This is to certify that the

dissertation entitled

PATTERNS OF PERFORMANCE ANXIETY AMONG UNIVERSITY MUSICIANS PREPARING FOR BRASS AREA JURY RECITALS: PHYSIOLOGICAL AROUSAL AND PERCEIVED STATE ANXIETY

presented by

Philip Michael Tartalone

has been accepted towards fulfillment of the requirements for

Ph.D. degree in Music

Albert LeBlanc
Major professor

Date Oct. 27, 1992

PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

DATE DUE	DATE DUE	DATE DUE
DEC 0 9 1994 ~~42864270~~	MAR 2 5 1995 M63483	
0 6 1998 ~~18208239~~	SEP 1 9 2006 091306	
NOV 0 2		
AUG 2 9 2002		
051209		

MSU Is An Affirmative Action/Equal Opportunity Institution

c:\circ\datedue.pm3-p.1

PATTERNS OF PERFORMANCE ANXIETY AMONG UNIVERSITY MUSICIANS PREPARING FOR BRASS AREA JURY RECITALS: PHYSIOLOGICAL AROUSAL AND PERCEIVED STATE ANXIETY

By

Philip Michael Tartalone

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

School of Music

1992

ABSTRACT

PATTERNS OF PERFORMANCE ANXIETY AMONG UNIVERSITY MUSICIANS PREPARING FOR BRASS AREA JURY RECITALS: PHYSIOLOGICAL AROUSAL AND PERCEIVED STATE ANXIETY

By

Philip Michael Tartalone

The purpose of this study was to determine the patterns of physiological arousal and self-reported anxiety in brass area music majors during jury recitals held at the end of an academic term, and throughout a four week period of preparation before the jury. I made comparisons between the inexperienced performers (freshmen and sophomores) and relatively experienced performers (juniors, seniors, and graduates) to discover if there were differences in anxiety and arousal, and when peak periods occurred. In addition, I compared the physiological assessments with self-reported measurements to ascertain if there was a correlation between the two methods of examining music performance anxiety.

Thirty-nine students, 25 inexperienced and 14 experienced, served as subjects for the research. Blood pressures, pulse rates, and respiration rates were used to determine physiological arousal, while self-reported anxiety was measured by the State-Trait Anxiety Inventory.[1] I made assessments concurrently, once a week for three weeks before each student's lesson, again at a dress rehearsal, and finally at the jury performance. In addition, heart rates were monitored electronically during the dress rehearsal and the performance.

I analyzed data for the research population, and for the inexperienced and experienced samples. Results of the study revealed elevated levels of physiological arousal and self-reported anxiety before the dress rehearsal and

the jury. The inexperienced subjects generally showed a greater range of increase on all measures and were usually higher than the experienced group immediately before the jury. The heart monitor showed the peak period of arousal to be approximately six minutes into the performance for both the inexperienced and experienced samples.

With the results of this research, I have concluded that anxiety and arousal patterns are similar for inexperienced and experienced performers, but the levels are generally higher for the inexperienced. In addition, I determined that physiological and self-reported measures were equally viable indicators of music performance anxiety because both showed significant increases during stressful situations. These findings should benefit future researchers who wish to establish types of therapy and times of administration when exploring anxiety reduction techniques.

---

[1] Spielberger, C. D., Gorusch, R. L., Lushene, R. E., Vagg, P. R., Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory (Form Y): Self-evaluation questionnaire.* Palo Alto, CA: Consulting Psychologists.

ACKNOWLEDGMENTS

I wish to express my appreciation to Dr. Albert LeBlanc, chair of my dissertation committee, for his effort and assistance throughout this research. Sincere gratitude is also extended to the guidance committee members, Dr. Robert Erbes, Dr. Rosalie Schellhous, Dr. Mark Sullivan, and Dr. John Baldwin, for their many helpful suggestions in the preparation of this document.

I would also like to acknowledge the brass faculty at Michigan State University, Professors Janine Gaboury-Sly, Richard Illman, Curtis Olson, and Philip Sinder, for their support and cooperation during the data gathering process. Finally, I must thank the brass students who participated as subjects; their commitment and enthusiasm made this study possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: THE PROBLEM

Background of the Study

Historically, the study of anxiety has been primarily the domain of experimental and clinical psychologists. The experimental psychologists were interested in the effects of anxiety on learning and the clinical psychologists were involved with the treatment of neurosis (Leary, 1990). Concurrent with the studies on anxiety and emotion was another body of literature concerned with the construct of physiological arousal, particularly in the area of motor performance (Duffy, 1934, 1941, 1957; Hull, 1943; Malmo, 1959; Spence, 1951; Yerkes & Dodson, 1908). This research developed as a reaction to the complex and somewhat confusing theories of emotion. The study of arousal was seemingly simpler and easier to quantify, and it supported the early developments in brain physiology (Neiss, 1988).

In this chapter, I will utilize recent research to provide insight to the psychological and physiological aspects of anxiety and arousal. To determine the consequences that these aspects have on performance, I will be examining each separately, as well as discussing their interactions. The research I have selected has been drawn from several areas that are concerned with the effects of the psychological and physiological aspects of anxiety and arousal. Each area will be analyzed in terms of its relevance to performance anxiety in music.

In the research dealing with the psychological concomitants of anxiety, one or several of the following affective or cognitive aspects are generally targeted as independent variables: self-related preoccupations, helplessness, expectations of negative consequences, self-efficacy, worry, catastrophizing, or fear. These are usually measured by means of subjective, self-report devices such as the Eysenck Personality Inventory (Eysenck & Eysenck, 1964), the Test Anxiety Scale (Sarason, 1978), the Cognitive Interference Questionnaire

(Sarason, 1978), the Sport Competition Anxiety Test (Martens, 1977), and the State-Trait Anxiety Inventory (Spielberger, Gorusch, Lushene, Vagg, & Jacobs, 1983), which is probably the most popular.

The methods being used to assess physiological arousal traditionally include a combination of the subject's blood pressure, pulse rate, and respiration rate. Other, more elaborate tests include: galvanic skin response (Epstein & Fenz, 1962; Fenz, 1964, 1973), muscle tension (McLeod, Hoehn-Saric, & Stefan, 1986), catecholamine concentration in the urine and/or blood (Lidén & Gottfries, 1974; Neftel, Adler, Käppeli, Rossi, Dolder, Käser, Bruggesser, & Vorkauf, 1982; Sjöberg, Frankenhaeuser, & Bjurstedt, 1979; Smith, Burwitz, & Jakeman, 1988; Starkman, Cameron, Nesse, & Zelnik, 1990; Wright, Wright, & Frankenhaeuser, 1981), salivary collection (Brantigan, Brantigan, & Joseph, 1982), an electroencephalogram (EEG) (Davidson, 1978), an electromyogram (EMG) (Cutietta, 1986; Fridlund, Schwartz, & Fowler, 1984), skin and urine pH (Sandin & Chorot, 1985), and regional cerebral blood flow (Gur, Gur, Skolnick, Resnick, Silver, Chawluk, Muenz, Obrist, & Reivich, 1988; Reiman, Fusselman, Fox, & Raichle, 1989).

Although useful studies that segregate the constructs of anxiety and arousal are still being conducted, many researchers now regard them as being reductionistic (Leary, 1990; Neiss, 1988). These researchers argue that by separately studying either anxiety or arousal, without exploring the other, an adequate examination will not be provided. To this end, there has been growing interest in the juxtaposition of the subjective stress typically labeled "anxiety," and the related objective patterns of behavior and physiological arousal. Researchers are now considering the study of anxiety as being a multidimensional psychological and physiological phenomenon that displays corroboration for the relationships between affective, cognitive, somatic, and/or behavioral responses (Borkovec, 1976; Hockey & Hamilton, 1983; Karteroliotis & Gill, 1987; Koksal, 1990; Landers, 1980; Leary, 1990; McCroskey & Richmond, 1990; Neiss, 1988; Sarason, Sarason, & Pierce, 1990; Schwarzer & Quast, 1985).

Because different performance activities may elicit diverse psychophysiological states (for example, a vocalist preparing to enter the stage for a recital versus a football lineman face-to-face with a tough opponent), this multifaceted approach has recently been applied to a variety of situation-specific activities in both the laboratory and the field. Researchers in each activity have devised their own approaches to the study of anxiety, and although each method may differ conceptually, all are similar in that they examine the relationships between the affective, cognitive, somatic, or behavioral ways that people react to social or evaluative situations. A few of the areas that have been under scrutiny are: social communication (Buck, Miller, & Caul, 1974), test taking (Deffenbacher & Hazaleus, 1985; Sarason, 1981, 1984), public speaking (Ayres, 1986; Behnke & Carlile, 1971; Motley, 1990), sport competition (Krane & Williams, 1987; Smith, Burwitz, & Jakeman, 1988), and pertinent to this study, music performance (Abel & Larkin, 1990; Craske & Craig, 1984; Steptoe & Fidler, 1987).

Music performance involves a multitude of factors that make it unique among the situation-specific areas (e.g., sports, test taking, or public speaking) concerned with the study of anxiety and arousal. These factors can range from the amount of preparation time to memorization and to the actual nature of the performance. Compounding the musician's problem is that, throughout a performance, he or she must simultaneously process a multitude of physical, cognitive, and emotional details. It is essential for a musician to initiate fine motor activity in the execution of technical passages and provide an emotional and artistic performance as well.

Due to this distinctive nature, several significant situational variables exist in the music performance anxiety literature: degree of performing experience, professional or amateur status, the presence of an audience, the nature of the audience, the type and importance of any evaluation, perceived difficulty of the music, and solo versus ensemble performance. In an anxiety-producing situation, any of these variables could conceivably affect only a single component of anxiety (affective, cognitive, somatic, or behavioral). Anxiety is multidimensional, however, and it is also possible for a variable to affect several components simultaneously, resulting in an interaction among them (Borkovec, 1976). An increase in somatic anxiety that is caused by high cognitive anxiety illustrates this situation well.

Rachman and Hodgson (1974) refer to this phenomenon as *response synchrony* and *response desynchrony.* In a synchronous response a subject will exhibit an increase or decrease in all the anxiety components at the same time (i.e., an increase in self-reported anxiety, increased physiological arousal, and observable behavior disruptions). In a desynchronous response, a subject may have an increase in physiological arousal, but self-reported anxiety and overt behavioral actions remain constant. In addition, Landers (1980) points out: "Some individuals, for example, will show autonomic arousal and report intense distress in a competitive situation but will show no avoidance behavior of the situation" (p. 77). Neiss (1988) concurs, and adds: "Because of histories and genetic makeup, individuals differ in the intensity and patterning of their reactions to any given stimulus condition" (p. 359).

Before a recital, for example, two performers may be anxious, but for entirely different reasons. In addition, they may respond to these feelings in entirely divergent ways. Difficult technical aspects of the music about to be performed might concern one individual, and result in a careful, calculated, "unmusical" performance; whereas, the other, stimulated by the presence of evaluators in the audience, gives a masterly performance. Therefore, due to the innumerable variables between individuals, it is desirable to use a multimethod, multidimensional assessment in the study of anxiety in music performance.

Unfortunately, studies concerning such patterns among musicians are few, and studies of long-term anxiety patterns in musicians are virtually nonexistent. Ongoing research in the sport literature by Walter D. Fenz and his colleagues perhaps best illustrates this long-term anxiety patterning. In his work with sport parachutists, Fenz attempted to determine when peak levels of anxiety occurred within different groups of individuals, and speculated on how these groups coped with their anxiety. Some of the variables used for comparison were: novice vs. experienced parachutists (Epstein & Fenz, 1962, 1965; Fenz, 1964, 1973; Fenz & Epstein, 1962, 1967; Fenz & Jones, 1972a), good performers vs. poor performers (Fenz & Jones, 1974), and the cognitive variables of certainty vs. uncertainty (Fenz & Jones, 1972b; Fenz, Kluck, & Bankart, 1969; Shapiro & Fenz, 1969).

Noting that a life-threatening activity such as parachuting would produce different patterns of anxiety compared to a less threatening activity, Fenz (1975) summarized his work:

> Monitoring parachutists throughout a sequence of events leading up to a jump, we noted changes in cognitive and physiological responses which were directly related to experience and mastery: while novice jumpers produced a sharp increase in physiological activity and reported an increase in anxiety and fear up to the moment of the jump, experienced parachutists produced an inverted V-shaped response pattern, i.e., a sharp initial increase was followed by a sharp decrease, so that immediately prior to the jump, responses were only slightly above normal levels. (p. 3)

Specifically, the investigation of the relationship between self-reported fear and physiological arousal (Fenz & Epstein, 1967; Fenz & Jones, 1972a) revealed that novice parachutists showed parallel increases in fear and arousal until they jumped from the aircraft. The experienced jumpers, on the other hand, showed a peak in self-reported fear on the morning of the jump and a steady decline thereafter; their physiological assessments, however, also showed an inverted-V pattern, but peaked when becoming airborne. The authors concluded that psychological fear and physiological arousal are two distinct concepts.

A number of other sports researchers have since tried to produce similar inverted-V patterns; unfortunately, the results have been contradictory. Mahoney and Avener (1977) found support for experience differences, but other investigators have not (Gould, Horn, & Spreemann, 1983; Gould, Petlichkoff, & Weinberg, 1984; Highlen & Bennett, 1979). In addition, it is noteworthy that agreement on the correlation between self-report and physiological measures is largely equivocal. Although some studies in the psychology literature show a significant correlation (Kelly & Walter, 1968; McLeod et al., 1986), other studies show little correlation (Pennebaker, 1982; Ray, Cole, & Raczynski, 1983).

In conclusion, four separate but interacting components (affective, cognitive, somatic, and behavioral) have been identified in anxious responses to internal and external stimuli. These components, acting alone or in combination, allow for individual differences in anxiety or arousal patterns. This study has reexamined these patterns, using the medium of music performance, so that future researchers and teachers will know when peak times of anxiety tend to occur. This knowledge might provide new ways to contribute to anxiety reduction techniques.

Purpose of the Study

The primary purpose of this work was to provide an exploratory study to determine physiological arousal and self-reported (perceived) anxiety patterns in brass area music majors. I collected data during jury recitals held at the end of an academic term, and throughout a four week period of preparation prior to the jury.

The brass area jury recitals at Michigan State University consist of a 15 minute adjudicated solo performance, which is a requirement for all undergraduate music majors. The adjudicators, usually faculty members, may ask a student to perform a prepared solo, scales, arpeggios, orchestral excerpts, or to sight-read a composition. The grade from this performance is factored into the student's final term grade. More detailed information concerning the jury performance can be found in the section entitled "The Performance" in Chapter 3.

With the results of the study, I wanted to identify when peak periods of anxiety occurred. An additional goal was to establish if these peaks occurred at relatively the same time within the total sample, or if there were differences in the anxiety patterns of performers who had different levels of experience (i.e., the difference between the anxiety patterns of a freshman and those of a senior). Finally, I wanted to compare self-reported anxiety and physiological arousal levels to determine how closely these measures paralleled each other when taken concurrently.

The Problem and Subproblems

The problem of this study was to chart arousal and perceived anxiety patterns of university brass area music majors under three different conditions: (a) once a week before each subject's lesson, (b) in the studio as a dress rehearsal situation, and (c) in a jury performance. Subproblems were to: (a) obtain appropriate physiological measurements of arousal by using the vital signs (blood pressure, pulse rate, and respiration rate), and (b) obtain measurements of perceived anxiety using the state-anxiety portion of the Spielberger et al. (1983) *State-Trait Anxiety Inventory* (STAI).

To determine peak periods of arousal and anxiety, I charted levels once a week from the time the students began seriously preparing for their jury recitals (which I operationally defined to be four weeks prior to the performances). I also obtained measures during the students' lessons one week before the juries (dress rehearsal situations), in the morning on the day of the juries, immediately before the juries, and during the performances. I monitored heart rates for five minutes during the dress rehearsals, and continuously throughout the jury performances. During the course of the research, I expected peak periods of arousal to appear at different times for experienced performers (juniors, seniors, and graduates) and the relatively inexperienced performers (freshmen and sophomores).

Variables

The independent variables of the study were performing experience as determined by each subject's academic level (freshman, sophomore, junior, senior, or graduate), and the times of the various assessments during the four week period prior to the jury. The dependent variables were perceived state anxiety as measured by scores on the state-anxiety portion of the STAI (Spielberger et al., 1983), and physiological arousal as measured by blood pressure, pulse rate, respiration rate (vital signs), and heart monitor readings.

The state-anxiety portion of the STAI consists of a 20-item, self-report scale, designed to assess anxiety as an emotional state; for example, immediate feelings of apprehension, tension, nervousness, and worry. The state-anxiety portion of the STAI takes approximately 10 minutes to complete.

(In future references to the STAI, I will only be referring to the state-anxiety portion of the test.)

Self-report measures of perceived anxiety and vital signs were obtained concurrently throughout the study. I collected these data and made comparisons between the two variables because several researchers have suggested that self-report indices were more viable than actual physiological measures (Deffenbacher & Hazaleus, 1985; Hamann, 1982; Holroyd & Appel, 1980). Others have stated that, especially in males, self-report measures have not been true indicators of actual anxiety (Abel & Larkin, 1990; Craske & Craig, 1984; Steptoe, 1989). The later have speculated that males have been "programmed" to repress their emotions, and due to ego involvement, will not indicate their true feelings. Comparisons of self-report measures and physiological arousal in this study showed a difference in responses between the inexperienced and experienced performers. Lower self-reported anxiety by the experienced performers may indicate ego involvement by this group as well.

Need for the Study

The existence of stage fright is prevalent among performing artists, nearly to the point of being considered an occupational hazard. Fishbein & Middlestadt (1988) related that stage fright is the most reported medical concern among professional musicians, and Steptoe & Fidler (1987) found that higher levels of anxiety were indicated by music students than by professional musicians. Because of these findings, stage fright can justifiably be considered an important factor in choosing or continuing a career in music.

The seriousness of performance anxiety is evident in the fact that the majority of professional musicians surveyed by Fishbein and Middlestadt resorted to medication as a method of coping with the problem. Of those who reported using beta-blockers, 70% did so without a doctor's prescription.

During my research, I have found that the use of beta-blockers may be encroaching on the student population as well. I am concerned that musicians may be seeking treatment only for the physiological symptoms of stage fright, when the psychological aspects may be the crux of the problem. Drug therapy may be preferred mainly because it is easy to take a pill, and the results are immediate and objective (e.g., decreased heart rate and/or respiration rate). As with any medication, a physical dependency for the drug may develop; and, in the case of musicians using beta-blockers, a psychological "crutch" may be the form of dependency.

Recent research has indicated that both psychological and physiological processes are involved with the onset of performance anxiety, but the evidence as to which occurs first is equivocal. Several studies (Ellis, 1977; Fishbein & Middlestadt, 1988; Steptoe, 1989; Steptoe & Fidler, 1987) have indicated that negative cognitions, specifically "catastrophizing" (a preoccupation with thoughts that something will go wrong to cause the performance to be a disaster), may be a major factor associated with the onset of performance anxiety. According to Spielberger (1966), anxiety is "characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (p. 17). By this definition, either one may precede the other.

Wine (1971) speculated that high levels of arousal (emotionality) may occur first--increased physiological arousal may lead to worry about the resulting tension, thereby causing a decrease in performance accuracy. Kohut (1977) explained this phenomenon as "disintegration anxiety," a process caused by cognitive overawareness of the physiological processes. Frequently, however, this worry is unfounded because there is not an actual increase in physiological arousal, only the performer's *perception* of an increase. Morris and Leibert (1970) and Pennebaker (1982) both show that perceived elevation of somatic arousal and actual increases are poorly correlated.

Throughout this study, I have recorded psychological and physiological measures concurrently, beginning four weeks before an important performance. These collected data indicate that negative cognitions and actual somatic arousal both show signs of escalation during the stressful situations of the dress rehearsal and the jury. This information will be useful in designing early treatment for performance anxiety problems, and perhaps it may dissuade individuals from immediately opting for medication. These data may also be helpful in directing the treatment of promising music students, plagued by stage fright, who may be questioning music performance as a career goal.

