales. The State Anxiety Scale demonstrated internal consistency and construct validity.

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*The State-Trait Anxiety Inventory STAI form X-1, is copyrighted, and cannot be replicated in this study. The test can be obtained from Consulting Psychologists Press, Palo Alto, California.

Procedure

The experimenter attended Texas Woman's University registration for Summer Session II and had consent forms for subjects to sign. Each subject was assigned a number and told the pretest time. At North Texas State University, an organizational meeting was held so that persons interested in the study had an opportunity to sign the consent form and to find out the time of the pretest performance.

In order to protect the rights of the subjects of this study permission to do the sudy was initially obtained from: a committee of the Human Research Review Committee at Texas Woman's University (see Appendix C); North Texas State University School of Music (see Appendix D); and the subjects themselves (see Appendix E). The subjects were informed of the risks and benefits of the study. Anonymity was protected by assigning each subject a number for identification.

For the pretest performance each subject took five minutes to perform. A timer was set and the subject stopped singing when it went off. The experimenter took each subject's pulse just prior to his performance. Immediately after the subject completed his song, he filled out the STAI anxiety scale. Just the measure of state anxiety was used. Subjects were instructed to fill out the form to describe how they felt just prior to performance. After the pretest performance, each subject was randomly assigned to one of two treatment

groups: The two treatments were visual temperature biofeedback (visual, or V) and visual temperature biofeedback with sedative music (visual, with music, or VM). Subjects who had volunteered for the study but could not attend the biofeedback training were placed in the no contact control group (c). The subjects in the treatment groups signed up for four half-hour sessions that they planned on attending.

During the treatment sessions, the subject entered a dimly lit biofeedback room and the experimenter asked him to sit down in a recliner and put his feet up. The experimenter told the subject that she was going to tape a temperature sensitive thermometer to the third digit of his dominant hand and proceeded to do so. The experimenter then told the subject that a relaxed state usually causes an increase in finger temperature, and familiarized the subject with the feedback mechanism which indicated any changes in his finger temperature. After this orientation, the experimenter told told the subject to "relax as much as possible." At this time, for the music group, the cassette tape recorder was started and the experimenter informed the subject that she was going to play some music.

During the biofeedback temperature training sessions the experimenter recorded a base line finger temperature after five minutes and subsequent increases in finger temperature at two-minute intervals. The highest tempera-

ture reached was recorded in degrees Fahrenheit. At the end of each training session the subject was asked to slowly open his eyes. If the subject appeared to be in a deep relaxed state, the experimenter counted down from five so the subject had an opportunity to reorient himself.

The posttest performance was essentially a replica of the pretest performance. Each subject performed a maximum of five minutes. Pulse rate was taken just proir to performance and immediately after the performance the subject filled out the STAI anxiety scale and was given a final

tion and a thank you from the experimenter (see Appendix ques

F).

RESULTS

The data were collected from twenty-four subjects divided into three groups of eight. Group "V" condition consisted of visual temperature biofeedback. Group "VM" condition consisted of visual temperature biofeedback with music. Group "C" condition was a no contact control group. Both experimental conditions consisted of four half-hour training sessions staged over a two week period.

Hypothesis 1

A t test of dependent observations was performed to determine if subjects in Group "V" were able to significantly raise their finger temperatures from the beginning to the end of each training session. The t value was 9.87. Thus, the null hypothesis "Subjects receiving visual temperature biofeedback will not be able to raise their finger temperatures" was rejected at the .05 level of significance. Subjects in Group "V" were able to significantly increase their finger temperatures during the training sessions. The average increase during the sessions was 4.74°F. (For a graphic representation of finger temperature increases for each subject in Group "V" see pages 29 and 30).

Hypothesis 2

All subjects in Group "VM" were able to increase their finger temperatures (see graphs on pages 31 and 32). A t test of dependent observations was performed to determine

if subjects in Group "VM" were able to significantly increase their finger temperature from the beginning to the end of each individual session. The t value was 3.706. Therefore, the null hypothesis "Subjects receiving visual temperature biofeedback while listening to sedative music will not be able to raise their finger temperatures" was rejected at the .05 level of significance. Subjects in Group "VM" were able to significantly increase their finger temperatures. The average increase during the training sessions was 4.81° F.

Hypothesis 3

Analysis of variance and covariance with repeated measures was performed on temperature increases for Group "V" and Group "VM". No significnat differences were found between Group "V" and Group "VM" ($p<.3543$) or between sessions ($p<.47$). The mean temperature increases and standard deviations for each training session are presented in Table 1.

Finger Temperature

Session	Mean Temperature Increase		Standard Deviation	
	V	VM	V	VM
1	4.46	4.36	1.71	3.56
2	5.90	3.92	1.92	1.45
3	5.71	5.16	3.30	2.23
4	4.51	4.38	1.55	1.93

TABLE 1

Hypothesis 4

Analysis of covariance was per

posttest scores from Spielberger's state anxiety scale. All three groups showed a decrease in state anxiety as measured by the STAI. The F value was 1.3965. The probability was $p < .271$ which was not statistically significant at the .05 alpha level. When examining the means in Table 2, one can observe that all three groups showed a decrease from pretest to posttest. This decrease was not statistically significant, however.