After careful review of the literature, I believe that this study is unique in two ways. The first is that I have not discovered a similar longitudinal study in the music performance anxiety literature; most of the current research is limited to assessments immediately before a performance. By charting anxiety and arousal patterns over an extended period, therapists will be better able to concentrate treatment at (or before) peak periods. In addition, by comparing anxiety patterns in novices with those of more experienced performers, teachers will be more knowledgeable as to the coping abilities of their students with varying levels of performance experience.

Second, I have monitored physiological arousal throughout the performance. Few studies have attempted this because the cumbersome equipment needed is often considerably distracting to musicians. The Vantage XL heart monitor (to be discussed in detail in Chapter 3) is very comfortable to wear and utilizes a small remote transmitter; consequently, there are no wires or gauges to distract the performer. Research examining the cognitive effects of anxiety has shown that people are more anxious before performing than they are during the actual performance (Highlen & Bennett, 1979; Mahoney & Avener, 1977; Meyers, Cooke, Cullen, & Liles, 1979). By monitoring heart rates throughout the performance, I have been able to determine if the levels of physiological arousal coincide with the cognitive reports given by the subjects.

Definitions

Anxiety, Arousal, and Stress

The terms *anxiety, arousal,* and *stress* are often used interchangeably, and because of this, it is helpful to clarify their differences. *Arousal* is a neutral term that reflects the physiological activation of the nervous system; it refers to the intensity of that activation and does not indicate an emotional response. *Anxiety,* on the other hand, *does* reflect an emotional reaction, and can be defined as a subjective feeling of apprehension, worry, uneasiness, or dread that is closely associated with the concept of fear (Levitt, 1980). Anxious feelings will often precede, or be accompanied by, a heightened state of physiological arousal. Consequently, a musician who manifests anxiety and apprehension before and during a performance will probably experience a higher level of arousal as well.

Stress is the result of the process that leads to the occurrence of adverse psychological or physiological responses. The process can be explained in terms of an objective demand (a required jury recital), a perceived threat (a bad grade), and an anxious reaction. Stress can be both mental and physical, and will occur if the perceived demand is not balanced by the performer's perception of his or her ability to respond (Cox, 1985).

Charles Spielberger (1966) discusses anxiety as two distinct psychological conditions. One is when a performer is anxious at a specific point in time (e.g., before entering the stage for a performance), which he refers to as "state anxiety." The other, he designates as "trait anxiety," that is when a person's personality is described as "typically anxious." According to Spielberger, state anxiety is "characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (p. 17). State anxiety is characteristic of a performer's attitude toward a stressful situation and is transitory in nature and fluctuates over time. Spielberger defines trait anxiety as a quality of personality that would seem to imply a "motive or acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively nondangerous circumstances as threatening, and respond to these with state-anxiety reactions disproportionate in intensity to the magnitude of the objective danger" (p. 17).

Physiological Response

Negative cognitions prior to musical performance, caused by apprehension, an audience, peer pressure, self-expectations, teacher expectations, fear of making mistakes, or other emotional stresses, are often exacerbated by a sympathetic nervous system discharge commonly known as the "fight or flight response." This reaction precipitates the release of substances called *catecholamines;* epinephrine, norepinephrine, and dopamine; which are secretions, or byproducts of secretions, of the medulla of the adrenal gland. *Epinephrine* is the hormone responsible for mobilizing the physiological changes that occur in the fight or flight response, those symptoms common to musicians suffering from performance anxiety. These include: rise in blood pressure, accelerated heart rate, increased respiratory rate, peripheral vasoconstriction (narrowing of the blood vessels in the hands and feet), piloerection (erection of the hairs, "goose flesh"), pupillary dilation, secretion of small quantities of thick saliva ("dry mouth"), depression of gastrointestinal activity, and an increased level of glucose in the blood (Taber, 1985).

The Arousal/Performance Relationship: Anxiety Theories

When examining anxiety in the context of motor performance, one of the most frequently used constructs is physiological arousal. This is understandable since it is a common concern among musicians, dancers, athletes, public speakers, and others seeking to cope with the pressures of public exposure. To respond with anxiety is the normal reaction to a threatening situation, as individuals consistently seek to attain the optimal level of arousal to confront the task at hand. A certain amount of arousal is beneficial and stimulates the performer to purposeful action, such as when a coach "psychs-up" the team before a game. Excessive arousal, however, may interfere with the efficient functioning of the individual, especially when the person is cognitively attending to that arousal. It has become common to attribute behavioral changes under stress to changes in the level of arousal; therefore, research attempting to explain the arousal-performance relationship has received considerable attention in the psychological literature.

Some of the earlier research (Duffy, 1934, 1941, 1957; Malmo, 1959) saw goal-directed behavior as varying along two basic dimensions--direction and intensity. *Direction* can be described as either moving toward or away from a stimulus situation; for example, either approach or withdrawal behavior. The level of *intensity* may be considered the state of physiological arousal, which is measured along a continuum ranging from coma to extreme excitement. (Other terms that have been used synonymously with intensity are drive, tension, and activation [Landers, 1980].) Approach or withdrawal behavior (direction) can occur at any level along this continuum. The combination of direction and intensity relative to behavior indicate a person's *motivation.* Motivation, therefore, may be defined as an internal factor that arouses, directs, and integrates a person's behavior (Martens, 1974).

I will discuss three competing constructs that attempt to explain the relationship between arousal and performance. The first is the *inverted-U hypothesis*, which proposes that the arousal/performance relationship takes the form of a quadratic curve. Second is the *cue utilization theory*, which is similar in concept to the inverted-U hypothesis. The third concept is *drive theory* (Hull, 1943; Spence, 1951), a theory of performance and learning that proposes a linear relationship between arousal and performance.

The Inverted-U Hypothesis

The inverted-U hypothesis is the oldest attempt to explain the arousal/performance relationship (see Figure 1). Simply stated, the quality of performance increases as arousal increases until an optimal point is reached, after which additional increases in arousal result in increasingly inferior performance (Martens, 1971). The difficulty of the task is also an important variable: There will be an optimal level of arousal for the performance of any task, and that optimum level will be lower for more difficult tasks (Hockey & Hamilton, 1983).

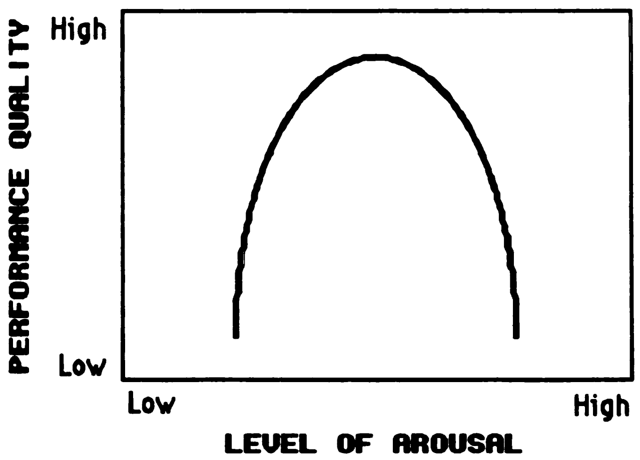

Figure 1. An illustration of the inverted-U hypothesis.

The foundation for the inverted-U hypothesis is derived from the classic research of Yerkes and Dodson (1908). The reason for the research was to discover how habit-formation (performance) was affected by the relationship between arousal (electrical shock) and task difficulty (visual discrimination). Using mice as subjects, Yerkes and Dodson measured performance by the number of trials needed for the mice to enter the brighter of two compartments.

Manipulation of the brightness between the two compartments was the criterion for task difficulty. Three conditions of discrimination were used: (a) a large contrast in brightness in which discrimination was easy, (b) medium contrast and difficulty, and (c) very little contrast in brightness, which provided difficult discrimination. Arousal, or stimulation, was measured in terms of the intensity of electric shock; the strength of the electric stimulation increased as the mice tried to enter the darker box.

The results of the experiment showed that the number of trials needed to discriminate between the two compartments increased as the difference in brightness between the two compartments decreased. They also found that when discrimination between the two compartments was difficult, learning rapidly increased as the intensity of stimulation increased. After a certain point, however, if stimulation continued to increase, the rapidity of learning began to decrease.

The so-called "Yerkes-Dodson Law" was derived from these findings. The law states that "An easily acquired habit, that is one which does not demand difficult sense discriminations or complex associations, may readily be formed under strong stimulation, whereas a difficult habit may be acquired readily only under relatively weak stimulation" (pp. 481-482). Practical application of the Yerkes-Dodson Law to the fine motor skills needed for a music performance would indicate that, as the complexity of the music increases, the amount of arousal needed for optimal performance must decrease.

The commonsense character of the Yerkes-Dodson Law is the basis for its appeal and durability. There is general support for its positive aspects, but the detrimental effects of heightened arousal have been assumed rather than proven by experimental results (Hockey & Hamilton, 1983).

Considerable dissension exists, therefore, toward the unequivocal acceptance of the Yerkes-Dodson Law. One reason is that it is difficult to test because of researchers' inability to measure arousal accurately. Another reason is that although it is evident that there is an inverted-U relationship between arousal and performance, it is not clear exactly why it occurs. Landers (1980) states: "In actuality, the inverted-U hypothesis is not an explanation for the arousal-performance relationship; it merely posits that this relationship is curvilinear without explaining what internal state or process produces it" (p. 78). Nevertheless, documentation of the inverted-U hypothesis abounds in the sports literature (Klavora, 1978; Landers, 1980; Martens, 1971, 1974; Martens & Landers, 1970; Sonstroem & Bernardo, 1982) where motor performance in competition is a primary concern.

Cue Utilization Theory

The efficiency with which task-related stimuli are gathered and utilized, and how they affect the quality of performance, has long been a topic of interest. Geen (1980) relates that in the early 1950's, the concept of "range of cues utilized" was first introduced by Bartlett (1950), and studies of motivation and responses to external stimuli were undertaken by Bahrick, Fitts, and Rankin (1952). Soon researchers were studying, and confirming, the effects of motivation on the range of cue utilization (Bahrick, 1954; Bruner, Matter, & Papanek, 1955; Callaway & Dembo, 1958; Callaway & Thompson, 1953). The culmination of this research came in 1959 as a result of an influential paper by J. A. Easterbrook.

The results of the work became known as Easterbrook's (1959) Cue Utilization Theory. The theory, which is one attempt to provide an observable basis for the inverted-U hypothesis, is structured on the concept of relevant and irrelevant environmental cues and their effects on emotion and the organization of behavior. Easterbrook proposed that "emotional arousal acts consistently to reduce the range of cues that an organism uses, and that the reduction in range of cue utilization influences action in ways that are either organizing or disorganizing, depending on the behavior concerned. . . . In general, the range of cue utilization is the total number of environmental cues in any situation that an organism observes, maintains an orientation towards, responds to, or associates with a response" (p. 183).

Under conditions of low arousal, a wide range of both relevant and irrelevant cues are available to the subject. At this level, presence of the irrelevant cues may be distracting to the individual and result in marginal performance. If the behavior continues in the same manner and drive (arousal) increases, attention will narrow until all the task-irrelevant cues are eliminated and only task-relevant cues remain--this is the point of optimal performance. If the range of cue utilization is reduced beyond this point, task-relevant cues will begin to be eliminated, again causing a decline in performance (see Figure 2).

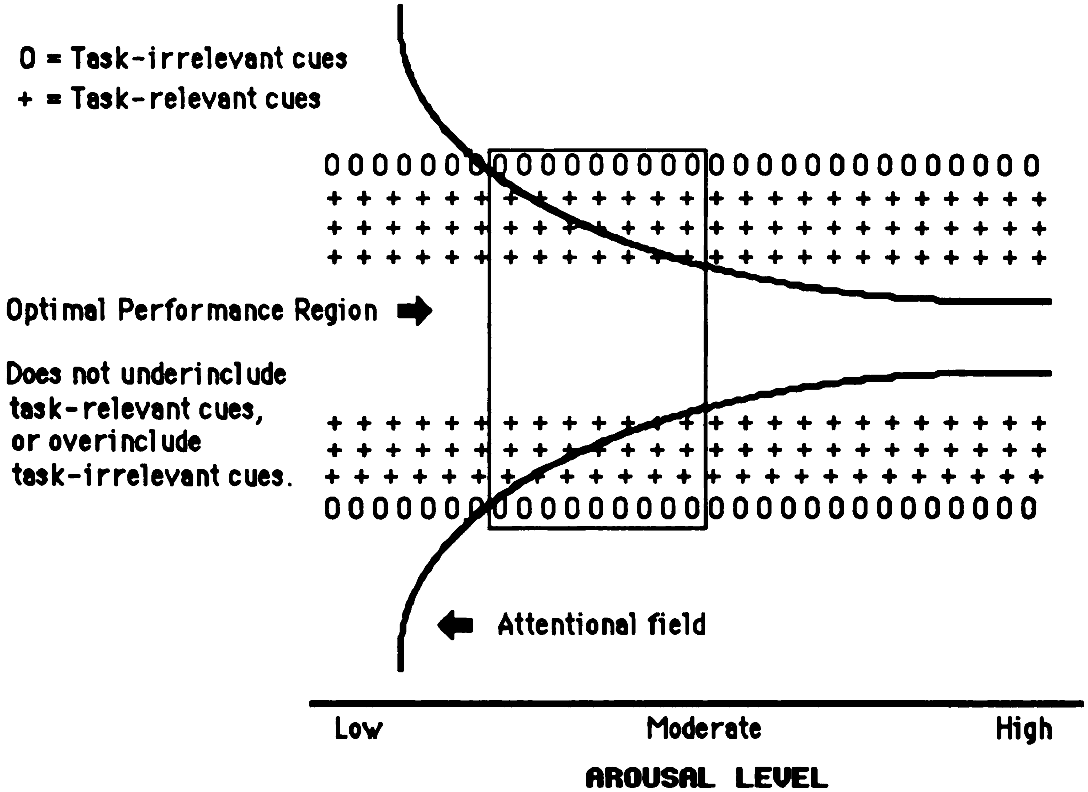

Figure 2. An illustration of the cue utilization theory and the arousal/performance relationship. This figure is adapted from D. M. Landers, The arousal-performance relationship revisited, *Research Quarterly for Exercise and Sport, 51,* 1980, 77-91. *Research Quarterly for Exercise and Sport* is a publication of the American Alliance for Health, Physical Education, Recreation, and Dance, 1900 Association Drive, Reston, VA 22091. Adapted by permission.

An example of cue-utilization in music performance might be a solo performer who begins a recital very relaxed. He or she is aware of everything that is going on in the auditorium (lights, audience, off-stage noise, and so forth), becomes distracted by these irrelevant cues, and begins to make mistakes. Consequently, there is an increase in the performer's arousal, and attention narrows to the task of making music; a period of optimal performance results. The musician's level of arousal continues to increase, however, and his or her thought processes begin to narrow further; just playing the correct notes is now the priority. The performance rapidly becomes very "mechanical" as dynamics and musical expression, which are considered "relevant cues" for a musical performance, are eliminated.

The popularity of this theory, like that of the inverted-U hypothesis, is its commonsense approach. In addition, it provides an answer to the question, 'What does arousal do?'--It progressively reduces the range of environmental cues cognitively considered by an individual (Hockey & Hamilton, 1983). As with the inverted-U hypothesis, positive documentation for the validity of the Cue Utilization Theory is strong (Agnew & Agnew, 1963; Bruning, Capage, Kozuh, Young, & Young, 1968; Hockey, 1970, 1973; McNamara & Fisch, 1964; O'Malley & Poplawsky, 1971).

By comparison, Easterbrook's theory is similar to, and provides support for the use of the inverted-U hypothesis. As a subject's arousal increases, there is a progressive increase in performance efficiency as attention narrows. Once arousal increases beyond an optimal level, however, there is a marked decrease in proficient task performance as the use of external cues generates distractibility.

Drive Theory

Certainly one of the most controversial constructs regarding the arousal/performance relationship is the Hull-Spence drive theory. It is a complex stimulus/response theory of motivation and learning. The theory not only attempts to explain the relationship between learning and arousal, but between performance and arousal as well. At its simplest, drive theory predicts the performance of complex skills at any level by the formula:

performance = habit x drive

This formula is an extreme simplification of drive theory as modified by Spence and Spence (1966).

Drive theory is based on the premise that *drive* and physiological arousal are synonymous. *Habit* is the hierarchical order, or dominance, of correct and incorrect responses. Dominance refers to where the majority of responses fall. If the majority of responses are the undesirable responses to complete a task, then the "dominant response" is incorrect. Conversely, if the majority of responses are the desired responses to complete the task, then the "dominant response" is the correct response.

Martens (1974) explains that as drive increases, the probability of the dominant response (either correct or incorrect) being emitted also increases. The probability that a response will be correct or incorrect depends on how well the assigned task has been mastered. During the early stages of learning, the dominant responses are likely to be incorrect responses. As the skill is mastered, however, the dominant responses will become the correct responses. It follows that an increase in drive (arousal) early in the learning process will impair performance, but when the skill becomes "automatic," increases in arousal will facilitate performance.

When the dominant responses are the correct responses, drive theory shows arousal and performance to have a parallel, positive linear relationship--as arousal increases, performance improves (see Figure 3). One of the drawbacks of drive theory, unfortunately, is that when the dominant responses are the incorrect responses, its predictions are not as clear. If performance is already poor, heightened arousal cannot deteriorate performance any further, but can only inhibit additional progress in the acquisition of the desired skill (Martens, 1974).

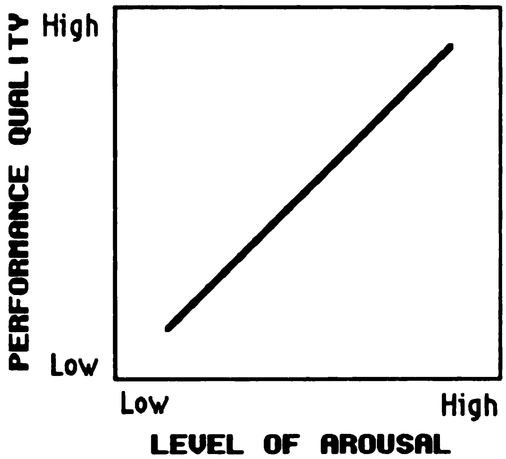

Figure 3. An illustration of the drive theory.

The crucial difference in the predictions between drive theory and the inverted-U hypothesis is evident in a situation where a subject's arousal level is high on a well-learned task. Drive theory will predict that the quality of performance will be high, whereas the inverted-U hypothesis will predict a low quality of performance. As could be expected, research supporting either theory is equivocal. Oxendine (1970) adopts drive theory for gross motor activities, but favors the inverted-U hypothesis for complex tasks. Using Oxendine's designation, it would be difficult to measure music performance anxiety in terms of drive theory because of the delicate motor activity that is involved. Martens (1974) rejects drive theory completely because it "is not testable for motor behavior because of the inability to specify habit hierarchies for motor performance" (p. 182).

Assumptions and Limitations

I limited the study to brass players majoring in music at Michigan State University because I assumed that they would be a typical sampling of university musicians. In addition, I postulated that juniors, seniors, and graduate students would have more experience (relative to the freshmen and sophomores) at performing jury recitals because they had accrued more years in college. Limiting the study to the brass area at MSU also allowed me to control for the variables of different jury requirements, different grading policies, and different judging panels. I did not design the study to control for how much rehearsal time each student devoted to jury preparation.

I used jury recitals as the test situation because I assumed that they would be an effective experimental condition for studying anxiety and arousal: (a) The juries would provide an adequately stressful situation for the subjects, especially because of the graded evaluation provided by the brass faculty, (b) the entire population of students was required to perform a jury, and (c) the performance conditions were relatively uniform. An additional benefit of using the juries was that I was able to complete the data collection within a controlled time span of two ten-week terms.

In virtually every study that has compared trait and state anxiety, subjects high in trait anxiety have been shown to be high in state anxiety as well. I assumed that the subjects participating in this study would also follow this established pattern. Therefore, this study only assessed state anxiety because a comparison of trait and state anxiety would have been redundant.

I used physiological arousal and perceived state anxiety as dependent variables because they are the most prevalent factors precipitating performance anxiety among typical musicians (Fishbein and Middlestadt, 1988; Steptoe and Fidler, 1987). Although blood pressures, pulse rates, and respiration rates are not infallible as indicators of arousal, they were the most convenient to use for performing musicians in a "real-life" evaluative situation. Serious musicians, performing for a grade, might be reluctant to participate in research if they knew they would be wired to an EKG machine during a performance. Using the vital signs was also the most economical method of assessing physiological arousal, as the cost and medical liability of drawing blood or using urine for measurement of catecholamine release was forbidding. Moreover, for some people, drawing blood is an extremely stressful process in itself. In addition, the puncture site may bruise and become sore, providing an obvious distraction that the musician would not want during a performance.

An additional limitation was that this research was not designed to alleviate performance anxiety problems, but rather, to determine when peak anxiety periods occurred. Therapists will be able to use these data to facilitate their treatment relative to these times. School music instructors can also use this information when preparing students for solo and small ensemble festivals or recitals.

Summary

Among the performing arts, music performance may well be the most complex. During a performance, cognitive, emotional, and physical processes are all occurring simultaneously within the musician. Confounded by these complex processes, the reality of stage fright for many performing artists, professionals as well as students, has become a serious medical concern. Because of its profound implications, the presence of stage fright is a major consideration for many musicians in choosing or continuing a career in performance.

The anxiety/arousal relationship is as complex as the performance itself. It is a multidimensional phenomenon that involves the interrelationship of affective, cognitive, somatic, and behavioral components. An anxious response can occur in all, or a combination of several, of these components at the same time (response synchrony); or, possibly, in only one of them (response desynchrony). This unique response pattern is what allows for individual differences in anxiety or arousal patterns.

Because the anxiety/arousal response is multidimensional, its assessment must be multidimensional as well. It is imperative that both the psychological and physiological aspects of anxiety and arousal be measured to assess fully a subject's reaction to a stressful situation.

Organization of the Study

I have organized this dissertation into four remaining chapters. In Chapter 2, I have reviewed the portion of the performance anxiety literature that I felt was appropriate to this study. Areas reviewed were: (a) the literature concerning the cognitive aspects of anxiety, (b) the test anxiety literature, (c) the sports literature, and (d) the music performance anxiety literature. I present a brief description of the research population and the data collection procedures in Chapter 3; and, in Chapter 4, I explain and interpret the statistical analysis. Finally, in Chapter 5, I summarize the research and provide suggestions for future study in performance anxiety.

CHAPTER 2: RELATED LITERATURE

Overview

The causes and effects of performance anxiety are many. Consequently, the literature dealing with it, in all of its variations, is formidable. The psychological and physiological research ranges in scope from psychosexual and narcissistic approaches (Gabbard, 1979, 1983; Kohut, 1971) to studies dealing with brain research (Gur, Gur, Skolnick, Resnick, Silver, Chawluk, Muenz, Obrist, & Reivich, 1988; Reiman, Fusselman, Fox, & Raichle, 1989). To review thoroughly the complexities of the anxiety/arousal phenomenon that are pertinent to this research, I have examined the following areas: (a) aspects of cognitive anxiety, (b) the literature concerning test anxiety, (c) the sport literature, and (d) the performance anxiety literature in music. Excluded from the review are research studies involving gender differences, speech anxiety, and methods of anxiety reduction including systematic desensitization, relaxation techniques, and biofeedback. Also excluded are studies dealing with the use of beta-adrenergic blocking drugs such as propranolol (Inderal), atenolol, nadolol, and other anxiolytic medications.

I realize that these exclusions will neglect a considerable body of music performance anxiety literature; however, I have chosen to omit these studies because they are not directly related to the purpose of this investigation. The range of music performance anxiety research that has been reviewed is narrowed to: (a) those studies that examined and assessed the psychological aspects of anxiety through questionnaires and self-report measures, and (b) multidimensional studies that explored both the psychological and psysiological concomitants of music performance anxiety.

Cognitive Aspects of Anxiety

The cognitive components of anxiety are focused on an individual's response to a perceived danger and a perceived inability to manage a situation in a satisfactory fashion. Specifically, these components are self-related preoccupations involving worry, feelings of helplessness, expectations of negative consequences, catastrophizing, and fear of loss of regard by others. There are various reasons for the occurrence of these cognitions. Most notably, they are the result of unrealistic interpretations of a situation or possibly a history of unpleasant experiences. History alone is not always relevant, however, because many anxious people are highly competent and rarely experience objective failure (Sarason, Sarason, & Pierce, 1990).

Situation-specific studies of cognitive anxiety abound in the literature on testing, sports, and music performance; I have addressed these studies in their respective areas of this review. In this section, I will discuss some of the background and general overviews concerning cognitive anxiety.

Sarason, Sarason, and Pierce (1990) and Ingram and Kendall (1987) describe the cognitive process as an "information-processing" procedure in which a person seeks environmental cues, selects the necessary relevant cues, integrates new information with the old, and makes a decision that results in an observable behavior. Cognitive anxiety disrupts this procedure when self-related preoccupations influence a person's level of anxiety resulting in heightened physiological arousal. As arousal increases, it interferes with the utilization of relevant cues and has a profound influence on behavior.

The early manifestations of the regressive power of the anxiety process, as it relates to stage fright, are mostly cognitive. They are the ruminations that begin several weeks before the performance that may include: concerns of self-efficacy, the fear that the material will not be adequately prepared by the performance date, the possibility of humiliating mistakes, the dread that no one will attend the performance, the dread that everyone will attend the performance, and the fear that the audience will be excessively critical.

To assert that performing can be threatening to a person's ego is, without a doubt, stating the obvious. Ego-threatening anxiety, as noted by Schwarzer and Quast (1985) is divided into the general categories of test anxiety and social anxiety. *Test anxiety,* used here in its broadest sense, encompasses emotions related to all kinds of achievement situations that are perceived by the individual as being evaluative. (In future references, "test anxiety" used in this context will be referred to as "evaluation anxiety" to avoid confusion with the "test anxiety" that pertains to examinations.) *Social anxiety,* on the other hand, was subdivided by Schwarzer and Quast into shyness, embarrassment, shame, and audience anxiety.

Shyness is described as being characterized by an absence or inhibition of an expected social behavior, and an awkwardness or discomfort in the presence of others. An example of shyness is when a person desires to make a favorable impression on others but is doubtful of the desired outcome. *Embarrassment* is seen as an extreme state of shyness. Shyness develops when a person imagines an uncomfortable situation--*embarrassment* manifests itself when the uncomfortable situation actually occurs. *Shame* results when the individual feels directly responsible for the negative outcomes of failing in public. These three emotions, therefore, can be seen as a hierarchical state-anxiety process. If a person expects to be deficient in impressing others in a given situation, shyness will result. If the anticipated deficiency becomes actual (failure actually occurs), the person will then feel embarrassed. As the individual ruminates on the situation, feelings of shame may be the outcome.

Audience anxiety (stage fright), although categorized as a type of social anxiety by Schwarzer and Quast, is, in reality, an entity of both social and evaluation anxiety. It can be categorized as social anxiety because the performer may experience affective and/or cognitive emotions related to the anticipated situation; and it can also be categorized as evaluation anxiety because the performer will constantly be under the scrutiny of an audience. Because of the complexity of potential responses resulting from this dual classification, audience anxiety can easily lead to a poor performance.

Individually, the cognitive aspects of social and evaluative anxiety obviously play an important role in music performance; furthermore, their disruptive effect on behavior is also a critical factor in the anxiety response. Both McCroskey and Richmond (1990) and Sarason et al. (1990) addressed the importance of the interaction between cognitions and behavioral outcomes. In a summary of their work, Leary (1990) provides three features that highlight these interrelationships.

1. *Behavior as a result of cognitive assessment.* People will regulate their behavior when thinking ahead to an assessment of their own success in meeting certain goals or standards. For example, a music student may weigh the potential rewards of performing a successful solo recital with the costs involved in the preparation and the possibilities of failure.

For some individuals, the time and stress involved in the preparation, and the risk of failure will be unacceptably high. These individuals will probably avoid doing the recital altogether. McCroskey and Richmond (1990) speculate that people who perceive themselves as being deficient will be less likely to perform a given behavior. Leary (1990) concurs, and states that they will probably perceive fewer rewards and greater risks associated with interacting.

This notion coincides with Bandura's (1977) self-efficacy theory that will be discussed later.

2. *Behavioral disruption as a consequence of cognitive interference.* Often individuals will not be able to avoid an anxiety-producing situation (for example, music students performing required jury recitals) and will be continually confronted with the possibility that they may prove to be inadequate. Sarason et al. (1990) observe that such a person will suffer the occurrence of frequent negative thoughts about personal abilities, as well as the perceived difficulty of the situation. These high levels of intrusive and interfering thoughts tend to revolve around excessive worry and preoccupation with self-evaluative thoughts. A preoccupying cognition, especially tangible to musicians, dancers, actors, and other stage performers is that of their own "stage presence," particularly when coupled with false perceptions about appearing foolish, or about one's physical attributes.

The shared issue among these thoughts is the overwhelming feeling of not meeting the demands of the situation, and consequently, not meeting the expectations of others. When this occurs, the individual becomes increasingly self-absorbed instead of task-absorbed and begins to utilize irrelevant cues. Disrupted behavior and performance errors will be the inevitable result. This phenomenon is directly related to Easterbrook's (1959) cue utilization theory; that is, the use of irrelevant cues when operating under conditions of either very low or very high arousal. It is also consistent with Ingram and Kendall (1987) who argue that "performance deficits observed in anxiety states are due to dysfunctional preoccupation with the self as opposed to the task" (p. 530).

3. *Behavior as an antecedent of anxious cognition and affect.* Behavioral inhibition and disruption may precede anxious cognitions and subjective anxiety. For example, a performer who is not necessarily anxious at

the beginning of a recital has a lapse of concentration and makes a mistake. The performer consequently perceives the mistake as ruining the entire recital. The musician then becomes anxious and continues to ruminate on the error, which in turn propagates further behavior disruptions. In this instance, the problematic behavior (the mistake) preceded the anxious cognition and affect.

In Leary's (1990) conclusion to his assessment of the interrelationship of affective, cognitive, and behavioral responses to anxiety, he suggests that the construct of anxiety is best regarded as a cyclic process. "Cognitive appraisal precipitates subjective anxiety, which disposes people to ruminate further and may interfere with ongoing behavior--as behavioral performance is degraded, intrusive thinking escalates, which results in increased anxiety and additional interference" (p. 43).

Considering the cognitive and behavioral dimensions of anxiety, and the variety of variables associated with it, Ingram and Kendall (1987) suggest, as do Sarason et al. (1990), that an anxious individual carries out a type of information-processing procedure that will elicit a variety of cognitions. They maintain that the individual will generally ruminate on future events, situations, and consequences, but when in a heightened anxious state, "he or she is more likely to retrieve from memory stored instances of past anxiety situations and reactions. . . . Functionally, such cognitions serve to reinforce and perhaps exacerbate the individual's state of anxiety since the person now has better access to anxiety-consistent information, and presumably, less access to anxiety-inconsistent information" (p 529). This entire process, as seen by Ingram and Kendall (1987), as well as by Borkovec, Robinson, Pruzinsky, and DePree (1983), and Meichenbaum (1977), is an irrational automatic response that proceeds without individual control. The person comprehends these exaggerated perceptions that emerge from this dysfunctional thinking as being reality, rather than using them positively toward purposeful, directed, information processing.

Spielberger (1972) suggests that a person's history of successfully or unsuccessfully dealing with anxiety producing experiences is a result of specific personality traits. He states that personality traits may be "regarded as reflecting individual differences in the frequency and the intensity with which certain emotional states have been manifested in the past, and differences in the probability that such states will be experienced in the future. The stronger a particular personality trait, the more probable it is that an individual will experience the emotional state that corresponds to this trait, and the greater the probability that behaviors associated with the trait will be manifested in a variety of situations" (p. 31).

The tendency for individuals to ruminate on past experiences may explain why more experienced performers generally display lower levels of anxiety than those with less experience. In the context of the present research, I hypothesized that the experienced players would know what to expect while performing the jury, and therefore would be more task oriented--as a consequence, they would experience less anxiety.

Deffenbacher, Zwemer, Whisman, Hill, and Sloan (1986) also found a correlation between trait anxiety and the ruminative self-preoccupational tendencies of anxious individuals. Their study, designed to overcome methodological shortcomings of previous research, measured irrational beliefs relative to several types of anxiety: trait anxiety, test anxiety, speech anxiety, fear of negative social evaluation, social avoidance, and distress. They report that the central irrational beliefs held by highly trait-anxious individuals were: overconcern, personal perfection, catastrophizing, and feelings of helplessness. Deffenbacher et al. found concern with personal perfection to be the most prominent, and that the individuals expressing this trait were more likely to utilize avoidance behavior when confronted with an anxiety producing situation. I submit that striving for personal perfection is probably the most common cause of frustration and anxiety among musicians.

The majority of research in the realm of cognitive anxiety has been accomplished using self-report measures in controlled situations, and frequently with introductory psychology students who were required to participate in a research study. Although this method provided a large sample population (such as with Deffenbacher et al. [1986] who used 451 subjects in a single sample), a drawback was that the age grouping was extremely narrow--the majority of introductory psychology students being university freshmen. Another shortcoming was that the research encompassed only the cognitive aspect of anxiety, which is merely one facet of anxiety's multidimensionality. Because of these deficiencies, I feel that it is necessary for the results of research based solely on self-report procedures to be followed up with behavioral measures and situation-specific field study before its full significance can be assessed.

Self-Efficacy

A body of literature has developed surrounding the cognitive/behavioral theory of self-efficacy advanced by Albert Bandura (1977). Self-efficacy, the power to produce effects or intended results, is used synonymously with the concepts of self-confidence and self-esteem. The theory is based on two divergent but complementary pathways: *cognitive processes* reflect the mechanisms by which human behavior patterns are acquired and regulated, while *performance-based procedures* are the principal means to effect psychological changes in the individual. Bandura (1977) postulates that "cognitive processes mediate change but . . . cognitive events are induced and altered most readily by experience of mastery arising from effective performance" (p. 191). He presents a model of self-efficacy in which he contends that personal efficacy is enhanced by four sources of information: performance accomplishments, vicarious experience, verbal persuasion, and emotional (physiological) arousal.

Performance accomplishments is the most important of the four factors because it is based on personal mastery of experiences. Successful performance raises expectations for future success, while failure, particularly if it occurs early in the course of events, will lower these expectations. The negative impact of occasional failures, however, is likely to be reduced if one's self-efficacy is enhanced by repeated success, especially at the most difficult tasks. Occasionally, failure may even increase future self-motivated effort if one overcomes that failure through sustained effort.

Vicarious experience although a weaker and less dependable method to elicit a change in self-confidence, is still a critical aspect of Bandura's theory. By watching a model consistently perform threatening activities with repeated success, observers can dispel expectations of adverse consequences and improve performance by intensifying their efforts. The basis for this method is "If they can do it, then I can do it." I speculate that a person could rationalize that "The model is an expert, and has been doing this for his or her entire life," and promptly initiate avoidance behavior. Another detriment may be that the subject's self-expectations may only increase by watching the model. These cognitions could result in the frustration of attempting to master too much too fast, instead of mastering one small task at a time.

Verbal persuasion is an attempt to influence behavior by leading people by suggestion into believing that they can accomplish a task that had been failed in the past. This method is also weak because the subject's history of failure may easily repress the positive admonishing.

Emotional (physiological) arousal can be an important influence regarding perceived self-efficacy, as people will generally assess their state of physiological arousal, either consciously or unconsciously, when faced with a stressful situation. Since increased levels of arousal are associated with debilitating performances, individuals will be more likely to exhibit avoidance behavior when arousal is high. Conversely, people generally expect success when in a relaxed state. Bandura (1977) notes:

> Fear reactions generate further fear of impending stressful situations through anticipatory self-arousal. By conjuring up fear-provoking thoughts about their ineptitude, individuals can rouse themselves to elevated levels of anxiety that far exceed the fear experienced during the actual threatening situation. (p. 199)

In addition, self-efficacy can be a predictor of a person's physiological arousal; low efficacy is usually accompanied by high arousal, and high efficacy is generally accompanied by low arousal.

For purposes of the present study, an assumption can be made based on Bandura's (1977) model. Seniors, who have a history of successfully passing several juries, will have heightened self-efficacy, and therefore, lower anxiety. This assumption will hold true even though the musical material is much more difficult. Freshmen, on the other hand, who will be performing their first jury, will have lower self-efficacy and higher levels of anxiety.

Considerable support for Bandura's theory exists in the research, especially in the sport literature (Feltz, Landers, & Raeder, 1979; Feltz & Mugno, 1983; Weinberg, Gould, & Jackson, 1979; Yan Lan & Gill, 1984). Teachers can utilize this research by establishing programs that provide positive role models, and by ensuring that students are not confronted with repeated failure. Winning should be de-emphasized, and success viewed in terms of effort and improvement.

The Test Literature

The function of the test anxiety literature is to examine a threatening and stressful environment that is common to all, that is, situations in which people are evaluated. This literature is relevant to music performance anxiety because musicians are constantly being evaluated. Evaluations occur throughout their formal training period in the form of grades, auditions for chairs in ensembles, solo and ensemble festivals, and many other circumstances. Constant evaluation continues into a musician's professional career with auditions for jobs and solo performance opportunities being prominent sources of anxiety.

The literature available concerning test anxiety is vast, but despite this large body of literature, Sarason (1984) notes that researchers still disagree on basic concepts concerning the nature of stress and anxiety, and on definitions, mechanisms, and outcomes. This disparity is highlighted by the fact that stress has been defined as a stimulus, a response, and/or a hypothetical state by various researchers. Sarason also speculates that the reason for this diversity is that researchers have failed to specify the contexts in which stress and anxiety are thought to occur.

Sarason (1984) further suggests that the occurrence of stress or anxiety in testing situations depends on personality variables within individuals and the way they perceive a given situation. Deffenbacher and Hazaleus (1985) concur with this notion and state: "In evaluative situations, highly test-anxious individuals perform more poorly than low test-anxious persons. Their performance, however, is not a simple function of ability but varies with evaluative stress. . . . evaluative stress appears to elicit characteristics that interfere with the performance of the highly test-anxious" (pp. 169-170). In low-stress situations, highly anxious people perform equally as well as the less anxious, but in high-stress situations, their performance drops to a level below the less anxious, and even below their own performances in low-stress situations. Similar views are expressed by Deffenbacher (1978, 1980), Sarason (1961, 1972, 1973), and Wine (1971).

Although extreme autonomic arousal has been considered to be a factor in test anxiety by interfering with performance or by initiating avoidance or escape behavior (Wolpe, 1973), most models of test-anxiety (Meichenbaum & Butler, 1980; Sarason, 1972; Wine, 1971, 1980) agree that cognitions play a more important mediating role in the effect anxiety has on performance. Deffenbacher and Hazaleus (1985) found, as did Holroyd and Appel (1980), that physiological measures did not contribute significantly to the measurement of test anxiety. Both studies reported that the level of physiological arousal did not differ between high and low test-anxious subjects. Deffenbacher and Hazaleus (1985) speculated that their subjects' interference may have been related to preoccupation with physiological arousal, rather than interference by physiological arousal itself. Wine (1971) reports similar findings: "Emotional arousal appears to bear no consistent relationship to performance on intellectual or cognitive tasks . . . degree of arousal is irrelevant unless the subject is attending to his arousal" (p. 100).

Deffenbacher and Hazaleus (1985) were using their subject's self-assessed heart rates, before and after the test, as independent variables. They speculated that perhaps their testing situation did not precipitate adequate physiological arousal and that heart rate alone was not a sufficient measure. If they could have assessed the heart rates throughout the exam they might have achieved a more significant outcome.

Research continues to show that cognitive processes are more likely than physiological arousal to cause a performance to deteriorate during a testing situation. Responses by test anxious individuals are generally found to be highly personalized and self-oriented. As a method of categorization, researchers have identified three broad areas of cognitive distraction: worry, emotionality, and task-generated interference.

Liebert and Morris (1967) were first to identify worry and emotionality as two distinct components in the measurement of state test anxiety. Worry refers to cognitive processes that focus attention on negative aspects such as poor performance, consequences of failure, and what others will think. Another definition is provided by Borkovec et al. (1983).