State Anxiety Scores
Adjusted Means For Analysis of Covariance

Group	Group Mean		Adjusted Group Mean	Standard Error
	Pretest	Posttest		
VM	46.625	35.000	33.992	2.336
V	43.625	34.250	34.160	2.780
C	39.75	38.875	39.971	2.847

TABLE 2

The analysis of covariance was also performed on the pretest and posttest pulse rates. The F value was 12.819. The p value was highly significant at the .0003 level. Thus, the null hypothesis that there would be no differences between Group V, Group VM and Group C in pulse rate was rejected at the .05 level of significance. Table 3 shows decreases in mean pulse rates by the treatment groups and an increase by the no contact control group.

Pulse Rates

Group	Estimates of Means Pretest/Posttest		Adjusted mean	Standard error
VM	66.5	60.5	61.91	2.73
V	71.5	66.0	65.79	2.58
C	75.0	82.0	80.78	2.69

TABLE 3

A Newman-Kuels test applied to the mean pulse rates indicated that both Group "V" and Group "VM" were significantly different from Group "C". When comparing the mean pulse rate of Group "V" to the mean pulse rate of Group "VM", no significant difference was found (see Table 4).

Newman-Kuels

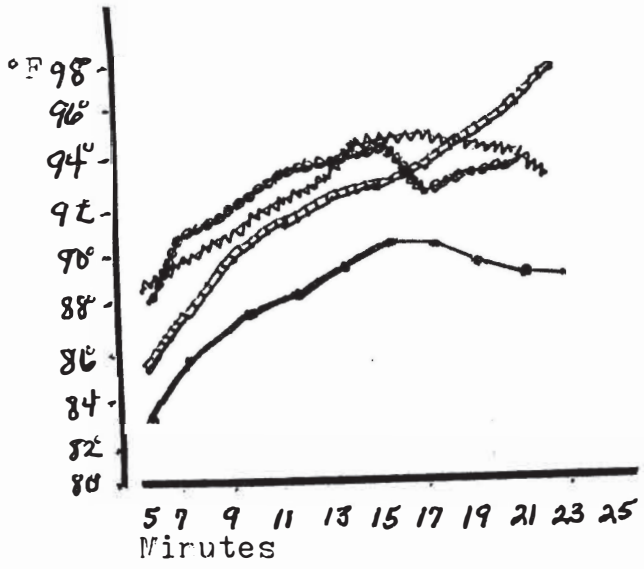
Differences			$S_{\bar{x}}$	Critical q value
C-VM=	80.78-61.91=	18.87 significant	2.666	9.49
C-V=	80.78-65.79=	14.99 significant		
V-VM=	65.79-61.91=	3.88 not significant		

TABLE 4

Visual temperature biofeedback, visual temperature biofeedback with sedative music, and a no contact control group were no significantly different in reducing anxiety as measured by the State Trait Anxiety Inventory. Pulse rate, however, was found to be significantly different between the two treatment groups and the no contact control group.

A Pearson r correlation revealed a high correlation ($r=.5578$ or $p<.002$) between pulse rate gain scores and state anxiety gain scores. This suggests there is a relationship between physiological and cognitive elements of state anxiety.

Increases In Temperature During Biofeedback Training



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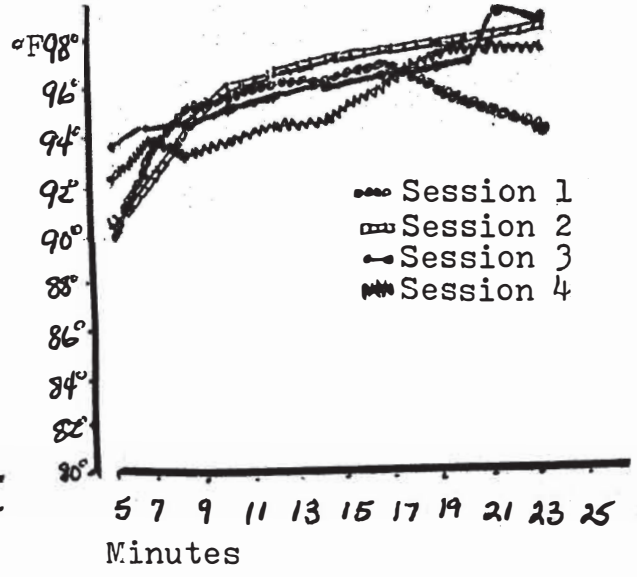

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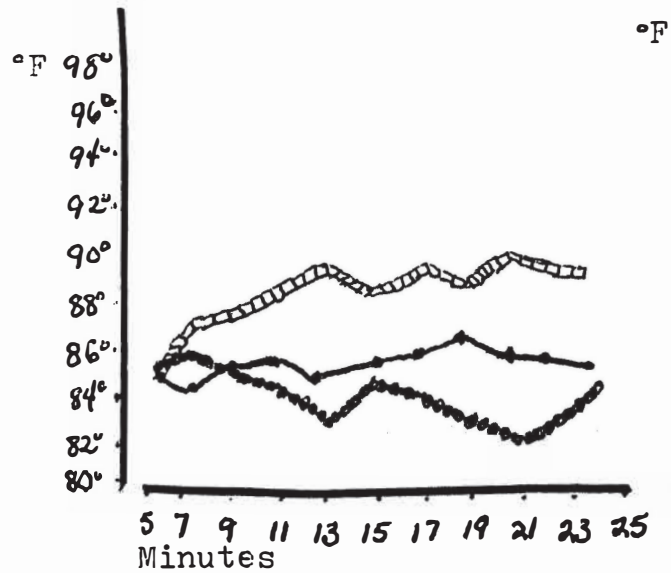