> Worry is a chain of thoughts and images, negatively affect-laden and relatively uncontrollable. The worry process represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes. Consequently, worry relates closely to fear process. (p. 10)

Emotionality, on the other hand, refers to the actual state of physiological arousal, or, more likely, to a preoccupation with self-perceived autonomic arousal. Deffenbacher and Hazaleus (1985) point out that worry has a consistent negative correlation with excellence in performance, while emotionality is either unrelated, or less consistently related, to performance. Geen (1980) points out that "emotionality is more confined to the situation in which the person is evaluated, peaking just before a test and falling off rapidly thereafter" (p. 55). Similar distinctions were reported by Doctor and Altman (1969), Liebert and Morris (1967), Morris and Liebert (1970), and Sarason (1960).

Task-generated interference, a phrase first coined by Deffenbacher (1978), is quite similar in concept to Easterbrook's (1959) Cue Utilization Theory. Task-generated interference suggests that highly test anxious individuals are more susceptible to distracting cues that are related to the task. Specific examples of distracting cues may be: preoccupation with time constraints, spending too much time on one problem, or continuing to return to a difficult problem. In a review of literature that focused on the cue utilization concept, Geen (1980) approached test anxiety as "a variable related to individual differences in such cognitive activities as attention, appraisal, and the storage and retrieval of information" (p. 43). He believed, as did Wine (1971) and Sarason (1972), that a person experiencing high test anxiety will divert his or her attention away from the task and focus on internal reactions that are self-evaluative and self-deprecatory in nature. This process deals directly with anxiety and the range of cue utilization. Geen supported his notions by citing several studies (Korchin, 1964; Mendelsohn & Griswold, 1967; Solso, 1968; Solso, Johnson, & Schatz, 1968; Zaffy & Bruning, 1966) that show a reduction in the range of cue utilization as a function of trait anxiety, and several others (Geen, 1976; Mueller, 1976; Wachtel, 1968; West, Lee, and Anderson, 1969) that are specific to test anxiety and showed the same results.

Concerning cue utilization in nonevaluative situations, interesting findings were reported by Wine (1971) and Geen (1980). In nonevaluative situations, highly test-anxious subjects did not display self-directed interfering cognitions and were able to direct full attention to the task. Conversely, under similar testing conditions, the nonanxious subjects were not sufficiently motivated by the task and did not apply full attention to it, which possibly resulted in indifference and disinterest. Geen (1980) speculated that in the performance of nonthreatening tasks, high test anxious subjects will do better than low test anxious subjects.

In a study that ultimately can be related to music performance in a jury situation, Geen (1977) examined the effects of an evaluator on anticipated positive or negative results during performance on an anagram task. In one condition the evaluator simply made notes on the subject's performance with no prior information given. In a second condition, the evaluator played the same role, but this time explained to the subject that the notes were to help improve the outcome of future performances. Geen observed that the redefinition of the evaluation in the second situation led to a more efficient and superior performance in highly test anxious subjects. The outcome of this study suggests that individuals high in test anxiety can be extremely sensitive to external cues. The fact that the distracting cues were from an audience indicates that there may be a high correlation with music performance situations.

I believe that test anxiety is more affected by psychological considerations because it is a cognitive activity. In "written test" situations, such as in Deffenbacher and Hazaleus (1985), motor performance is not a factor. Therefore, physiological arousal will not adversely affect performance unless it is cognitively attended to. Conversely, motor performance, as will be seen in the following section, is more affected by autonomic arousal because it is primarily a kinetic activity. Research evidence indicates that performance anxiety in music will be unique because it involves, to a large extent, both cognitive and kinesthetic processes.

The Sport Literature

An extremely important body of literature that is usually not reported by music researchers are the studies involving anxiety and stress in sport competition and motor behavior. Scanlan and Lewthwaite (1984) define competitive stress as an "acute state-anxiety reaction to competitive situations that the participant perceives as threatening to self-esteem. . . . Stress is triggered when the participant perceives that he/she is not capable of meeting competitive demands successfully and therefore anticipates negative consequences. In sport, these consequences can include perceptions of failure and the potential for receiving negative social evaluation of motoric competence from people who are significant to the child such as parents, coaches, and peers" (p. 209).

It is obvious that if a few of the words were changed in this definition it would be highly applicable to music performance. Music performance in the United States, even before the turn of the century, has been continually involved with competition. The first documented music contest took place in Carbondale, Pennsylviana in 1850. Fed by the nation's competitive spirit, music contests quickly became popular and spread throughout the country. Other early evidence of the competitive nature of music performance was the establishment of the National Bureau for the Advancement of Music in 1916. Throughout its ten year record, the bureau promoted all forms of musical advancement including music memory contests and band contests. Likewise, the inevitable inclusion of music contests in the schools led to the first national school band contest that was held in Chicago in June of 1923 (Keene, 1982). Today, music contests thrive in all forms, from public school festivals to international contests, such as the Tchaikovsky Competition, for professional musicians.

Because of this intense interest in music competition, I am surprised that there has not been more collaboration between sport and music researchers. "Like athletes, musicians perform for the public; and like professional athletes, they can lose their jobs if they don't perform" (Bejjani & Snow, 1990, p. 45). Athletic competition involves both team and individual sports, which make it easily comparable to ensemble and solo performance in music. Scanlan (1984) reveals that individual sports, as compared to team sports, characteristically involve greater social evaluation potential because they focus more strongly on individual performance. Other studies (Griffin, 1972; Johnson, 1949; Simon & Martens, 1979) also have demonstrated that individual sports are more stressful than team sports.

A reason for this disparity may have been discovered by Krane and Williams (1987). In their research on performance environments, they found that "athletes participating in sports scored subjectively by judges [diving, figure skating, gymnastics, and so forth] have higher cognitive anxiety and lower self-confidence than athletes in objectively scored sports" (p. 54). This situation is highly applicable to music since music performance is perceived subjectively by the audience, or judges in the case of music competition.

To highlight this point, Simon and Martens (1979) have provided a comparison of precompetitive state-anxiety levels in various competitive sports; included in the comparison are band performances and instrumental solos (see Figure 4). Band performances ranked above all other team sports in the comparison--instrumental solos eclipsed all of the activities, including the individual sports of gymnastics and wrestling. I offer that this is the case, particularly in the public schools, because athletic events generally occur at least once or twice a week throughout their respective seasons. This provides athletes with an avenue to gain more competitive experience. Music performances, on the other hand, will often occur only once or twice a year, which does not allow musicians adequate time to gain comparable performance experience.

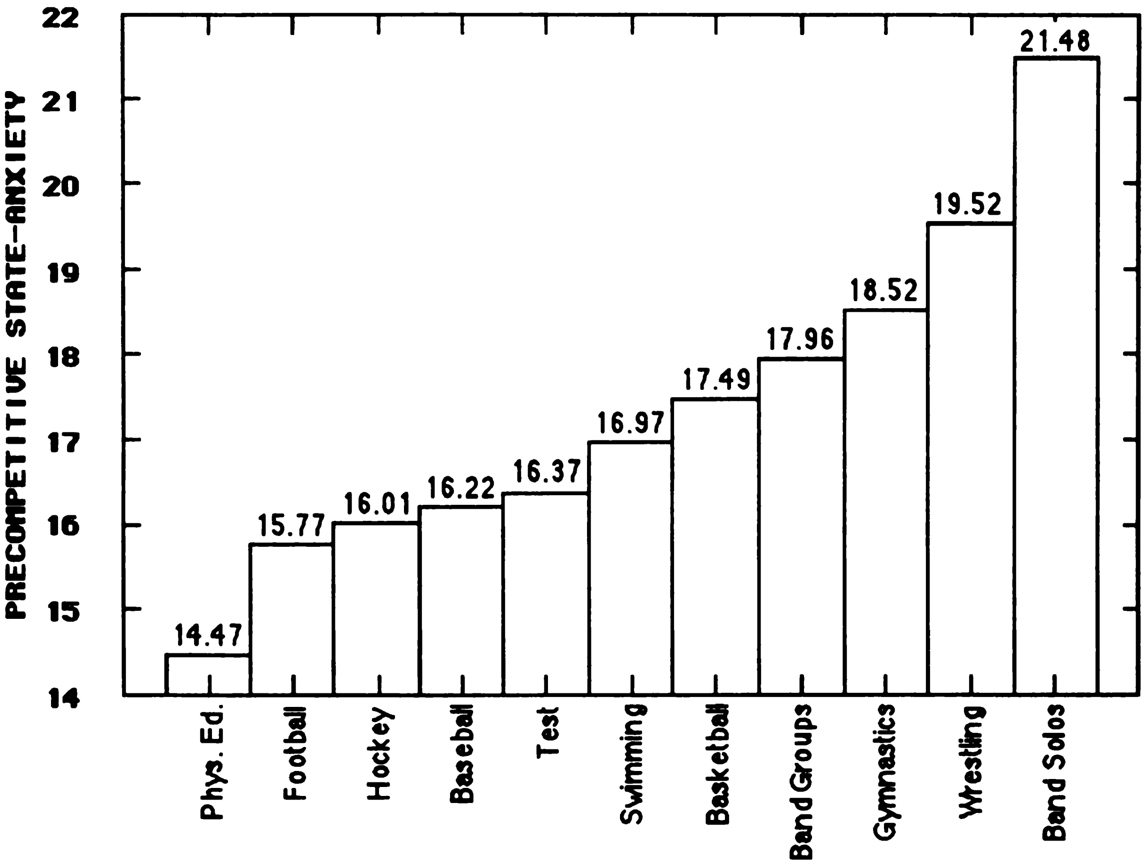

Figure 4. Precompetitive state-anxiety levels in various competitive and evaluative activities. From Children's anxiety in sport and non-sport evaluative activities by J. A. Simon and R. Martens, 1979, *Journal of Sport Psychology, 1,* p. 165. Copyright 1979 by Human Kinetics. Adapted by permission.

I will present here a sampling of sport related research dealing with precompetitive anxiety as it is the most studied subject in the sport anxiety literature. Included will be references to anxiety and motor performance, studies dealing with cognitive anxiety, comparisons of experienced and inexperienced athletes, and finally, competitive anxiety as a multidimensional construct.

Early research in sport and motor behavior focused on examining the relationship between anxiety and motor behavior. This was accomplished through laboratory and field studies utilizing anxiety theories, such as the inverted-U hypothesis, drive theory, and cue-utilization theory as a foundation for the research (Carron, 1971; Carron & Morford, 1968; Hanson, 1967; Klavora, 1978; Landers, 1980; Martens 1971, 1974; Martens & Landers, 1970; Spielberger, 1971; Weinberg & Genuchi, 1980; Weinberg & Hunt, 1976). Other early studies provided an examination of factors influencing anxiety (Martens & Gill, 1976; Scanlan & Passer, 1978, 1979), and the degree of anxiety experienced in competition (Purdy, Haufler, & Eitzen, 1981; Simon & Martens, 1979). The sport studies that have direct significance to the present study are those that examine competitive anxiety patterns prior to, and during performance (Fenz, 1975; Gould, Horn, & Spreemann, 1983; Gould, Weiss, & Weinberg, 1981; Highlen & Bennett, 1979; Mahoney & Avener, 1977; Meyers, Cooke, Cullen, & Liles, 1979).

Some of the first research to examine preperformance anxiety patterns were a series of studies using sport parachutists done by Walter D. Fenz and his associates throughout the 1960s and 1970s. Since this research was discussed in Chapter 1, I will simply highlight the results here. Fenz found distinct differences in anxiety patterns between experienced and inexperienced parachutists, and between good and poor performers. Inexperienced and poor performers showed a continual increase in levels of anxiety and arousal up to the time of the jump. Experienced and good performers, on the other hand, displayed an inverted-V pattern--a sharp initial increase that was followed by a sharp decrease so that at the time of the jump, their anxiety levels were close to normal. Fenz concluded that the reason for the difference in anxiety patterns was that the experienced and good performers were better able to cope with their anxiety by becoming more task oriented, while the inexperienced and poorer performers tended to internalize and ruminate on their fears.

Another field study examining anxiety patterns was undertaken by Mahoney and Avener (1977). Their study utilized 12 elite gymnasts competing for a berth on the 1976 United States Men's Olympic Gymnastics Team. Whereas the Fenz studies employed both psychological and physiological measures, Mahoney and Avener specifically examined cognitive anxiety patterns. They devised a psychological skills inventory as a measurement device that was administered 48 hours before the final qualifying meet. The athletes were asked to report their typical anxiety levels at various times prior to competition: one week, one day, one hour, dressing at the meet, warming up, chalking up, before their best event, before their worst event, while performing their best event, and while performing their worst event.

Mahoney and Avener's results were congruent with those of Fenz in that differences in anxiety patterns were found between successful (those who made the team) and unsuccessful (those that were cut) performers. Significant correlations were found between self-confidence, frequency of gymnastics dreams, performance success in dreams, frequency of gymnastics thoughts, self-talk, the use of imagery, and performance success in competition. Mahoney and Avener found an important difference between their findings and those of Fenz. In their study, the better performers showed a higher level of anxiety than the poorer performers before competition. During competition, however, the patterns were reversed--the less skilled reported the higher levels of anxiety.

In an attempt to replicate the findings of Mahoney and Avener (1977), Meyers, Cooke, Cullen, & Liles (1979) conducted a follow-up study utilizing nine male undergraduate members of the Memphis State University racquetball team. Their measures were a modified version of the Mahoney and Avener questionnaire that was administered three times during the racquetball season, and a skill level ranking of the nine players by the team coach. Their findings were consistent with those of Mahoney and Avener (1977). Better performers were more self-confident, reported fewer self-doubts, and racquetball tended to pervade their dreams and everyday thoughts. They exhibited more self-talk in practice and competition, and were more able to maintain successful performances using imagery. Another important similarity with the Mahoney and Avener study was that the more highly skilled racquetball players reported less anxiety during competition.

An additional study that employed an adapted version of the Mahoney and Avener (1977) questionnaire was undertaken by Highlen and Bennett (1979) using wrestlers competing to qualify for positions on three Canadian World wrestling teams. Like the previous studies, the primary purpose was to identify psychological factors that differentiated between successful and unsuccessful performers; an important difference, however, was that Highlen and Bennett used a much larger sample (N = 39). They were also attempting to replicate the Mahoney and Avener (1977) study utilizing an open-skill sport.

Open-skill and closed-skill activities were first identified by Gentile (1972). Open-skill activities are executed in an ever-changing environment like wrestling, football, and hockey. In these activities the performer attempts to develop a repertoire of patterns that match the environmental stimuli that are encountered during skill execution. Closed-skill activities, on the other hand, occur in an environment that remains constant, for example, gymnastics, diving, and music performance. In the execution of these skills the performer attempts to produce consistent, habitual patterns.

The strongest findings reported by Highlen and Bennett (1979) were that qualifiers were more confident than nonqualifiers, and that qualifiers reported less stress both before and during competition. Congruent with the previous studies, it was reported that anticipatory anxiety was greater than that experienced during actual competition, and that successful wrestlers were better able to focus their attention on the performance.

A meaningful difference between Highlen and Bennett's findings and those of Mahoney and Avener (1977) involved the importance of imagery, dreams, and self-talk. Although these traits were influential in distinguishing between successful and unsuccessful gymnasts, they were of little significance in the context of wrestling. Highlen and Bennett surmise that this is so because wrestling primarily involves open skills, whereas gymnastics is largely a closed-skill sport. They believe it may be more difficult for a wrestler to visualize competition with an unpredictable opponent, whereas gymnasts find it easier to imagine their individual performances.

Highlen and Bennett (1979) reported two additional findings that may have significance in preparing for music performance. The first was that as the number of hours spent in training increased, so did anxiety. This characteristic was common to both successful and unsuccessful wrestlers; however, the successful wrestlers spent fewer hours in training than the unsuccessful wrestlers. Highlen and Bennett acknowledge that they could not conclude that anxious wrestlers train more or that more training increases anxiety. I speculate that since it has been proven that successful performers are more task-oriented, they benefit from intense and productive practice sessions, and consequently, need not devote excessive amounts of time.

The other finding was that elite wrestlers were more concerned about their coaches' assessment when they were *losing* a match. Highlen and Bennett identify this as a critical time for careful intervention by the coach. This finding can be applied to the preparation phase of music performance and the role of the teacher in initiating strategies for the regulation of anxiety.

Two additional studies utilizing wrestlers (Gould, Weiss, & Weinberg, 1981; Gould, Horn, & Spreemann, 1983) were undertaken that were similar in design to the ones previously mentioned. The results of Gould et al. (1981) replicated the findings of Mahoney and Avener (1977), Meyers et al. (1979), and Highlen and Bennett (1979) in that successful wrestlers reported more self-confidence, and were better able to focus on task-related thoughts than the less successful athletes. In addition, all the wrestlers reported higher levels of anxiety before competition than during the actual competition.

Unlike the previous studies, however, Gould et al. (1981) did not find differences in levels of anxiety and cognitive coping strategies employed by successful and unsuccessful wrestlers. In addition, no differences were found in the use of imagery, which was so important in Mahoney and Avener (1977) and Meyers et al. (1979). Gould et al. (1981) suggest that the conflicting findings may be due to the use of imagery being sport specific and that more controlled research is needed to substantiate this claim. The idea that imagery can be used as a coping strategy to control cognitive anxiety makes sense, particularly when considering Highlen and Bennett's discussion of open and closed-skill activities.

Gould et al. (1983), like Gould et al. (1981), also found no differences in precompetitive and performance anxiety patterns between successful and unsuccessful or more or less experienced competitors. Once again, these findings were inconsistent with previous research. Gould et al. (1983) attributed these contradictory findings to the fact that the athletes were asked, 48 hours before the competition, how they typically felt before performing, rather than how they felt at the moment. Another important consideration is the use of a much larger sampling in both Gould et al. (1981) and Gould et al. (1983). Sample sizes were N = 49 and N = 464 respectively.

More recently, researchers in sport psychology have been adapting to contemporary anxiety research that is redefining state anxiety as being multidimensional in nature (Davidson & Schwartz, 1976; Landers, 1980; Liebert & Morris, 1967; Schwartz, Davidson, & Goleman, 1978). In response to this change, the Competitive State Anxiety Inventory-2 (CSAI-2) was developed to measure both the cognitive and somatic components of state anxiety (Martens, Burton, Vealey, Bump, & Smith, 1990). The test is an adaptation of an earlier version of the STAI (Spielberger, Gorusch, & Lushene, 1970) and the original Competitive State Anxiety Inventory as developed by Martens, Burton, Rivkin, and Simon (1980). The CSAI-2 is a sport-specific multidimensional state-anxiety inventory that separately assesses cognitive and somatic state anxiety, as well as self-confidence. This is accomplished by means of 27 Likert-type scale questions (Gould, Petlichkoff, & Weinberg, 1984). Examples of the CSAI-2 are given in Jones and Cale (1989): cognitive anxiety items include "I am concerned about this competition" and "I'm concerned about performing poorly," somatic anxiety items include "I feel nervous" and "my body feels tense," self-confidence items include "I feel at ease" and "I'm confident about performing well."

I will present here three studies that utilized the CSAI-2 as a measurement. Chronologically they are: Gould, Petlichkoff, and Weinberg (1984), Ussher and Hardy (1985), and Karteroliotis and Gill (1987).

One of the first examinations of precompetitive anxiety utilizing the multidimensional constructs of the CSAI-2 was undertaken by Gould et al. (1984). They presented two studies designed to replicate and test various relationships between cognitive and somatic anxiety as hypothesized by the CSAI-2. In addition, Gould et al. (1984) suggested that cognitive and somatic anxiety affect performance differently, therefore, they felt it was important that the two constructs be assessed separately as well. Gould et al. provided evidence that supported the distinction between cognitive and somatic anxiety: "the degree of cognitive state anxiety elicited by an athlete is dependent on his or her perceived ability, which is primarily generated from previous competitive experience" (p. 291). They consider somatic anxiety to be a conditioned or reflexive response to environmental stimuli; for instance, the competition site. Thus, performance expectancies before competition should be more highly correlated with the level of cognitive anxiety rather than somatic anxiety. They continued by citing Morris and Fulmer (1976) and Smith and Morris (1976), who reported that somatic anxiety steadily increases prior to evaluation, whereas cognitive anxiety shows little fluctuation, thereby establishing the independence of the two constructs.

In both studies, the CSAI-2 was administered five different times before a major tournament: 1 week, 2 days, 1 day, 2 hours, and 20 minutes. Subjects employed by Gould et al. (1984) were intercollegiate wrestlers in the first study (N = 37), and female high school volleyball players in the second (N = 63), thereby evaluating both a closed and an open-skill sport.

Results of the study were consistent with previous research showing that somatic anxiety increases prior to competition, while cognitive anxiety and self-confidence remained constant. The prediction that cognitive anxiety would be a more viable indicator of performance than somatic anxiety was only partially supported. Finally, Gould et al. (1984) found no differences between experienced and inexperienced performers for either cognitive or somatic anxiety patterns. These results contradicted the findings initially reported by Fenz (1975) who did find significant differences in anxiety patterns between experienced and inexperienced performers.

Ussher and Hardy (1985) presented another study employing the CSAI-2, investigating the separate influences of cognitive and somatic anxiety upon several cognitive and motor tasks using a 'time to a significant event' paradigm. They tested an experimental group of eight experienced rowers on four occasions: 2 weeks, 24 hours, and 2 hours before a competition, and 2 weeks after the competition. In addition, they tested a control group of eight equally experienced rowers at the same time interval who did not have an impending competition. Cognitive anxiety, somatic anxiety, and self-confidence were measured by the CSAI-2, while physiological arousal was measured by heart rate.

Results for the experimental group indicated that cognitive anxiety was elevated throughout the pre-competition period while somatic anxiety steadily increased up to the time of the competition. Self-confidence and cognitive anxiety showed a negative correlation: When cognitive anxiety was elevated, self-confidence was depressed, and vice versa. Results for the control group were not reported.

Karteroliotis and Gill (1987) recognized that the somatic portion of the CSAI-2 is reported by the subject as a perceived autonomic response rather than an actual physiological reaction. Thus, noting that physiological measures had not yet been compared to CSAI-2 measures, they incorporated pulse rate and blood pressure into their study. Judging by the results of Martens et al. (1983) and Gould et al. (1984), Karteroliotis and Gill (1987) hypothesized that actual physiological measures and somatic anxiety scores from the CSAI-2, should show a positive relationship.

The results of their study, which was a laboratory-contrived competitive setting rather than an actual sport situation, contrasted significantly with the previous research testing the CSAI-2. In opposition to previous findings where somatic anxiety increased up to the competition and then decreased as the competition progressed, Karteroliotis and Gill's results showed both cognitive and somatic anxiety following similar patterns throughout the test--both maintained baseline levels up to the start of competition, then significantly increased. Actual physiological measures were not related to CSAI-2 reports at any stage of the assessment. Karteroliotis and Gill speculate that these contrasting findings were due to the contrived nature of the study. They contended that their situation did not elicit as much anxiety as an actual sport competition where there would be higher potential for evaluation.

Implications for Music Performance Anxiety

In conclusion, some solid generalizations can be made from the sport literature that provide implications for music performance. As a point of departure, it has been shown that an individual's response to anxiety will differ depending on the performance situation. For example, different anxiety response patterns have been found between persons participating in open or closed-skill environments, and in events that are scored subjectively or objectively. This leads to the logical assumption that, due to an increased potential for evaluation, a soloist is going to exhibit greater anxiety levels than a musician in an ensemble.

Secondly, experienced performers will generally exhibit different anxiety patterns than inexperienced performers. Experienced performers maintain a relatively higher level of anxiety up to the time of performance, then become increasingly task-oriented, which results in lower anxiety levels during the actual performance. Inexperienced performers, on the other hand, will tend to ruminate on their fears and generally show a steady increase in anxiety prior to and during the performance.

Finally, successful performers will report higher levels of self-confidence (no matter what their experience level) than unsuccessful performers due to positive past experiences. In all performers, however, self-confidence will be high when anxiety is low, and low when anxiety is high.

The Music Performance Anxiety Literature

The symptoms of stage fright, that well known discomfort experienced by many musicians performing before an audience, can vary from a transient sense of anxiety to an incapacitating response of the autonomic nervous system. Ordinarily, the symptoms will dissipate several minutes into the performance. For an unfortunate few, however, the psychological and physiological manifestations of stage fright may continue throughout the performance and for several minutes thereafter. Kaplan (1969) vividly describes this process as *blocking* and *depersonalization.*

> Blocking is the momentary experience of complete loss of perception and rehearsed function. . . . Blocking erases all sense of control and aims at a total extinction of impulse by disconnecting the self from all avenues of functioning . . . Once onstage, blocking gives way to depersonalization. This reaction is most often experienced as a split between a functioning and an observing self, with pronounced spatial disorientation. The observing self perceives the functioning self as off at a distance, operating mechanically before an audience that is also perceived as quite distant. . . . The performer is conscious of his limbs, face, and posture and loses a sense of trustworthiness about their coordination; the heartbeat intrudes upon consciousness, often audibly, sometimes deafeningly. Color perception is lost, and the visual components of the experience resemble a black-and-white dream. (p. 64)

As early as 1964, writers on music performance anxiety have recognized its psychological and physiological concomitants (Martin, 1964), however, much of what has been written on the subject has not been research based (Dodge, 1989; Fogle, 1979; Gates, 1988; Harris, 1988; Nagel, Himle, & Papsdorf, 1981; Neubert, 1990; Stollak & Stollak, 1988). Only recently have studies in music performance anxiety begun to examine its multifaceted dimensions; however, as indicated by Salmon (1990), "much of our understanding of music performance anxiety is still derived from studies of other individuals equally prone to anxiety, but perhaps for different reasons and in different ways" (p. 9). It is evident, however, that studies in music performance anxiety have not utilized the achievements of research in other disciplines as much as would be desired. Consequently, as recognized by Abel and Larkin (1990), Hamann and Sobaje (1983), Neiss (1988), Salmon (1990), and Wesner, Noyes, and Davis (1990), the literature on music performance anxiety has not yet been fully developed.

A distinctive characteristic of the music literature is that the majority of the research-based studies have been in the realm of anxiety reduction (Appel, 1976; Kanefield, 1990; Lund, 1972; Montello, Coons, & Kantor, 1990; Nideffer & Hessler, 1978; Terwilliger, 1972; Wardle, 1974; Wolfe, 1977; Wolfe, 1990). These studies generally assumed that anxiety reduced the quality of performance, and that intervention techniques either improved performance or had no effect on its quality.

Two studies in particular (Kendrick, Craig, Lawson, & Davidson, 1982; Sweeney & Horan, 1982), approached anxiety intervention from a multifaceted perspective. Both employed *cognitive restructuring* as a means of anxiety reduction. Salmon (1990) referred to cognitive restructuring as "a procedure for (1) monitoring one's thoughts; (2) exploring the dysfunctional qualities of troublesome thoughts; (3) developing effective counter-responses; (4) rehearsing the new responses; and (5) incorporating them into task-relevant activities" (p. 8).

A new and burgeoning field concerning the reduction of music performance anxiety is the use of beta-adrenergic blockading drugs (Brandfonbrener, 1990; Brantigan, Brantigan, & Joseph, 1982; Brantigan, Joseph, & Brantigan, 1978, 1979; James, Griffith, Pearson, & Newbury, 1977; James & Savage, 1984; Lidén & Gottfries, 1974; Neftel, Adler, Käppeli, Rossi, Dolder, Käser, Bruggesser, & Vorkauf, 1982; Nies, 1990). The use of beta-blockers is relatively unique to music performance situations, as other activities do not respond as well to their effects (Steptoe, 1989; Tyrer & Lader, 1974). This is especially true in athletic competition where athletes must maintain an optimal level of physiological arousal and cardiac output because of the physical activity involved.

Although the purpose of the present study is not to investigate anxiety reduction techniques, I feel that it is necessary to mention the above studies because of their importance in the range of the music performance anxiety literature. The remainder of this review will be devoted to studies conducted using: (a) questionnaires that probe a broad range of performance concerns among various groups of musicians, (b) self-report measures in which individuals indicate their particular level of anxiety (usually cognitive anxiety) at a given moment, and (c) multidimensional studies that examine both the psychological and physiological aspects of music performance anxiety.

Questionnaire Studies

Acknowledging that psychological treatments such as behavior modification and systematic desensitization have achieved some success in reducing anxiety, and that pharmacological treatments utilizing beta-blockers are effective in reducing autonomic arousal, Steptoe and Fidler (1987) presented a questionnaire survey concerning various cognitive aspects associated with performance anxiety. Two primary issues were addressed: the relationship of anxiety with amount of performing experience, and various cognitive processes involved with performance anxiety. To examine the role of experience, their study compared subjects from two prominent London professional orchestras with a group of music students. Since experience is sometimes thought of as being synonymous with age, they included a third group, as a thoughtful foresight, consisting of adult amateur musicians who possessed relatively limited performance experience. Added as a factor to control for age, the amateur musicians were intermediate in age (m = 28.9) between the professionals (m = 37.0) and the students (m = 20.8), but displayed a wider range of ages (r = 14.9) as compared to the professionals (r = 10.5) and the students (r = 2.2).

Steptoe and Fidler (1987) found that the student musicians manifested higher levels of stage fright than did the professionals. They attributed this finding to either performance experience or age, speculating that age may have been the more important factor since the amateur group reported lower anxiety levels than the students. Furthermore, they conceded that the amateurs may have had reduced anxiety levels because they did not have the evaluative and career ramifications to consider as did the professionals and students. In other words, the amateurs were just having fun with music.

Of the various cognitive aspects explored in the study, catastrophizing was found to be the most important in all three groups of musicians. This indicates that people with stage fright worry most about perceived tension and exaggerated beliefs concerning the importance and consequences of any performance, or of impending disaster during the performance. Catastrophizing was identified by Steptoe and Fidler (1987) through statements such as "I am almost sure to make a dreadful mistake and that will ruin everything," "I do not think I will be able to get through to the end without cracking up," and "I do not feel in control of this situation; anything might happen." This finding concurs with Ellis (1977) who identified catastrophizing as a major element in the pattern of irrational beliefs associated with anxiety.

The results of Steptoe and Fidler (1987) were further reinforced by Steptoe (1989) in a review of the recent conceptualizations of music performance anxiety. His article encompassed both physiological and cognitive aspects of stage fright, as well as career stress in musicians and their coping strategies. He reports that in a comparison between orchestral musicians, physicians, air traffic controllers, and waiters in Sweden, orchestral musicians had the lowest ratings of authority over decisions. This indicates that musicians playing in an orchestra have no control over what is played, and very little flexibility in how to play it. According to Karasek (1979), these findings rank orchestral musicians high in the category of potential job stressfulness.

Steptoe (1989) reported that, in order to cope with these stresses, the methods used by professional musicians varied greatly. During the period prior to performance, 28% of the professionals tried to distract themselves, 38% engaged in deep breathing, and 23% used muscle relaxation. In addition, 22% resorted to the use of alcohol, while 12% admitted to using sedatives. Steptoe does not indicate which sedatives were used, consequently, a correlation cannot be drawn between this study and Fishbein & Middlestadt (1988) as to the frequency of the use of beta-blockers.

Steptoe (1989) concluded by suggesting that the domains of career stress and stage fright are not independent and that the two must be considered together when approaching solutions for stress management. Professional musicians are unique in this respect because their working environment (i.e., monotony, lack of freedom to make decisions, irregular hours, travel schedules, and so forth), as well as the anxiety related to constant public performance place an inordinate amount of stress upon them.

Dews and Williams (1989) also used a questionnaire approach to determine the foremost emotional and psychological issues facing musicians and their methods of coping with them. Their study included a diverse sample of college music majors, both undergraduate and graduate, from three universities: Southwest Texas State University, the University of Miami, and the Manhattan School of Music. The responses that Dews and Williams received enabled them to provide a list of the top ten issues that concerned the students surveyed. Like Steptoe and Fidler (1987), these results reveal that many of the stresses faced by musicians are extramusical, especially when career is concerned. The top ten issues are as follows:

> (1) stress, (2) preperformance nervousness, (3) progress impatience, (4) burnout with musical progress, (5) job insecurity, (6) feeling conflict between music and one's personal life, (7) inadequate practice facilities, (8) depression, (9) stage fright, and (10) concentration. (p. 39)

Dews and Williams (1989) also highlight perfectionism as a major source of stress in performance anxiety. Their findings are concurrent with those of Fogle (1982) who observed that musicians often suffer from a "trying-too-hard" effect. Fogle states that in this circumstance, anxiety can be reduced considerably if the student is given permission to make mistakes--even to the point of programming mistakes into the music. Dews and Williams (1989) reported that to cope with these stresses, music students indicated that they turned to their friends first, then to their teachers. A family member was their third choice; and lastly, it was found that professional counseling was sought least frequently for help in music-related problems.

To learn more about coping strategies among musicians, as well as the nature and extent of their performance anxiety, a recent survey (Wesner, Noyes, & Davis, 1990) was conducted at the University of Iowa School of Music. A questionnaire was distributed to survey the attitudes and experiences of these musicians regarding their distress due to performance anxiety, impairment caused by it, and treatment sought for it. The survey encompassed undergraduates, graduate students, and faculty. The findings of Wesner et al. (1990) were similar to those found in the other surveys reviewed: the most commonly reported symptoms of anxiety were fear of performance, poor concentration, rapid heart rate, sweating, and dry mouth. Drug and alcohol abuse throughout the sample population was reported as minimal, and women reported more distress and impairment than men. Age, however, contradicting the speculations of Steptoe and Fidler (1987), was not found to be a significant factor in this study.

Self-Report Studies

Although anxiety/arousal theories are a major focus in the sport literature, I have discovered only two studies (Hamann, 1982; Hamann & Sobaje, 1983) that have used them in a music performance context. Both articles investigated anxiety only in terms of drive theory, and did not consider the inverted-U hypothesis or cue utilization theory. It is perplexing that both articles cite Martens (1971), but fail to note his rejection of drive theory in favor of the inverted-U hypothesis or cue utilization theory. In Martens' (1974) review of literature he further denounces drive theory and concedes that the inverted-U hypothesis also has limitations, but is still more plausible than drive theory as an explanation of the arousal/performance relationship. In addition, Oxendine's (1970) research supported drive theory for gross motor activities only, not for more complex motor tasks. Neither Hamann (1982) nor Hamann and Sobaje (1983) cite Martens (1974) or the host of other sport-related literature that has examined the anxiety/arousal theories.

It is somewhat disappointing that in both studies, only self-report measures of arousal were used. Drive theory is a construct that compares performance with corresponding levels of arousal. This being the case, I feel it would have been beneficial to utilize more concrete and objective measurements to determine levels of arousal. In addition, the self-report measures were administered *after* the performance sessions. Since the majority of research reviewed in the present survey of literature indicate that anxiety is highest immediately *before* the performance, I submit that it would have been useful to have administered the survey at that time, while the subjects were actually feeling anxious.

The importance of Hamann (1982) and Hamann and Sobaje (1983) to the present study are that both examined levels of experience and the training and ability of college music students. In addition, Hamann and Sobaje (1983) used a jury situation and a nonjury situation to measure the anxiety levels of their subjects.

Hamann (1982) set up two performance situations that would elicit different extremes of anxiety. In the first situation, subjects were asked to play into a tape recorder with no audience present. The second situation, an enhanced anxiety setting, was a contrived studio performance in which the subjects played before an audience consisting of faculty and peers. Hamann found that subjects with more years of formal training performed in a superior manner under conditions of increased anxiety. He concluded from these results that anxiety can have motivational or drive properties for some musicians. I speculate that because the studio performance was contrived for the purpose of the research, and the subjects were not graded, the experience may not have produced sufficient anxiety to cause an inverted-U shaped pattern among the experienced performers. Since there was minimal risk for the performers, drive theory properties were enhanced.

Hamann and Sobaje (1983) was designed in a similar manner as Hamann (1982) except that the enhanced anxiety setting was a jury situation in which the subjects performed for university faculty who administered a grade and decided whether the students should advance in the music program. The results of the study were similar to Hamann (1982): The jury situation produced greater state anxiety than the nonjury situation, subjects with high trait anxiety showed higher state anxiety, performances in the jury situation were superior to those of the nonjury situation, and the more experienced performers performed better than the inexperienced performers in the jury situation.

Hamann and Sobaje (1983) concluded that: "Anxiety does have Drive or motivational properties for musicians performing in anxious situations. Further, it can be stated that subjects with greater task mastery will exhibit increased performance ability, at a significant level, under anxious situations than will subjects with less task mastery" (p. 48). In this statement, "task mastery" is not defined. Task mastery could be regarded as either how well the music is prepared (I believe this was the intended purpose) or the number of juries each subject has performed in his or her college career. Since an inexperienced performer could have the music prepared as well as an experienced performer (given a relative level of proficiency), I expect that experience in playing juries could affect the quality of performance significantly.

Multidimensional Studies

I feel that the value of questionnaire and self-report studies of anxiety are important primarily to establish cognitive sources of anxiety. They are also beneficial as a foundation on which to structure more elaborate research. The importance of conducting multidimensional anxiety research in music (research that examines both psychological and physiological aspects of anxiety) is becoming more apparent. As identified by Lang (1978), and more recently by Abel and Larkin (1990), Karteroliotis and Gill (1987), McLeod, Hoehn-Saric, and Stefan (1986), and Waal-Manning, Knight, Spears, and Paulin (1986), cognitive anxiety, physiological arousal, and behavioral signs of anxiety have been found to effect individuals in different ways. Therefore, it has become increasingly important to develop assessment strategies to examine these distinct but interrelated areas.

Lang (1978) suggested a three-systems model of anxiety based on behavioral, physiological, and verbal components. This model was extended by Rachman and Hodgson (1974), and revised again by Lang, Miller, and Levin (1988). The model, as described by Lang et al. (1988), is a product of fear reactions, autonomic arousal, and behavioral responses to a perceived threat. These three factors can be highly interactive (synchronous) or partially independent (desynchronous), thereby making them capable of responding differently under various conditions. Response synchrony, where all three factors are highly active, generally occurs under conditions of extreme anxiety. Response desynchrony, the more common phenomenon, will generally occur under conditions of relatively less anxiety, and elicit a wider variety of symptoms. For example, a performer can feel physiologically aroused without having distressful thoughts. Conversely, a person can initiate avoidance behavior, which was activated by negative cognitions, without experiencing overt physiological arousal. Because of this divergence, Salmon (1990) points out that it has not been agreed upon by psychologists if anxiety is initiated by cognitive perception of danger, which, in turn, activates arousal and behavioral changes, or if physiological arousal initiates anxious thoughts.

Craske and Craig (1984) provided support for the three-systems approach. Their subjects were 40 proficient piano students who were divided into anxious and nonanxious groups. Each performed a piece from memory in two situations: alone with a hidden video camera, and one week later, before an exposed video camera and a panel of five judges who were introduced to the subject as accomplished pianists and experts in behavioral assessment.

The subjects were evaluated using three categories of dependent variables that consisted of (a) a variety of cognitive self-report measures, (b) behavioral measures of musical performance quality and a checklist of observable indicators of anxiety, and (c) three measures of physiological arousal, including skin conductance, heart rate, and respiration rate.

The results reported by Craske and Craig (1984) showed that the audience situation elicited a higher level of stress and greater synchrony among the more anxious pianists. The nonanxious performers, in contrast, displayed a greater tendency toward desynchrony; they remained relatively stable on self-report and behavioral measures, but showed a mean increase in heart rate. This display of an increased heart rate, while cognitive indicators remained unchanged, concurs with the findings of Ussher and Hardy (1985), Gould et al. (1984), and other sport research.

A more recent study involving the psychological and physiological concomitants of performance anxiety was conducted by Abel and Larkin (1990). The purpose of their study was to examine the levels of physiological arousal and self-reported anxiety prior to musical performance, and to examine the relationship between self-report measures and physiological indicators of arousal. An additional purpose, not related to the present study, was to determine if response patterns differed between male and female musicians. Abel and Larkin used heart rate and blood pressure as indicators of physiological arousal, and an abbreviated version of the Spielberger et al. (1970) *State-Trait Anxiety Inventory* as a self-report cognitive measure. To obtain data, the measures were administered to 22 undergraduate music students in two sessions. The first was a nonstress situation to obtain baseline anxiety and arousal levels, which was conducted early in the semester. The second session, in an effort to obtain optimal levels of arousal, took place immediately before student performance juries at the semester's end.

As was expected, higher levels of physiological arousal and self-reported anxiety appeared immediately before the juries as compared with those that were recorded during the baseline sessions. Anxiety patterns, however, differed between males and females. Consistent with the findings of Craske and Craig (1984), males displayed higher blood pressures, while females reported greater subjective anxiety. Also consistent with previous research was that, in general, response desynchrony was recorded; heart rates and blood pressures increased immediately before the performance, while self-reported anxiety remained constant.