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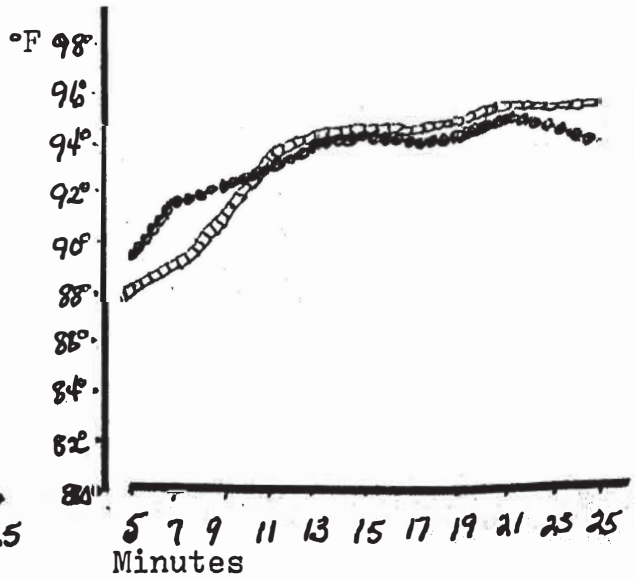
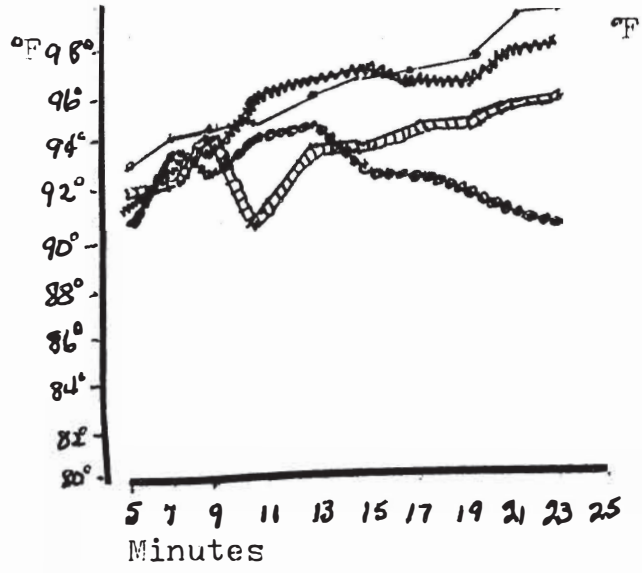
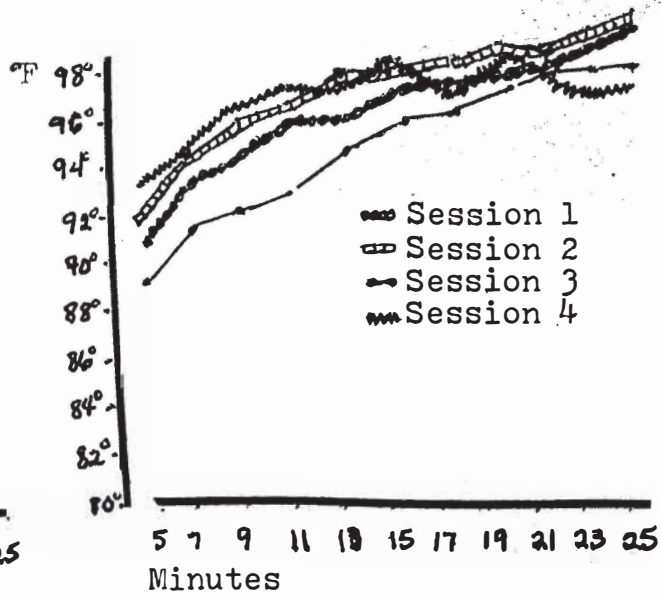


Subject 4 (V)

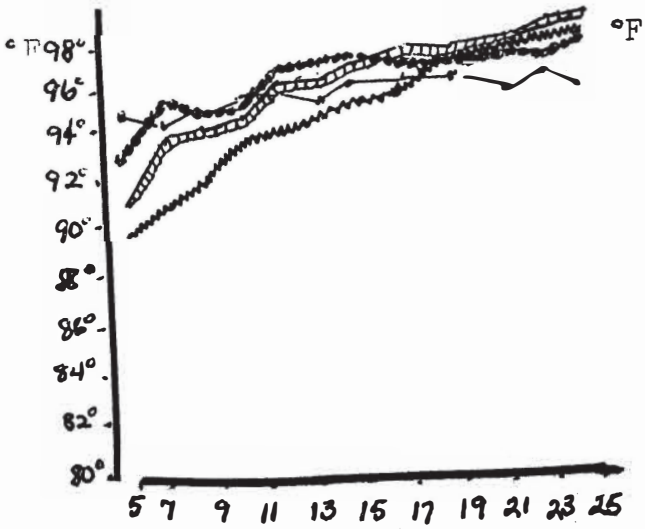
Increases In Temperature During Biofeedback Training