Abel and Larkin (1990) indicate that their findings may have implications to the development and treatment of performance anxious musicians. They suggested that musicians who reacted with increased heart rate and blood pressure may benefit from relaxation exercises such as biofeedback or progressive muscle relaxation (they do not mention beta-blockers, however) to lower their physiological response. In addition, those that responded with increases in self-reported anxiety could benefit from cognitive interventions.

Conclusion

Considerable evidence has been provided that music performance anxiety is an extensive problem that manifests itself in cognitive, behavioral, and physiological ways. Symptoms of anxiety can occur simultaneously in all three of these realms (synchrony), or separately (desynchrony). It is still not clear, however, which area causes the greatest distress, or which area shows significant elevations of arousal or anxiety first. The majority of research in music performance anxiety has been done on anxiety reduction instead of its causes. As a consequence, I am concerned that we do not fully understand its manifestations, and that drastic measures, such as the use of beta-blockers, are being used in its treatment before subjects are properly diagnosed. Survey and self-report studies have suggested that musicians are more prone to worry about self-image and perfectionism, which makes catastrophizing a major factor in precipitating performance anxiety. Perhaps more research involving both the psychological and physiological aspects of music performance anxiety will give us a clearer understanding of this problematic area.

Recent research in music has only begun to examine the multifaceted dimensions of anxiety, and as indicated by Salmon (1990), "much of our understanding of music performance anxiety is still derived from studies of other individuals [from other fields] equally prone to anxiety, but perhaps for different reasons and in different ways" (p. 9).

CHAPTER 3: PROCEDURES

Proposal

I completed the research proposal during the summer of 1991 and submitted it to my guidance committee for review in September 1991. The committee unanimously approved the proposal. I subsequently applied to the University Committee on Research Involving Human Subjects (UCRIHS) for permission to conduct the study. After two minor revisions of the Procedures section, UCRIHS also approved the proposal. I began collecting data in November 1991, and finished at the end of the Winter term in March 1992.

Subjects

Forty-two students served as subjects for the research: 11 freshmen, 14 sophomores, 4 juniors, 11 seniors, and 2 graduate students. The graduate students were so close in age to the seniors that I decided to use them to bolster the numbers of the "experienced" group. I decided not to use the data for three subjects in the analysis because of the medications they were using. (Criterion for medical exclusion from the study is described later in this chapter.) Of the remaining 39 students: (a) 27 were male and 12 were female; (b) their ages ranged from 18 to 27 years; (c) there were 11 freshmen, 14 sophomores, 2 juniors, 10 seniors, and 2 graduates; and (d) 7 were horn players, 15 played trumpet, 9 were trombone players, and 8 were from the tuba/euphonium studio.

Brass area music majors at Michigan State University were required to perform two jury recitals during the school year. When these data were collected, the university was on a three-term academic calendar; consequently, the studio teachers decided in which two terms each student would perform. Some of the students involved in the research performed a jury recital in both the Fall and Winter terms, but they were only needed to serve as a subject once.

Cooperation of the four studio teachers was vitally important to the successful collection of the data and to maintain each student's interest in the research. Consequently, I approached the studio teachers very early in the study to inform them of its nature and to secure their support. I kept the studio teachers continually informed as to the progress of the data collection.

The Performance

Music for the jury was co-selected by the individual studio teachers and their students by mid-term (either Fall or Winter term). The material consisted of a solo, several etudes, and possibly some orchestral excerpts or scales and arpeggios (assignments to prepare orchestral excerpts or scales and arpeggios were at the studio teacher's discretion). The difficulty of the music was representative of each student's performance ability, but selected to challenge the student. All subjects had approximately the same time, in terms of calendar days, to prepare for the jury. The students rehearsed the music with assistance from their respective studio teachers.

Jury recitals were held during the first two days of final examinations week for both Fall and Winter terms; on December 9 and 10, 1991, and on March 16 and 17, 1992. Each student signed up during the last week of classes of the Fall term, 1991 and/or Winter term, 1992, for a convenient performance time.

The performances took place in a large-group rehearsal room (room 103) in the Music Practice Building (MPB). The room is used primarily for choral rehearsals, and is constructed accordingly with tiered risers. The adjudicating brass faculty were positioned on the second level, while the performers were on the main floor.

Performances were 15 minutes each and were adjudicated by the four members of the brass faculty--this panel remained constant throughout the research. Each student received a grade (4.0, 3.5, 3.0, . . . 0.0) for his or her performance, which was based on a consensus among the panel members. This grade, considered along with other factors, became the student's term grade (the respective studio teachers had the option to raise or lower their student's jury grade by 0.5 if warranted). After the jury, the subjects received comment sheets about their performance from each member of the panel. I did not use the grade or the comment sheets as part of the research. Spectators were not present in the performance room during the juries.

Obtaining Data

Vital Signs

I used the vital signs of blood pressure, pulse rate, and respiration rate as measurements of physiological response to anxiety. Temperature was not used because I thought that it would not vary enough to be an important factor in determining physiological response. Since I am a licensed Emergency Medical Technician, I personally obtained the vital sign readings. Blood pressures and pulses were routinely measured from each subject's left arm so that the assessments would remain consistent. This was done, because in most people, blood pressures can vary as much as 10 millimeters of mercury (blood pressures are numerically expressed in millimeters of mercury--mm Hg) between their left and right arms.

When taking the vital signs, I assessed pulse rates and respiration rates first. Pulses were measured by palpating the radial artery in the wrist for 15 seconds and then multiplying by 4. Pulse rates are reported in "beats per minute." Next, I assessed respirations by watching the rise and fall of the subject's chest. Respirations were also counted for 15 seconds and multiplied by 4. Respiration rates are reported in "breaths per minute." Full inhalation followed by a full exhalation constitutes 1 breath. The average pulse rate for an adult is between 60 and 80 beats per minute. The average adult respiration rate is between 12 and 20 breaths per minute.

A person's blood pressure is simply the pressure that the blood exerts against the walls of the arteries. Blood pressure has two components, the systole and the diastole. These correspond to the two phases of the cardiac cycle--the contracting (systole) and relaxing (diastole) of the ventricles of the heart. Systolic pressure is the point of highest pressure; the period when the ventricles are contracting. Diastolic pressure is the low pressure point, or the period when the ventricles are relaxed. Because of the two phases, blood pressure measurements are expressed as a fraction, the systolic pressure is the numerator and the diastolic pressure is the denominator.

I assessed blood pressures using a stethoscope and a sphygmomanometer (blood pressure cuff) consisting of an inflatable cuff and a pressure gauge. Blood pressure is measured by wrapping the cuff around the subject's upper arm and placing the stethoscope over the antecubital artery. The cuff is then inflated until the blood flow through the brachial artery in the upper arm is stopped. The air in the cuff is then slowly released. As the pressure in the cuff decreases, blood will resume flowing through the brachial artery. At this point a thumping sound can be ascultated through the stethoscope; this is recorded from the pressure gauge as the systolic pressure. As the cuff deflates further and the blood flow completely resumes, the thumping will eventually disappear; this point is recorded as the diastolic pressure. The normal blood pressure for an adult man is roughly between 100/60 to 140/90. Normal blood pressure for an adult woman is approximately 10 millimeters of mercury lower for both the systolic and diastolic pressures.

Since the systolic pressure and the diastolic pressure can fluctuate differently between readings, I decided to calculate the *mean arterial pressure,* which reduces the reported blood pressure fraction to one number. Using one number to represent the blood pressure also simplified the statistical analysis. Mean arterial pressure is "the average pressure tending to push blood through the systemic circulatory system" (Guyton, 1981, p. 247). Although mean arterial pressure is the average pressure throughout each cycle of the heartbeat, it is not mathematically equal to the average of the systolic and diastolic pressures. The mean arterial pressure is actually slightly less than that average. The formula for computing mean arterial pressure is as follows:

$$[(\text{systolic} - \text{diastolic}) \div 3] + \text{diastolic} = \text{mean arterial pressure}.$$

Assuming that the average adult blood pressure is 120/80, the average mean arterial pressure will be 93 millimeters of mercury.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (Spielberger, Gorusch, Lushene, Vagg, & Jacobs, 1983) consists of two self-report scales; one scale measures state anxiety, and the other measures trait anxiety. Both scales consist of 20 questions each that are printed on opposite sides of a test form. The state-anxiety portion of the inventory assesses how a person feels "right now, at this moment," while the trait-anxiety portion assesses how a person generally feels. I used the state-anxiety portion of the inventory exclusively in this research, and will be referring to only this section when "STAI" is mentioned.

Qualities that are evaluated by the state-anxiety scale are feelings of apprehension, tension, nervousness, and worry about a situation from the past, the present, or an event that will occur in the future. Spielberger et al. (1983) have found that the scale is a sensitive indicator of transitory anxiety in a wide variety of stressful settings. When I administered the STAI during this research, I asked the students to indicate how they were "feeling right now, at this moment, about the upcoming jury."

Subjects responded to the STAI items by blackening the appropriate circled number to the right of each statement that best indicated the intensity of their feelings: (1) not at all, (2) somewhat, (3) moderately so, and (4) very much so. Each item was assigned a weighted score of 1 to 4. Marking selection 4 (very much so) indicated the presence of a high anxiety level on 10 of the statements. For example, on statements such as "I feel uneasy" or "I feel agitated," a response of 4 would indicate high anxiety and receive a score of 4. For the remaining 10 items, a response of 1 (not at all) indicated high anxiety and received a weighted score of 4. Statements such as, "I feel sure of myself" or "I am composed" would be good examples. (I devised these statements for purposes of example only. They are similar to, but not actual statements from the *State-Trait Anxiety Inventory*.)

To score the STAI, I added the weighted scores for the 20 items. The scoring template that is provided with the test manual takes into account the reversed scores of the items described above. The total scores can vary from 20, indicating extremely low anxiety, to as score of 80, which would suggest a high level of anxiety. Spielberger et al. (1983) reports that the normative mean score for college students is 36.47 for males, and 38.76 for females.

Heart Monitor

The Polar Vantage XL Heart Rate Monitor (Polar USA, Inc., Stamford, CT) was used to monitor heart rates throughout the dress rehearsal situations and during the jury recitals. The *Vantage XL* is the updated successor to the CIC Heartwatch, Model 8799, which was evaluated and described in detail by LeBlanc, Shehan Campbell, and Codding (1992). The monitor is a battery powered, remote monitor that operates without the use of cumbersome wires or adhesive electrodes. Its parts consist of a sensor/transmitter, an elastic chest band, and a wrist monitor.

In order to avoid confusion for the reader, I will refer to all measurements from the heart monitor as "heart rate," while palpated pulse rates from the vital signs assessments will always be referred to as "pulse rates." These designations will remain consistent throughout the dissertation.

The sensor/transmitter is snapped on to the adjustable elastic chest band that contains conductive electrodes on its inside. The chest band is worn with the sensor/transmitter centered on the anterior side of the chest approximately 1 to 2 inches below the pectoral muscles (breasts). The wrist monitor is approximately the same size as a large wrist watch, and is worn in the same fashion. It is the computer portion of the Vantage XL and can be programmed to record a heart rate at either 05, 15, or 60 second intervals. For the purpose of this study, 15 second intervals were used. The wrist monitor has the capability of recording eight separate files, after which it can be downloaded to a computer for data analysis. The computer used throughout the study for this purpose was a Zenith, Model 159. Precise instructions for fitting and wearing the Vantage XL (to be referred to as the "heart monitor" in future references) were provided for the subjects during their "familiarization" practice session several weeks before the jury (see Appendix A).

The heart monitor was used to monitor heart rates during the performances to determine if arousal levels dropped or if they continued to rise. In several self-report studies from the sport literature, subjects reported lower anxiety levels during the actual performance (Highlen & Bennett, 1979; Mahoney & Avener, 1977; Meyers, Cooke, Cullen, & Liles, 1979). Utilizing the heart monitor, I was able to determine actual levels of physiological arousal throughout the performance. Of the studies that I reviewed that continuously monitored arousal during the performance, the performance situations were contrived especially for the research and may not have elicited adequate levels of arousal.

Gathering Data

After the research proposal was approved by the UCRIHS in November 1991, I presented a lecture on performance anxiety at a brass master class and explained the proposed research. At this lecture, I provided a concise written description of the procedures for the studio teachers and for the students (see Appendix B).

I had originally proposed to start the research during the third week of the term but did not obtain UCRIHS approval until much later. Consequently, the dates for the start of the research that are indicated in Appendix B (which was part of the original proposal) are not completely accurate.

The studio teachers had provided me with a list of students who would be performing a jury in the Fall or Winter terms. I met these potential subjects at their lessons during the following week and asked them to participate in the study. Interested students who volunteered signed a form agreeing to participate in the research (see Appendix C) and completed a confidential questionnaire concerning their present health and medications (see Appendix D).

A medical doctor screened the questionnaires to determine each subject's medical eligibility to participate in the study. Exclusion resulted if a subject's vital signs were adversely affected by a medical condition or by prescribed medications; for example, if a medication caused a significant deviation from previous vital sign assessments. Students with the following medical conditions, or who were taking the listed medications, were considered for exclusion from the study:

1. Smokers.

2. Students whose base line vital signs were consistently abnormal (e.g., obese students with hypertension).

3. Anyone taking beta-blocking or anxiolytic medication, for any reason, at any time, during the course of the study.

4. Anyone taking cold medications or antihistamines on the day of the jury.

5. Anyone taking cardiovascular medications.

6. Anyone taking asthma medications.

7. Anyone taking medications that would directly affect the central nervous system.

I asked the participants not to consume abnormal amounts (relative to their usual consumption) of caffeine (coffee, tea, soft drinks, and so forth), and to refrain from vigorous exercise for at least three hours before each assessment of vital signs. I also asked them to abstain from alcohol for at least 12 hours before each assessment. I provided all the subjects with a handout documenting the activities and substances they needed to avoid during the study. This information was part of the student's copy of the agreement to participate form (see Appendix C).

During the seventh week of each term (four weeks before the jury), I obtained baseline vital signs (blood pressure, pulse, and respirations) and administered the initial State-Trait Anxiety Inventory (STAI) before each student's lesson. For the next three weeks, I monitored vital signs and administered additional STAIs once a week before each student's lesson. Each subject wore the heart monitor in his or her lesson several weeks before the jury for purposes of familiarization only. The data from these sessions was not used in the research.

During the week before the jury, each subject's lesson was predetermined with the brass faculty to be a dress rehearsal situation. When applicable, the subject's accompanist was present to provide a more realistic setting. I obtained an additional set of vital signs and an STAI immediately before their lessons; and had the students wear the heart monitor to record pulse rates for five minutes before, and for five minutes during their lessons. I recorded an "intermediate time" on the computer analysis by pushing a button on the monitor when the subjects entered their lessons and juries. Using this "intermediate time," I was able to calculate 5 minutes before and 5 minutes during the performances. Pulse rates were recorded by the monitor at 15 second intervals. Jury materials were rehearsed exclusively during the monitored period.

On the day of the jury, vital signs and STAIs were obtained at the following times:

1. In the morning, each subject completed an STAI at home before leaving for school. Vital signs were not assessed at this time. A few subjects forgot to do this and were asked, when they arrived at school, to recall how they felt at home that morning.

2. I asked the subjects to report to room 102 MPB when they arrived at the School of Music. Room 102 is a small classroom adjacent to the performance room. There, they filled out a second STAI and I obtained the first set of vital signs. I used these assessments to determine if arousal and anxious cognitions were greater before the students warmed-up and possibly began "task-oriented" thinking.

3. I obtained a third assessment immediately before the performance. I asked the students to report to room 102 MPB no later than 20 minutes before their assigned performance time; 5 minutes to put on the heart monitor (a small

storage room in room 102 was used for privacy), 10 minutes to complete the STAI, and an additional 5 minutes to obtain vital signs.

Each student's pulse rate was recorded, by way of the heart monitor for 5 minutes before, and for the entire performance. Pulse rates were recorded by the monitor at 15 second intervals.

After the performance, I asked each subject to complete a questionnaire entitled "Coping With Performance Anxiety Questionnaire" (see Appendix E) that asked about the methods they have used to deal with performance anxiety. I included the results of the questionnaire in this document to provide a comparison of the answers of the experienced versus the inexperienced performers. At the end of the questionnaire, I asked the subjects to comment on the events that transpired during the study and to suggest improvements that may benefit future research.

CHAPTER 4: DATA ANALYSIS

To report concisely the findings of this research, I have structured Chapter 4 to first describe how the raw data was organized, and then to define what statistical procedures were used for the analysis. The remainder of the chapter will be given over to conveying the results of the data analysis. This will be accomplished by describing separately the findings for blood pressures, pulse rates, respiration rates, and STAI scores, and then examining the interactions between each of these variables. I have devoted the final section to presenting the monitor readings for the dress rehearsal and jury.

Procedures

Raw Data Collection

I collected raw data for blood pressures, pulse rates, respiration rates, and scores from the state-anxiety portion of the *State-Trait Anxiety Inventory* for each subject throughout either the Fall or Winter term. These data were recorded on the *Individual Student Record* form (see Appendix F). Data from the Polar Vantage XL Heart Rate Monitor, recorded during the dress rehearsals and juries, was downloaded on a Zenith, Model 159 computer and stored on two floppy disks. I made hard copies of these data when the juries were completed at the end of the winter term.

When the data collection process was completed, I compiled plain text, free format ASCII files on a Macintosh SE computer using the Microsoft Word 4.0 word processing application. Labels for continuous and categorical variables were constructed using the Data Editor of the SYSTAT 5.1 statistical package (Wilkinson, 1989b). I then imported the ASCII files to the Data Editor and arranged the cases by class (freshmen through graduates) for subsequent analysis.

It became apparent that several cases had missing values for the vital signs and STAI scores that were to have been gathered upon the subjects' arrival at the School of Music on the day of the jury. For the subjects performing their juries early in the morning, this assessment was impractical because time did not permit two assessments before their scheduled jury. Other students simply forgot that this assessment was to be taken. To insure a complete matrix of values, I decided to eliminate this assessment from the list of dependent variables. The two remaining assessments on the day of the jury are the STAI taken at home before leaving for school, and the vital signs and STAI immediately before the performance. I determined that eliminating this variable would not impair the results of the study because two measurements were still available to assess anxiety on the jury day.

Exploratory Analysis

I accomplished the exploratory data analysis by constructing line graphs of the raw data using SYGRAPH (Wilkinson, 1989a), which is the graphics package of the SYSTAT program. I devised the graphs using, as dependent variables, assessments of the subjects' of blood pressures, pulse rates, and respiration rates (5 assessments each); STAI scores (6 scores); heart monitor readings for the dress rehearsal (10 readings); and heart monitor readings for the jury (12 readings). These variables comprised the Y axes of the graphs. The various assessments taken over time comprised the X axes. Each dependent variable was examined for each of three samples: (a) the entire research population, (b) the inexperienced subjects (freshmen and sophomores), and (c) the experienced subjects (juniors, seniors, and graduates). Throughout the analysis, I made comparisons between the inexperienced sample and the experienced sample to determine if there were significant differences between the two groups. I determined statistical significance to be at the .05 level for all the analyses.

Statistical Analysis

I began the statistical analysis by running descriptive statistics for each dependent variable, and frequencies for the categorical variables of age, gender, and class level. Frequencies are reported in the "Subjects" section of Chapter 3. Like the graphs, descriptive statistics were calculated for the total research population, inexperienced performers (freshmen and sophomores), and experienced performers (juniors, seniors, and graduates).

To test for significant differences between the inexperienced and experienced samples, I ran independent samples *t*-tests on blood pressures, pulse rates, respiration rates, STAI scores, and monitor readings for the dress rehearsal and the jury. Because the number of subjects varied greatly between the inexperienced group ($n = 25$) and the experienced group ($n = 14$), I used the *t*-test formula for pooled variances.

One of the major goals of this study was to measure the changes in anxiety and arousal occurring over time. To accomplish this, I ran a one-way analysis of variance on repeated measures for each of the five assessments of blood pressure, pulse, and respirations, and the six assessments of the STAI. I also ran repeated measures on the monitor readings for the dress rehearsal and the jury. When the repeated-measures test showed significant changes over time, I ran paired samples *t*-tests to determine those variables that showed significant differences. A matrix of probabilities for each variable in each category (population, inexperienced, and experienced) is included in the text.

To interpret these matrices, locate a measurement in the left column to compare with a measurement in the top row, for an example refer to Table 3. To compare the blood pressure assessment in week 1 with the blood pressure assessment of week 2, locate "Week 1" in the left column and "Week 2" in the top row. This paired samples *t*-test probability is 0.54. It is beneficial to refer often to the graph corresponding to the matrix being analyzed. The most important cells of these matrices are those that show changes from week to week: Week 1 with Week 2, Week 2 with Week 3, Week 3 with Dress, and Dress with Jury. For the STAI scores the AM score must be considered: Dress with AM, and AM with Jury is the appropriate order. For a complete set of statistics from the paired *t*-test analysis, see Appendix G.

To investigate further the relationships of the data over time, trend analyses (polynomial contrasts) were run with the ANOVAs on each set of dependent variables. Since there were five levels of the independent variable for the vital signs (Weeks 1-3, Dress, and Jury), six levels for the STAI scores, and even more for the monitor readings, I was able to test for linear, quadratic, cubic, and quartic trends in the data. These tests were run to determine whether a trend departed significantly from the linear, and, if so, was the relationship quadratic, cubic, or quartic. More than one trend was often statistically significant; for instance, in the case of the STAI scores for the population (see Figure 12), a quartic trend was accompanied by a linear and a quadratic trend. In the text, I generally reported only those trends that were statistically significant.

Another goal of this study was to determine the degree of relationship between variables, particularly the vital signs relative to the STAI since they were assessed at the same times. I especially wanted to determine if increases and decreases between the variables showed a significant correlation. To achieve this goal I ran Pearson product-moment correlation coefficients on each assessment of blood pressure, pulse, respirations, and STAI.

Results for the Vital Signs and STAI

Assessments for weeks 1, 2, and 3 on the blood pressure, pulse, and respiration graphs indicate the mean levels of physiological arousal that were recorded before the student's lessons 4, 3, and 2 weeks respectively, prior to the jury. The next assessment shows the mean arousal level immediately before the dress rehearsal during the week prior to the jury. This assessment is labeled "DRESS" on the graphs and in the statistical analysis. The last assessment is the level taken immediately before the jury, and is labeled "JURY" throughout the analysis.

The levels of psychological anxiety, as depicted by the STAI graphs, were administered at identical times as the corresponding assessments presented on the vital signs graphs. An exception is the "AM" score, which was taken to indicate the level of anxiety on the day of the jury, before the subjects left for school in the morning (no vital signs were taken at this time). Descriptive statistics for each variable accompany their corresponding graphs.

Blood Pressures

I converted the two numbers of the blood pressure (systolic and diastolic) to one number, the "mean arterial pressure," to simplify the data analysis; consequently, all the information on the graphs and in the statistical analysis is a result of this conversion. The formula to determine mean arterial blood pressure is found in the "Vital Signs" section of Chapter 3. Throughout the text, I have referred to the mean arterial blood pressure as, simply, "blood pressure."

The blood pressure graph for the research population (see Figure 5) shows a slight decrease over the first three assessments and then a dramatic increase before the dress rehearsal. This is followed by another increase before the jury. The magnitude of the blood pressure increases can also be seen by examining the "mean" and "minimum" in the descriptive statistics (see

Table 1). For the first three assessments, the means are slightly above 86, but before the dress rehearsal, they increase to 90.15 and then to 94.08 before the jury. This is an increase of over 8 millimeters of mercury (mm Hg). An even more abrupt increase is seen in the "minimum" statistics. Between the dress rehearsal and the jury, there is an increase of 10 mm Hg.

The repeated-measures analysis determined that the blood pressure assessments showed significant changes over time, and that there was a linear and quadratic relationship between the assessments with the linear effect being stronger (see Table 2). The results of the paired samples *t*-tests (see Table 3) verified the findings of the repeated-measures analysis and explained the abrupt increases in blood pressure before the dress rehearsal and jury performance. Significance was found for all comparisons of the dress rehearsal and jury.

The abrupt increases on the last two assessments are not surprising, since these assessments were taken before potentially stressful situations. What is curious, however, is the decrease in blood pressure between the first and second readings. One explanation may be that for the first assessment the students were not accustomed to being scrutinized by a researcher before their lessons. The fact that the data gathering process was new to them during this first meeting and that they had to fill out three forms, along with an assessment of their vital signs, may have initiated the relatively slight increase in blood pressure.

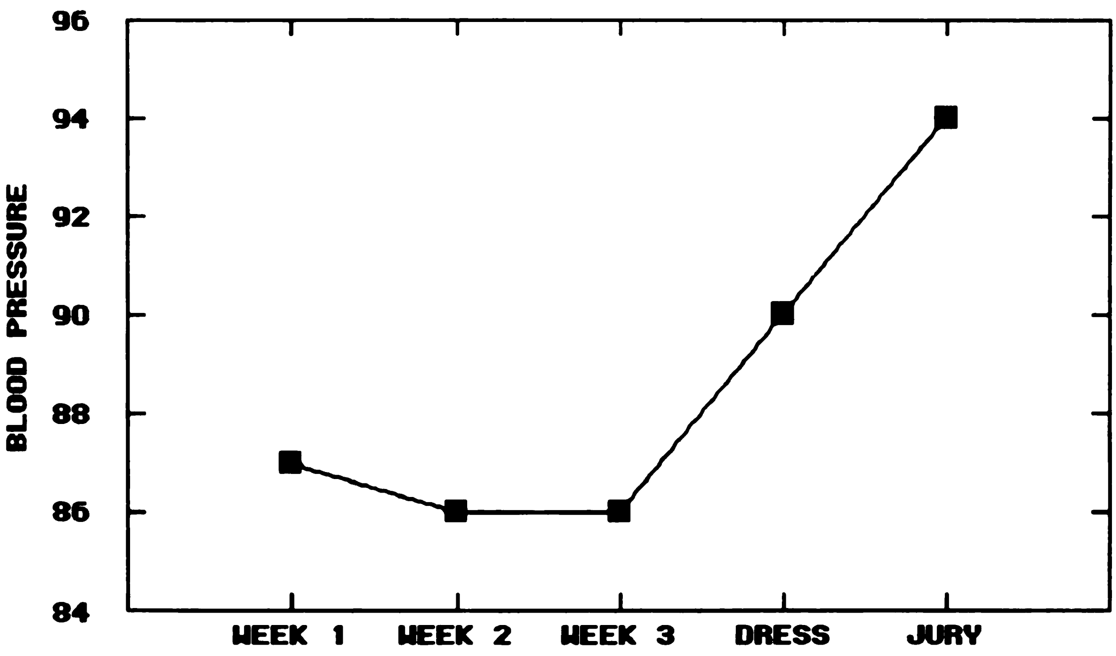

Figure 5. Mean blood pressures of the research population.

Table 1

Descriptive Statistics: Blood Pressures for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	39	39	39	39	39
Minimum	69.00	75.00	70.00	71.00	81.00
Maximum	107.00	108.00	116.00	105.00	109.00
Range	38.00	33.00	46.00	34.00	28.00
Mean	86.85	86.13	86.03	90.15	94.08
Variance	66.29	53.54	68.13	57.50	53.70
SD	8.14	7.32	8.25	7.58	7.33

Table 2

Repeated-Measures ANOVA: Blood Pressures for the Research Population

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	1332.93	1	1332.93	35.69	0.00
Error	1419.17	38	37.35		
2 (quadratic)	508.66	1	508.66	14.90	0.00
Error	1297.41	38	34.14		

Test Statistics

F-Statistic = 13.29 DF = 4, 35 Probability = 0.00

Table 3

Paired Samples *t*-tests Matrix of Probabilities: Blood Pressures for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.54	0.58	0.01	0.00
Week 2			0.92	0.00	0.00
Week 3				0.00	0.00
Dress					0.00
Jury					

The graph showing the blood pressure comparisons between the inexperienced and experienced groups (see Figure 6) is noteworthy in that the experienced subjects were considerably higher for all assessments. The exception was before the jury when the inexperienced subjects were only slightly below the experienced group. The experienced subjects showed steady increases over time, while the inexperienced subjects displayed a similar pattern to the population chart (see Figure 5). That is, the mean blood pressures of the inexperienced group decreased slightly after the first reading, and then rose rapidly before the dress rehearsal and again before the jury. This resemblance is probably due to the greater number of subjects in the inexperienced group (25 subjects out of a population of 39) influencing the overall mean of the research population. The independent samples *t*-tests support what is shown on the graph. Significant differences were found between the inexperienced and experienced subjects for week 2, week 3, and the dress rehearsal (see Table 6).

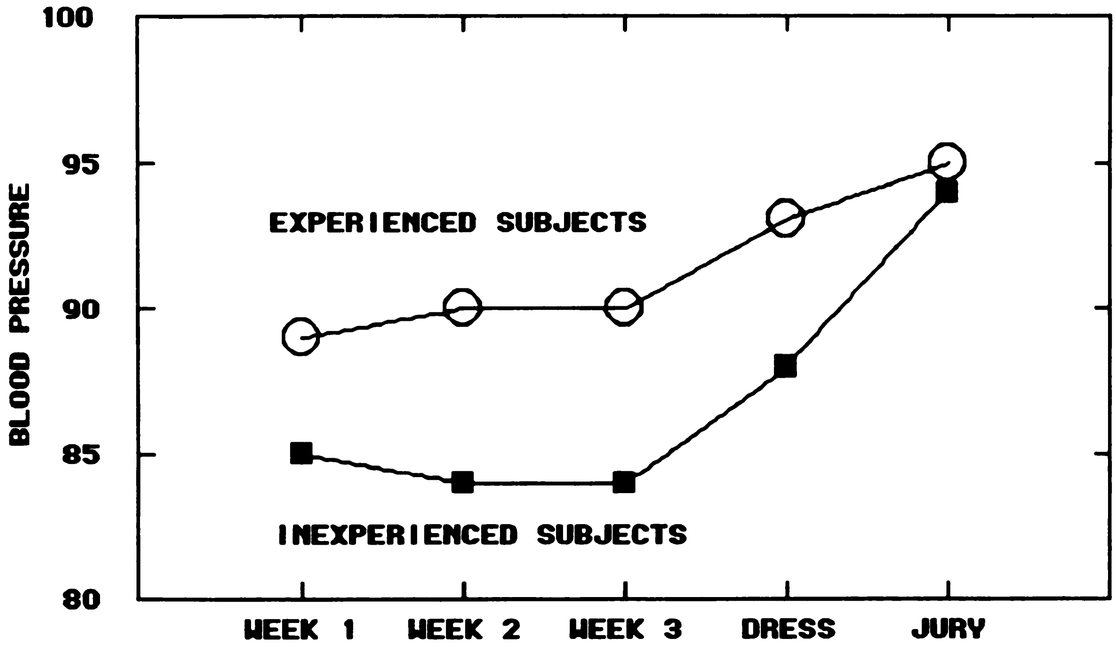

Figure 6. Mean blood pressures: A comparison between the inexperienced and experienced subjects.

Table 4

Descriptive Statistics: Blood Pressures for the Inexperienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	25	25	25	25	25
Minimum	69.00	75.00	70.00	71.00	81.00
Maximum	100.00	93.00	94.00	100.00	108.00
Range	31.00	18.00	24.00	29.00	27.00
Mean	85.48	83.88	83.56	88.32	93.76
Variance	54.09	29.86	35.340	50.31	49.61
SD	7.36	5.46	5.95	7.09	7.04

Table 5

Descriptive Statistics: Blood Pressures for the Experienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	14	14	14	14	14
Minimum	78.00	76.00	73.00	76.00	83.00
Maximum	107.00	108.00	116.00	105.00	109.00
Range	29.00	32.00	43.00	29.00	26.00
Mean	89.29	90.14	90.43	93.43	94.64
Variance	83.91	74.29	101.34	57.19	64.86
SD	9.16	8.62	10.07	7.56	8.05

Table 6

Independent Samples *t*-tests for Blood Pressures Grouped by Level of Experience

Week 1

Group	Number	Mean	Standard Deviation
Inexperienced	25	85.48	7.36
Experienced	14	89.29	9.16
Pooled Variances	T = -1.42	DF = 37	Probability = 0.16

Week 2

Group	Number	Mean	Standard Deviation
Inexperienced	25	83.88	5.46
Experienced	14	90.14	8.62
Pooled Variances	T = -2.78	DF = 37	Probability = 0.01

Week 3

Group	Number	Mean	Standard Deviation
Inexperienced	25	83.56	5.95
Experienced	14	90.43	10.07
Pooled Variances	T = -2.69	DF = 37	Probability = 0.01

Table 6 (cont'd)

Dress Rehearsal			
Group	Number	Mean	Standard Deviation
Inexperienced	25	88.32	7.09
Experienced	14	93.43	7.56
Pooled Variances	T = -2.11	DF = 37	Probability = 0.04
Jury			
Group	Number	Mean	Standard Deviation
Inexperienced	25	93.76	7.04
Experienced	14	94.64	8.05
Pooled Variances	T = -0.36	DF = 37	Probability = 0.72

The repeated-measures ANOVA for the inexperienced sample shows that there were significant changes over time, and that the data displays both a linear and quadratic trend (see Table 7). As in the population analysis, the linear effect is much stronger. Significant differences between the two experience levels were found on the paired *t*-tests between weeks 2 and 3 with the dress rehearsal, and all assessments with the jury performance indicating a significant increase in blood pressure for the dress rehearsal and the jury (see Table 8).

The statistics for the experienced subjects, however, do not show significant changes and display only a linear trend (see Table 9). This finding is supported by the paired *t*-tests, which do not show any significant differences except between week 1 and the dress rehearsal (see Table 10).

Table 7

Repeated-Measures ANOVA: Blood Pressures for the Inexperienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	1102.50	1	1102.50	32.23	0.00
Error	821.00	24	34.21		
2 (quadratic)	655.55	1	655.55	19.98	0.00
Error	787.53	24	32.81		

Test Statistics

F-Statistic = 18.52 DF = 4, 21 Probability = 0.00

Table 8

Paired Samples *t*-tests Matrix of Probabilities: Blood Pressures for the Inexperienced Sample

	Week 1	**Week 2**	**Week 3**	**Dress**	**Jury**
Week 1		0.28	0.32	0.09	0.00
Week 2			0.78	0.00	0.00
Week 3				0.00	0.00
Dress					0.00
Jury					

Table 9

Repeated-Measures ANOVA: Blood Pressures for the Experienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	274.40	1	274.40	6.44	0.03
Error	554.20	13	42.63		
2 (quadratic)	11.76	1	11.76	0.44	0.52
Error	351.25	13	27.02		

Test Statistics

F-Statistic = 1.50 DF = 4, 10 Probability = 0.28

Table 10

Paired Samples *t*-tests Matrix of Probabilities: Blood Pressures for the Experienced Sample

	Week 1	**Week 2**	**Week 3**	**Dress**	**Jury**
Week 1		0.67	0.61	0.04	0.06
Week 2			0.89	0.11	0.08
Week 3				0.21	0.09
Dress					0.60
Jury					

Pulse Rates

The graph of mean pulse rates for the population (see Figure 7) demonstrates a steady increase over time. Like the blood pressure graph, there is a dramatic increase before the dress rehearsal and another before the jury. An interesting observation is that the first assessment of pulse rates was not higher than the second, as was displayed with the blood pressures. The results of the repeated-measures ANOVA shows corroboration with the graph, as the changes over time were found to be significant. Like the blood pressure results, the pulse rates have a very strong linear relationship, as well as a quadratic trend (see Table 12). The paired *t*-tests confirm the other statistics by showing significance on all measures with the dress rehearsal and the jury (see Table 13).

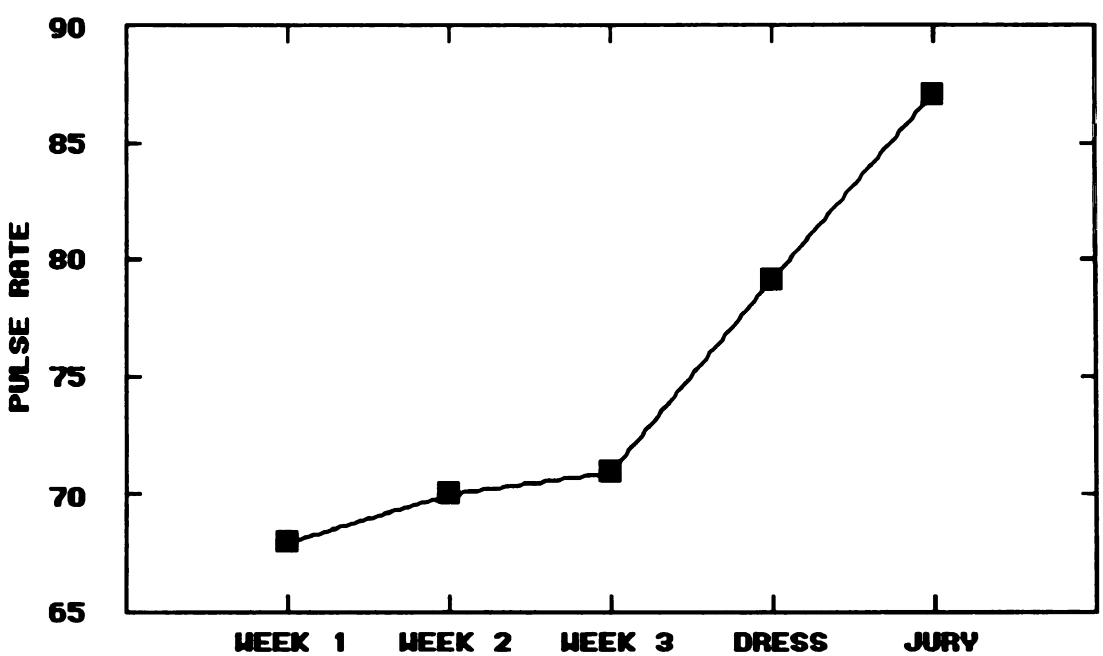

Figure 7. Mean pulse rates of the research population.

Table 11

Descriptive Statistics: Pulse Rates for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	39	39	39	39	39
Minimum	52.00	40.00	44.00	60.00	56.00
Maximum	88.00	112.00	100.00	100.00	120.00
Range	36.00	72.00	56.00	40.00	64.00
Mean	68.00	70.46	70.77	78.97	86.56
Variance	114.53	164.73	137.39	138.50	206.52
SD	10.70	12.84	11.72	11.77	14.37

Table 12

Repeated-Measures ANOVA: Pulse Rates for the Research Population

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	8124.10	1	8124.10	63.66	0.00
Error	4849.50	38	127.62		
2 (quadratic)	918.07	1	918.07	9.60	0.00
Error	3635.65	38	95.68		

Test Statistics

F-Statistic = 16.02 DF = 4, 35 Probability = 0.00

Table 13

Paired Samples *t*-tests Matrix of Probabilities: Pulse Rates for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.26	0.11	0.00	0.00
Week 2			0.90	0.00	0.00
Week 3				0.00	0.00
Dress					0.01
Jury					

The graph showing the inexperienced/experienced comparison (see Figure 8) is complicated by the fact that the relationships are not as simple as with the blood pressures. In the first assessment, the experienced subjects were higher than the inexperienced. The second and third assessments showed no remarkable contrasts, but before the dress rehearsal, the experienced subjects were again higher. Before the jury, however, the inexperienced subjects were assessed above the experienced, who showed a similar level of arousal for the dress rehearsal and jury. This reversal may be because the inexperienced performers, many of whom were playing a jury for the first time, did not know what to expect in the performance. The closeness of these measures is demonstrated by the independent samples *t*-tests, as no significant differences were found between the two groups (see Table 16).