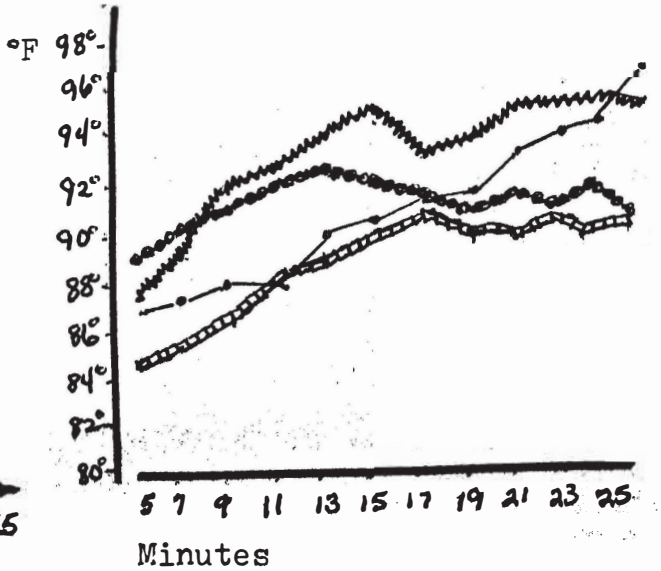
Subject 5 (V)



Subject 6 (V)

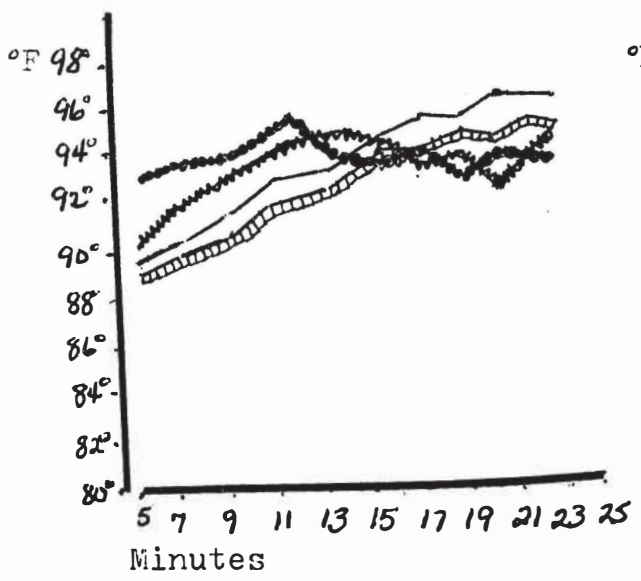


Subject 7 (V)

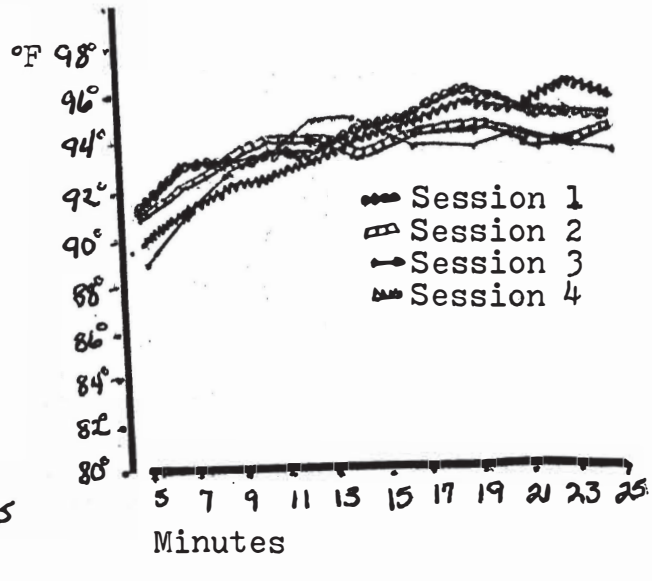


Subject 8 (V)

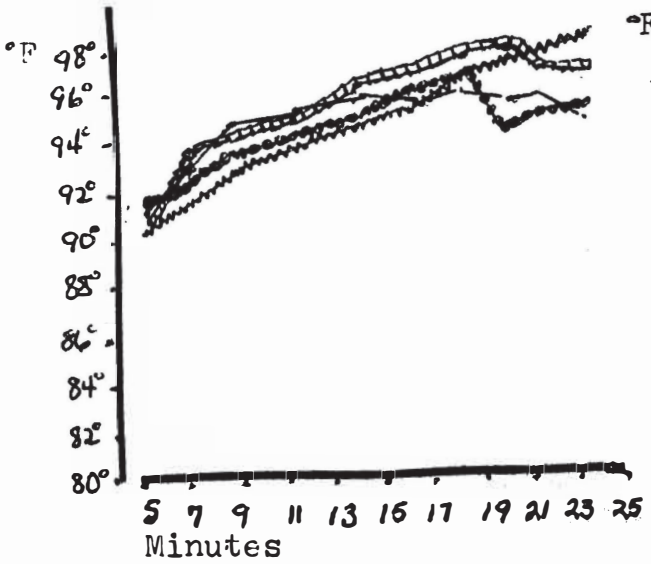
Increases In Temperature During Biofeedback Training
With Music



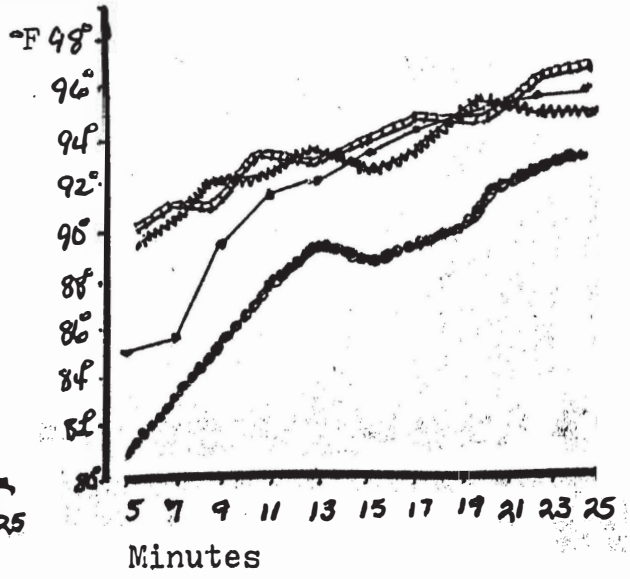
Subject 1 (VM)



Subject 2 (VM)

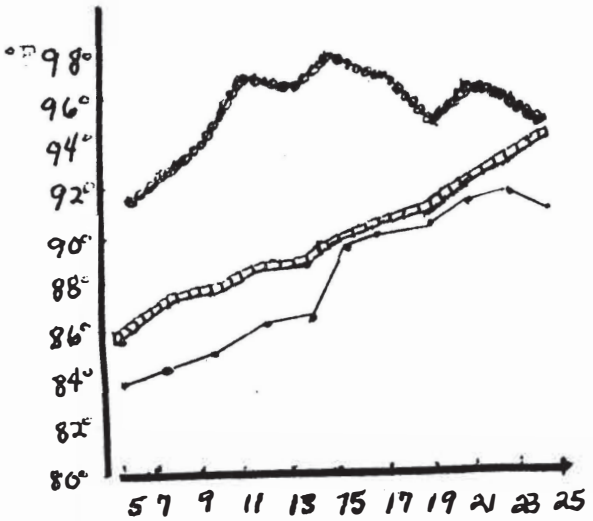


Subject 3 (VM)

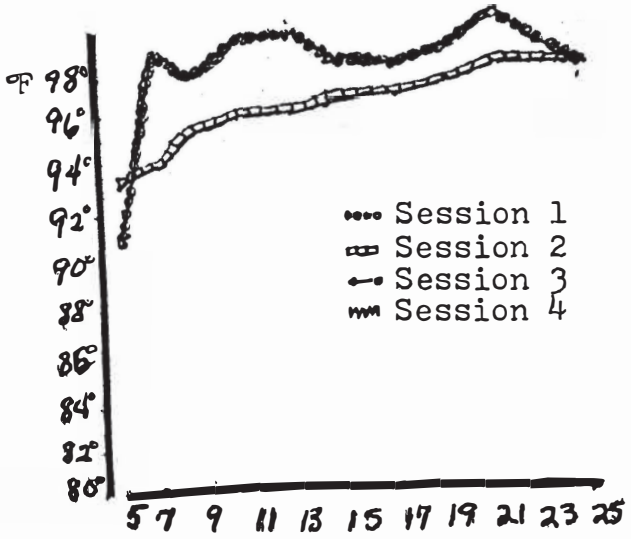


Subject 4 (VM)

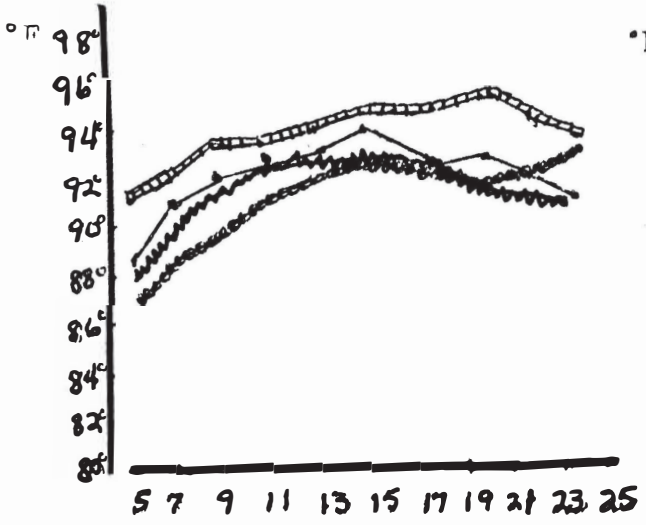
Increases In Temperature During Biofeedback Training
With Music



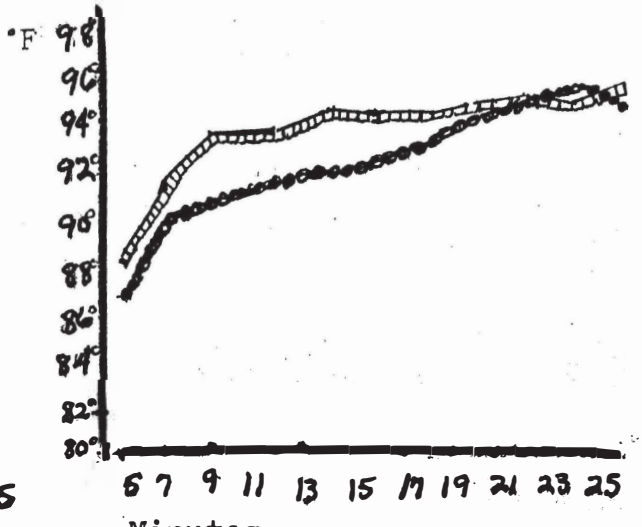
Subject 5 (VM)



Subject 6 (VM)



Subject 7 (VM)



Subject 8 (VM)

DISCUSSION

This study was conducted to investigate the possibility of using sedative music to enhance visual temperature biofeedback in reducing music performance anxiety. Specifically, the experimenter asked two questions: (1) does temperature biofeedback promote a relaxation response which can be generalized to the music performance setting, and (2) could sedative music enhance this relaxation response?

The experimenter believes several factors influenced the results of this study. The first was the actual size of the experimental and control groups. The samples were very small consisting of eight subjects each. The smaller the sample, the greater the chance of it being biased. A large digression made by Subject 2 in the control group may have contributed to the fact that the reduction of state anxiety scores was not significant.

Several extraneous variables became apparent during the biofeedback training. The effect of the presence of the experimenter being in the room cannot be overlooked. The Rosenthal effect could have taken place since the trainer and experimenter were one and the same. The biofeedback equipment at North Texas State University had many wires which could be considered threatening to some individuals. For both sets of biofeedback equipment, a red light lit up

as subjects became relaxed. Since the color red is often thought to be stimulating, it could have become a distracting stimulus. In fact, one subject reported she was so fascinated with the lights that she found it hard to relax while watching them.

One important consideration when examining the relaxation response is what time of day the subject had his/her training. Generally, subjects who had early morning sessions and late evening sessions appeared to be more relaxed than subjects receiving training during the day.

The psychological and physical states of the subjects during the training could influence their ability to relax. Several subjects described anxiety producing situations they were experiencing to the experimenter. For instance, Subject 3 (VM) after his first training session told the experimenter that he had parked illegally just prior to the session. (This event could explain why he had such a low base line temperature.) Subjects came to training sessions before major exams, after unsuccessful voice lessons, having only three hours of sleep, after playing racketball, and running late. Two of the subjects were preparing for upcoming recitals. Thus, the general amount of anxiety felt by the subjects and how tired they were could have affected the cognitive element in learning to relax.

Besides considering the psychological and physical states of the subjects, previous experience in relaxation could have a positive influence upon a subject's ability to increase finger temperature. Subject 2 (VM) said he was "into" self hypnosis. Since deep states of relaxation are close to hypnosis, he found it very easy to relax.

The quality of music production which can be attained from a cassette tape recorder is questionable. When possible, a high fidelity system should be used. The music stimulus was intended to be sedative background music in this study. The subject was not expected to focus his attention on the music. Subject 3 (VM) found that he began to analyze the music since he was a music major. Subject 7 (VM) reported that she did not like some of the music selections. Ideally, the subject should be able to choose his favorite music to relax to. Also, one should not rule out the possibility that an individual may prefer total silence for relaxation.

An interesting phenomenon the experimenter observed was that some of the subjects tried too hard to relax. Subject 2 (V) was able to steadily increase his finger temperature but he concentrated so hard that he wrinkled his brow. It would be intriguing to combine frontalis EMG biofeedback with temperature biofeedback to determine whether separate autonomic functions are independent.

Recognition of music as an aid in relaxation is slow. Music is an auditory stimulus which has the potential to influence us emotionally and physically. Biofeedback, on the other hand, gives a person an exceptionally enticing visual stimulus which displays the state of his bodily functions. Temperature biofeedback gives a person precise and accurate feedback of his peripheral body temperature. Persons who practice yoga and other forms of meditation are "in touch" with their physical state and usually do not need the extra visual cue to become relaxed. Ideally, biofeedback promotes self awareness and advancement towards total relaxation.

All subjects receiving biofeedback training in this study were able to increase their finger temperatures (see Appendix G). The average temperature increases for Group VM were slightly higher than for Group V. For some individuals music enhanced relaxation. Several individual subjects were able to greatly decrease their anxiety as measured by the STAI anxiety scale and pulse rate (see Appendix G). Subjects 1 (VM), 2 (VM), 2 (V), and 7 (V) all showed immense decreases in anxiety.

The majority of the subjects receiving training felt that they benefited from it. Responses on the posttest questionnaire (see Appendix F) were mostly positive.

The written responses to the question "Was there a difference in how you felt about the posttest performance as compared to the pretest performance?" were as follows:

I was a little calmer. I still feel I need more work on anxiety and tension but this is a good start.

Yes, I was able to control my tension and anxiety better, and felt more comfortable about myself. It was easier to relax and enjoy singing, when usually I'm almost dreading singing for fear that I will not do everything right.

Sorry, I did not do too well. All of this past week I've had a lot of physical and emotional tension, and today was no exception.

I was more relaxed than usual because my mind was on other things than performing. Interesting!

Yes.
Yes, Posttest I was aware of my ability to slow my heart and raise my hand temperature.

Much more relaxed.

I felt more relaxed and positive today than during the pretest.

I was very much at ease for the posttest. The relaxation techniques helped me learn to control my physical "jitters" and therefore put me in a calmer mood.

Yes. I was much calmer especially in the beginning. I did begin to feel more nervous toward the end of the song, but not anywhere close to how nervous I was last time. Thanx.

Outside influences affected me more than actual performance anxiety.

Yes. I felt calmer after the song this time.

The biofeedback helped me - it kept the tension I felt from coming into my voice.

Not really - you picked a bad time but in the two weeks of time more things piled up on me. I enjoyed the experience.

CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that visual temperature biofeedback and visual temperature biofeedback combined with music reduced a physiological symptom of performance anxiety. Both methods significantly reduced pulse rate before a performance. No significant difference was found between visual biofeedback and visual biofeedback combined with music in aiding the reduction of pulse rate. Decreases in scores on a psychological measure of anxiety, the State-Trait Anxiety Inventory, were not significant.

All subjects receiving temperature biofeedback training were able to significantly increase their finger temperatures. In fact, there were no significant differences between the average temperature increases of subjects receiving visual biofeedback and those receiving visual biofeedback with sedative music. In addition, there were no significant differences in the average temperature increases between sessions. This indicates that the relaxation response may be learned within a very short period of time.

Since most of the subjects appeared to learn how to increase their finger temperature during the first session, it is recommended that this study be replicated with fewer training sessions to determine if the relaxation response can generalize after a shorter duration of training. This author believes that increase in finger

is a reliable indicator of relaxation. Finger temperature could be monitored during music therapy relaxation techniques to determine whether deep states of relaxation are attained. Similarily, by doing a case study, an experimenter could examine in depth the effect of different relaxation techniques upon peripheral temperature. In addition, he could determine what events were stressful for one person.

Since temperature biofeedback was found to be effective in reducing anxiety associated with performing for some individuals in this study, it should be an option available to vocal performers to decrease their performance anxiety.

APPENDIX A

Design of the Study

DESIGN

Pretest		Posttest
O_1	X_1	O_2
O_1	X_2	O_2
O_1	C	O_2

Dependent Variables:

State Trait Anxiety Inventory scores
Pulse Rate

Independent Variables:

X_1 visual temperature biofeedback training (V)

X_2 visual temperature biofeedback training with sedative music or (VM)

C no contact control group

APPENDIX B

Musical Selections

MUSICAL SELECTIONS

John Denver	Season Suite
	(Early Spring)
Dan Fogelberg	Souvenirs
	The Long Way
Christopher Cross	Sailing
Earl Klugh	Heart String
	I'll see you again
	Acoustical Lady
	(Part 1 & 2)

ALBUMS

Cross, Christopher. Sailing. Warner Brothers, 1979.

Denver, John. Rocky Moutain High. New York: Cherry Lane Music Company, 1972.

Fogelberg, Dan. Souvenirs. Los Angeles, California: ABC Records, Inc., 1974.

Klugh, Earl. Heart String. Los Angeles, California: Liberty/ United Records, Inc., 1979.

APPENDIX C

Permission from the Human Research Review Committee

TEXAS WOMAN'S UNIVERSITY
Box 23717 TWU Station
Denton, Texas 76204

HUMAN SUBJECTS REVIEW COMMITTEE

Name of Investigator: Kristi A. Stadum Center: Denton

Address: 1119 Frame Date: July 7, 1981

Denton, Texas 7620

Dear Ms. Stadum:

Your study entitled Music Performance Anxiety: Temperature Biofeedback vs Systematic Desensitization With Music

has been reviewed by a committee of the Human Subjects Review Committee and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health, Education, and Welfare regulations typically require that signatures indicating informed consent be obtained from all human subjects in your studies. These are to be filed with the Human Subjects Review Committee. Any exception to this requirement is noted below. Furthermore, according to DHEW regulations, another review by the Committee is required if your project changes.

Any special provisions pertaining to your study are noted below:

_____ Add to informed consent form: No medical service or compensation is provided to subjects by the University as a result of injury from participation in research.

_____ Add to informed consent form: I UNDERSTAND THAT THE RETURN OF MY QUESTIONNAIRE CONSTITUTES MY INFORMED CONSENT TO ACT AS A SUBJECT IN THIS RESEARCH.

_____ The filing of signatures of subjects with the Human Subjects Review Committee is not required.

_____ Other:

__x__ No special provisions apply

cc: Graduate School
Project Director
Director of School or
Chairman of Department

Sincerely,

Marilyn Hinson

Chairman, Human Subjects
Review Committee

at Denton

TEXAS WOMAN'S UNIVERSITY
BOX 23717, TWU STATION
DENTON, TEXAS 76204

HUMAN SUBJECTS REVIEW COMMITTEE

JULY 23, 1981
Date

TO: Project Director

Director of School or
Chairman of Department

This is to inform you that, as of this date, KRISTI A. STADUM has placed on file with the Human Subjects Review Committee the signatures of the subjects who participated in his/her research. The signatures constitute evidence of informed consent of each subject.

Marilyn Hinson
Chairman, Human Subjects Review
Committee

cc: Investigator
Graduate School

APPENDIX D

Permission from North Texas State University

North Texas State University
Denton, Texas 76203

memo

June 19, 1981

To: Dr. Berry, Dean of the Graduate School
Texas Woman's University

From:
David C. McGuire, Coordinator, Graduate Music Education
North Texas State University

Kristi Stadum (R.M.T.), a graduate student at TWU, has my permission to contact faculty and students in the school of Music at NTSU for the purpose of gathering data for her masters degree research.

Permission is approved in the spirit of promoting cooperation between our two institutions, especially in the area of graduate research.

David C. McGuire

Marcean D. Myers, Dean, School of Music

Robert B. Toulouse

School of Music

APPENDIX E

Consent Form

CONSENT FORM
TEXAS WOMAN'S UNIVERSITY
HUMAN RESEARCH REVIEW COMMITTEE

Consent to Act as a Subject for Research and Investigation

1. I hereby authorize Kristi Stadum R.M.T. to perform the following procedures:

   1. Administer the State-Trait Anxiety Inventory to me for me to fill out after a Pretest performance.

   2. Take my pulse before a Pretest perfromance.

   3. Monitor my finger temperature during a two week training period on relaxation.

   4. Administer the State-Trait Anxiety Inventory to me for me to fill out after a Posttest performance.

   5. Take my pulse and finger temperature before a Posttest performance.

As a subject:

   1. I agree to fill out the State-Trait Anxiety Inventory.

   2. I understand that my name will not be used in any release of data and I will be given an individual identification number for the study.

   3. I understand that my scores will be used in a graduate research study and my answers will be kept confidential.

2. The procedure listed in Paragraph I has been explined to me by _____.

3. a. I understand that the procedures described in Paragraph I involve the following risks or discomforts:

   There may be added anxiety due to equipment or the experiment.

   b. I understand that the procedures described in Paragraph I have the following possible benefits to myself:

   Achievement of a relaxed state during training sessions.
   Reduction in performance anxiety.
   An increase in the ability to control hand temperature.
   Experience performing in front of my peers.

   c. I understand that - No medical service or compensation is provided to subjects by the university as a result of injury from participation in research.

4. An offer to answer all my questions regarding the study has been made. If alternative procedures are more adventageous to me, they have been explained. I understand that I may terminate my participation in the study at any time.

Student's signature _____ Date

APPENDIX F

Posttest Questionnaire

Was there a difference in how you felt about this Posttest Performance as compared to the Pretest Performance?

I would like to take this opportunity to thank you for being a part of my thesis study on performance anxiety. Without your cooperation, I would not have been able to complete the study this summer.

There are many methods for anxiety reduction. Temperature biofeedback is one way to failitate relaxation and reduce tension. If you felt that temperature biofeedback training did not help you reduce anxiety associated with performing, keep in mind that there are other options available. Positive experiences, preparation, and systematic desensitization have been effective in reducing performance anxiety.

Thank you again for taking the time to be a part of my study.

Kristi Stadum, R.M.T.

APPENDIX G

Raw Data

INCREASES IN FINGER TEMPERATURE

Visual Temperature Biofeedback		Visual Temperature Biofeedback with music	
Subject 1 (V)		Subject 1 (VM)	
Session 1 4	.7	Session 1	1.7
Session 2 -	5.8	Session 2 -	5.5
Session 3	9.4	Session 3	6.4
Session 4	5.5	Session 4	3.7
Subject 2 (V)		Subject 2 (VM)	
Session 1	6.6	Session 1	2.4
Session 2 -	8.8	Session 2 -	2.8
Session 3 -	3.1	Session 3 -	3.6
Session 4 -	3.6	Session 4 -	4.2
Subject 3 (V)		Subject 3 (VM)	
Session 1 -	-3.0	Session 1 -	2.9
Session 2 -	5.2	Session 2 -	4.7
Session 3 -	1.3	Session 3 -	2.9
Session 4 -		Session 4 -	7.7
Subject 4 (V)		Subject 4 (VM)	
Session 1 -	4.4	Session 1 -	10.5
Session 2 -	6.0	Session 2 -	4.6
Session 3 -		Session 3 -	8.4
Session 4 -		Session 4 -	2.7
Subject 5 (V)		Subject 5 (VM)	
Session 1 -	3.0	Session 1	5.1
Session 2	2.8	Session 2 -	6.9
Session 3	4.5	Session 3	6.4
Session 4	4.0	Session 4	
Subject 6 (V)		Subject 6 (VM)	
Session 1 -	6.4	Session 1 -	7.5
Session 2 -	6.5	Session 2 -	4.2
Session 3 -	7.2	Session 3 -	
Session 4	2.1	Session 4 -	

Visual Temperature Biofeedback		Visual Temperature Biofeedback with music	
Subject 7 (V)		Subject 7 (VM)	
Session 1 -	3.3	Session 1 -	4.3
Session 2 -	6.0	Session 2 -	2.0
Session 3 -	1.2	Session 3 -	4.5
Session 4 - 8	5.	Session 4 -	3.6
Subject 8 (V)		Subject 8 (VM)	
Session 1 -	2.8	Session 1 -	6.2
Session 2 -	5.5	Session 2 -	4.7
Session 3 -	8.9	Session 3 -	
Session 4 -	6.1	Session 4 -	

RAW SCORES
SPIELBERGER STATE ANXIETY INVENTORY

Group	Pretest	Posttest	Gain
Group MV			
Subject 1	46	29	-17
Subject 2	63	38	-25
Subject 3	27	23	-4
Subject 4	54	50	-4
Subject 5	31	34	+3
Subject 6	58	41	-17
Subject 7	41	33	-8
Subject 8	53	32	-21
Group V			
Subject 1	39	39	0
Subject 2	54	22	-32
Subject 3	35	42	+7
Subject 4	39	29	-10
Subject 5	54	40	-14
Subject 6	43	49	+6
Subject 7	57	31	-26
Subject 8	28	22	-6
Group C			
Subject 1	43	35	-8
Subject 2	36	33	-13
Subject 3	39	34	-5
Subject 4	50	53	+3
Subject 5	41	37	-4
Subject 6	41	42	+1
Subject 7	34	36	+2
Subject 8	34	41	+7

RAW SCORES
PULSE RATES BEFORE PRETEST AND POSTTEST PERFORMANCES

Group	Pretest	Posttest	Gain
Group MV			
Subject 1	60	52	-8
Subject 2	70	60	-10
Subject 3	60	56	-4
Subject 4	70	64	-6
Subject 5	75	72	-3
Subject 6	66	60	-6
Subject 7	72	58	-14
Subject 8	59	62	+3
Group V			
Subject 1	70	66	-4
Subject 2	78	62	-16
Subject 3	56	48	-8
Subject 4	80	64	-16
Subject 5	70	60	-10
Subject 6	64	78	+14
Subject 7	80	72	-8
Subject 8	76	78	+2
Group C			
Subject 1	90	86	-4
Subject 2	80	74	-6
Subject 3	84	80	-4
Subject 4	72	90	+18
Subject 5	64	74	+10
Subject 6	70	86	+16
Subject 7	64	86	+22
Subject 8	76	80	+4

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