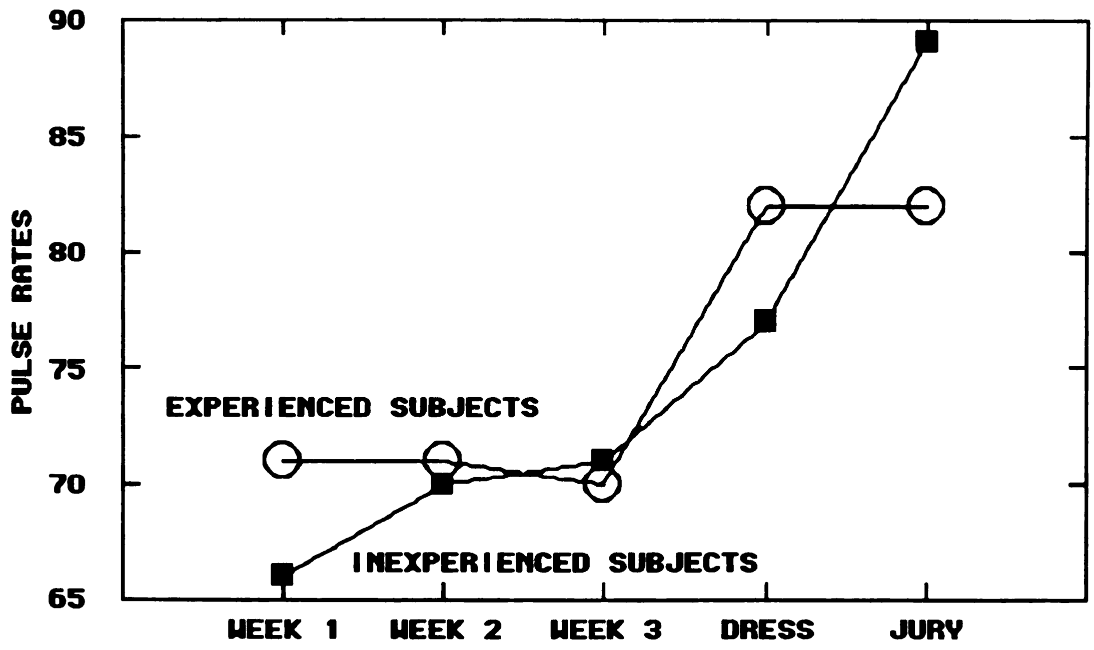

Figure 8. Mean pulse rates: A comparison between the inexperienced and experienced subjects.

Table 14

Descriptive Statistics: Pulse Rates for the Inexperienced Subjects

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	25	25	25	25	25
Minimum	52.00	40.00	56.00	60.00	72.00
Maximum	80.00	112.00	100.00	100.00	120.00
Range	28.00	72.00	44.00	40.00	48.00
Mean	66.08	70.08	71.36	77.44	89.20
Variance	105.49	182.83	110.24	130.51	158.67
SD	10.27	13.52	10.50	11.42	12.60

Table 15

Descriptive Statistics: Pulse Rates for the Experienced Subjects

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	14	14	14	14	14
Minimum	52.00	44.00	44.00	60.00	56.00
Maximum	88.00	96.00	96.00	100.00	120.00
Range	36.00	52.00	52.00	40.00	64.00
Mean	71.43	71.14	69.71	81.71	81.86
Variance	120.26	143.21	196.22	151.30	273.52
SD	10.97	11.97	14.01	12.30	16.54

Table 16

Independent Samples *t*-tests for Pulse Rates

Grouped by Level of Experience

Week 1

Group	Number	Mean	Standard Deviation
Inexperienced	25	66.08	10.27
Experienced	14	71.43	10.97
Pooled Variances	T = -1.52	DF = 37	Probability = 0.14

Week 2

Group	Number	Mean	Standard Deviation
Inexperienced	25	70.08	13.52
Experienced	14	71.14	11.97
Pooled Variances	T = -0.25	DF = 37	Probability = 0.81

Week 3

Group	Number	Mean	Standard Deviation
Inexperienced	25	71.36	10.50
Experienced	14	69.71	14.01
Pooled Variances	T = 0.42	DF = 37	Probability = 0.68

Table 16 (cont'd)

Dress Rehearsal			
Group	Number	Mean	Standard Deviation
Inexperienced	25	77.44	11.42
Experienced	14	81.71	12.30
Pooled Variances	T = -1.09	DF = 37	Probability = 0.28
Jury			
Group	Number	Mean	Standard Deviation
Inexperienced	25	89.20	12.60
Experienced	14	81.86	16.54
Pooled Variances	T = 1.56	DF = 37	Probability = 0.13

Repeated-measures ANOVAs for both the inexperienced and experienced samples report significant changes in pulse rates over time. The polynomial contrasts for the inexperienced sample shows a linear and quadratic trend with the linear being stronger, while the experienced sample displays only a linear trend (see Tables 17 and 19).

These findings are corroborated by the paired samples *t*-tests. The inexperienced sample shows significant differences on all but two measures--week 1 with week 2, and week 2 with week 3--thus indicating a significant increase in pulse rate before the dress rehearsal and again before the jury (see Table 18). In the paired *t*-test analysis for the experienced sample, significant differences were found between all but one of the measures with the dress rehearsal and the jury. The exception was the assessment between the dress rehearsal and the jury where the mean pulse rates were almost identical (see Table 20).

Table 17

Repeated-Measures ANOVA: Pulse Rates for the Inexperienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	7182.40	1	7182.40	50.49	0.00
Error	3414.40	24	142.27		
2 (quadratic)	737.33	1	737.33	6.74	0.02
Error	2626.10	24	109.42		

Test Statistics

F-Statistic = 13.11 DF = 4, 21 Probability = 0.00

Table 18

Paired Samples *t*-tests Matrix of Probabilities: Pulse Rates for the Inexperienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.20	0.02	0.00	0.00
Week 2			0.68	0.05	0.00
Week 3				0.02	0.00
Dress					0.00
Jury					

Table 19

Repeated-Measures ANOVA: Pulse Rates for the Experienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	1382.86	1	1382.86	18.09	0.00
Error	993.94	13	76.46		
2 (quadratic)	204.08	1	204.08	2.69	0.13
Error	986.20	13	75.86		

Test Statistics

F-Statistic = 5.04 DF = 4, 10 Probability = 0.02

Table 20

Paired Samples *t*-tests Matrix of Probabilities: Pulse Rates for the Experienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.91	0.52	0.02	0.00
Week 2			0.69	0.01	0.02
Week 3				0.01	0.00
Dress					0.98
Jury					

To summarize the data for the pulse rates, it can be noted that the inexperienced subjects had fairly steady increases in arousal as the performance time approached. The experienced subjects, on the other hand, abruptly moved between a lower plateau during the first three weeks of data collection, and then a higher plateau for the dress rehearsal and jury performance. One of the more remarkable aspects of this data is the difference in the range exhibited by the two samples, as represented by the bar graph in Figure 9. The mean pulse rates for the experienced performers ranged from a low of 71.43 to a high of 81.86, a difference of 10.43 beats per minute. The inexperienced subjects, on the other hand, began the study with a mean pulse rate of 66.08, and increased 23.12 beats per minute to a mean pulse rate of 89.20 immediately before the jury.

A possible explanation for the difference in arousal patterns between the two samples may be that the experienced subjects did not perceive the approaching jury performance as being threatening and consequently did not exhibit increased arousal for the first three assessments. The increase in pulse rates for the experienced performers at the dress rehearsal and jury may be explained as the natural "psyching-up" process, as described by Weinberg, Gould, and Jackson (1980), needed to prepare for the performance. The inexperienced performers, however, may have continued to ruminate about the approaching jury performance, thereby increasing their pulse rates at each assessment.

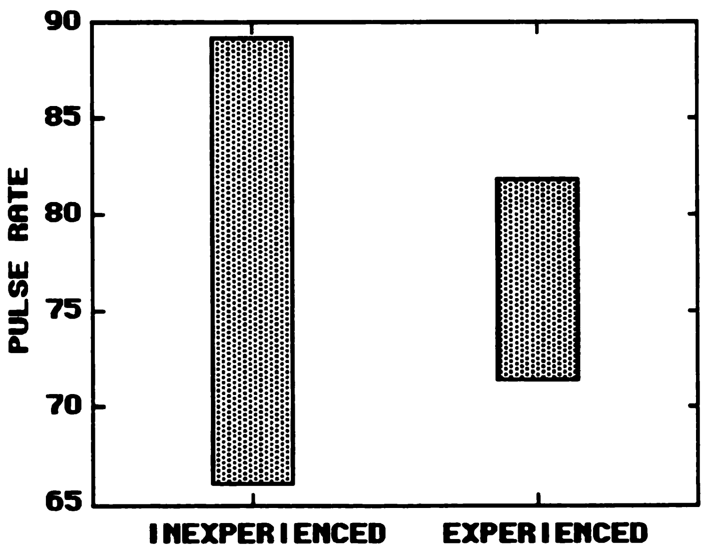

Figure 9. A comparison of the range of pulse rates between the inexperienced and experienced subjects.

Respiration Rates

The assessments of respiration rates (see Figure 10) appear to show dramatic changes, but upon closer inspection, the reader will find that the range of mean levels is between 13 and 16 breaths per minute--all within the "normal" range for an average adult. Even within this small scale, however, increased respiration rates were assessed before the dress rehearsal and again before the jury, with the respiration rates at the time of the jury performance being higher than those recorded at any other time in the study. Since a goal of this study was to measure changes in arousal and anxiety over time, these increases were considered to be important and were corroborated by the repeated-measures ANOVA, which demonstrated that the changes were significant. The polynomial contrasts showed that these data have both a linear and a quadratic relationship (see Table 22). In the paired samples *t*-tests, all but one of the significant differences are found with the jury situation. This indicates that the largest increase in respiration rates took place before the jury (see Table 23). This finding supports the other analyses of respiration rates for the research population.

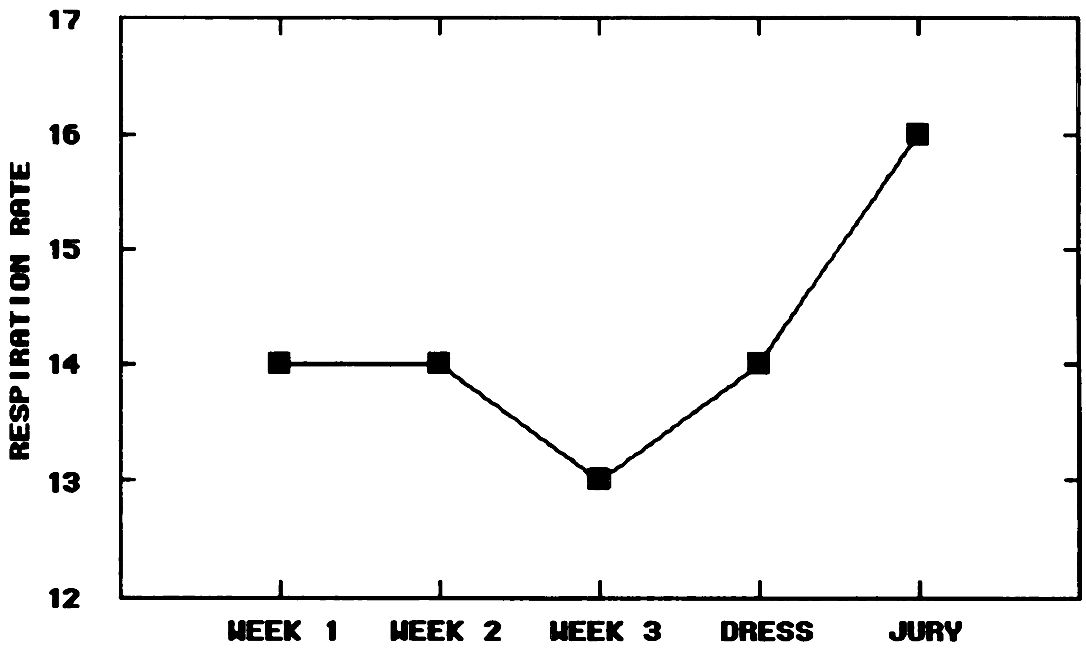

Figure 10. Mean respiration rates of the research population.

Table 21

Descriptive Statistics: Respiration Rates for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	39	39	39	39	39
Minimum	12.00	12.00	12.00	12.00	12.00
Maximum	20.00	20.00	16.00	20.00	28.00
Range	8.00	8.00	4.00	8.00	16.00
Mean	13.54	13.64	13.44	14.46	15.80
Variance	6.41	5.66	3.78	7.26	14.27
SD	2.53	2.38	1.94	2.69	3.78

Table 22

Repeated-Measures ANOVA: Respiration Rates for the Research Population

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	110.93	1	110.93	16.40	0.00
Error	257.07	38	6.77		
2 (quadratic)	37.98	1	37.98	6.17	0.02
Error	234.02	38	6.16		

Test Statistics

F-Statistic = 4.33 DF = 4, 35 Probability = 0.01

Table 23

Paired Samples *t*-tests Matrix of Probabilities: Respiration Rates for the Research Population

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.82	0.82	0.08	0.00
Week 2			0.66	0.17	0.00
Week 3				0.05	0.00
Dress					0.06
Jury					

The inexperienced/experienced comparison graph (see Figure 11) shows a rather close relationship between the two groups. The independent samples *t*-tests confirm what is seen on the graph by demonstrating that the differences between the two samples is not significant (see Table 26).

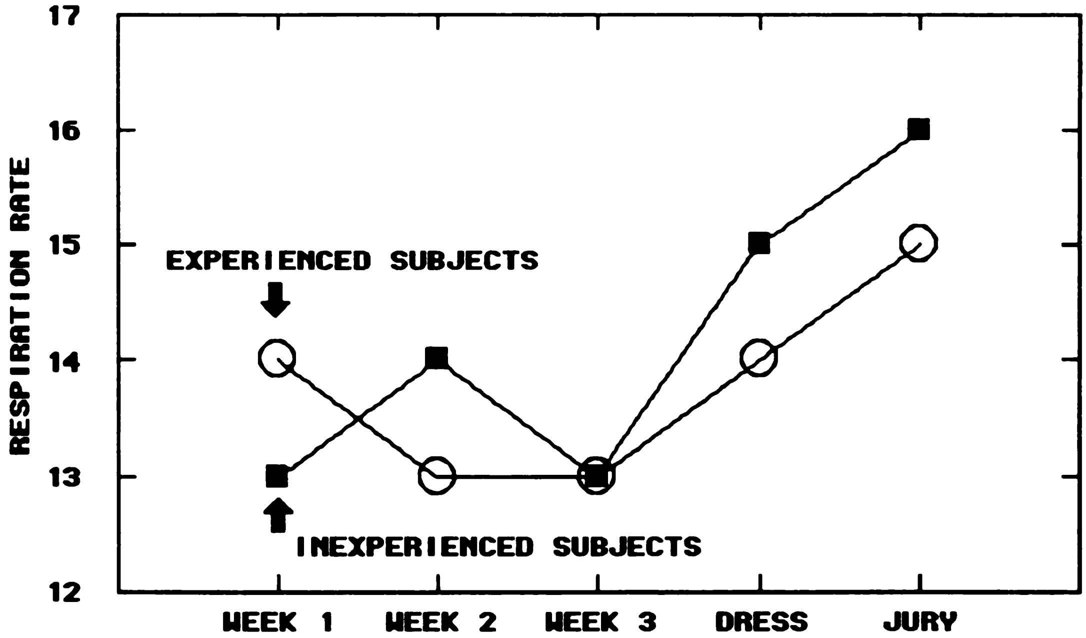

Figure 11. Mean respiration rates: A comparison between the inexperienced and experienced subjects.

Table 24

Descriptive Statistics: Respiration Rates for the Inexperienced Subjects

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	25	25	25	25	25
Minimum	12.00	12.000	12.000	12.00	12.00
Maximum	16.00	20.00	16.000	20.00	28.00
Range	4.00	8.00	4.000	8.00	16.00
Mean	13.44	13.76	13.440	14.72	16.32
Variance	3.84	5.44	3.840	7.63	14.56
SD	1.96	2.33	1.960	2.76	3.82

Table 25

Descriptive Statistics: Respiration Rates for the Experienced Subjects

	Week 1	Week 2	Week 3	Dress	Jury
N of Cases	14	14	14	14	14
Minimum	12.00	12.00	12.00	12.00	12.00
Maximum	20.00	20.00	16.00	20.00	24.00
Range	8.00	8.00	4.00	8.00	12.00
Mean	13.71	13.43	13.43	14.00	14.86
Variance	11.60	6.42	3.96	6.77	13.36
SD	3.41	2.53	1.99	2.60	3.66

Table 26

Independent Samples *t*-tests for Respiration Rates Grouped by Level of Experience

Week 1

Group	Number	Mean	Standard Deviation
Inexperienced	25	13.44	1.96
Experienced	14	13.71	3.41
Pooled Variances	T = -0.32	DF = 37	Probability = 0.75

Week 2

Group	Number	Mean	Standard Deviation
Inexperienced	25	13.76	2.33
Experienced	14	13.43	2.53
Pooled Variances	T = 0.41	DF = 37	Probability = 0.68

Week 3

Group	Number	Mean	Standard Deviation
Inexperienced	25	13.44	1.96
Experienced	14	13.43	1.99
Pooled Variances	T = 0.02	DF = 37	Probability = 0.99

Table 26 (cont'd)

Dress Rehearsal			
Group	Number	Mean	Standard Deviation
Inexperienced	25	14.72	2.76
Experienced	14	14.00	2.60
Pooled Variances	T = 0.80	DF = 37	Probability = 0.43
Jury			
Group	Number	Mean	Standard Deviation
Inexperienced	25	16.32	3.82
Experienced	14	14.86	3.66
Pooled Variances	T = 1.17	DF = 37	Probability = 0.25

As observed over time, both the inexperienced and experienced performers displayed increased respiration rates before the dress rehearsal and the jury. For the inexperienced subjects, this increase is confirmed by the repeated-measures ANOVA that shows significant changes, and that the assessments have both a linear and a quadratic relationship (see Table 27). The paired samples *t*-tests show these significant changes occurring between all assessments with the jury performance (see Table 28). An exception is between the dress rehearsal and the jury where a significant difference is not found.

Conversely, for the experienced sample, neither the repeated-measures ANOVA nor the polynomial contrasts show significance (see Table 29). This finding is supported by the paired *t*-tests, which show significance only between week 2 and the jury (see Table 30).

Table 27

Repeated-Measures ANOVA: Respiration Rates for the Inexperienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	112.90	1	112.90	17.38	0.00
Error	155.90	24	6.50		
2 (quadratic)	30.90	1	30.90	4.24	0.05
Error	174.81	24	7.28		

Test Statistics

F-Statistic = 3.89 DF = 4, 21 Probability = 0.02

Table 28

Paired Samples *t*-tests Matrix of Probabilities: Respiration Rates for the Inexperienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.57	1.00	0.06	0.00
Week 2			0.60	0.27	0.00
Week 3				0.07	0.00
Dress					0.12
Jury					

Table 29

Repeated-Measures ANOVA: Respiration Rates for the Experienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	11.43	1	11.43	1.69	0.22
Error	87.77	13	6.75		
2 (quadratic)	8.16	1	8.16	1.83	0.20
Error	58.12	13	4.47		

Test Statistics

F-Statistic = 1.00 DF = 4, 10 Probability = 0.45

Table 30

Paired Samples *t*-tests Matrix of Probabilities: Respiration Rates for the Experienced Sample

	Week 1	Week 2	Week 3	Dress	Jury
Week 1		0.72	0.75	0.75	0.30
Week 2			1.00	0.43	0.05
Week 3				0.43	0.14
Dress					0.34
Jury					

State-Trait Anxiety Inventory

To begin studying the results of the STAI, I first ran a reliability analysis on the raw scores of the 20-item state-anxiety portion of the STAI. The Alpha Coefficients of this analysis are reported in Table 31. The values for Cronbach's Alpha are at, or above, .95 for each of the six administrations of the STAI. This value is quite large, indicating that the test was very reliable for this particular population.

Table 31

Reliability Analysis for the STAI Responses

	Mean	Variance	Standard Deviation	Alpha
Week 1				
Scale Statistics	39.82	177.73	13.33	.95
Week 2				
Scale Statistics	41.73	161.88	12.72	.96
Week 3				
Scale Statistics	37.90	137.04	11.71	.95
Dress				
Scale Statistics	42.49	150.20	12.56	.95

Table 31 (cont'd)

AM				
Scale Statistics	Mean	Variance	Standard Deviation	Alpha
	46.41	178.56	13.36	.95
Jury				
Scale Statistics	Mean	Variance	Standard Deviation	Alpha
	46.38	177.93	13.34	.96

The pattern of the population data for the STAI (see Figure 12) showed some unusual fluctuations in the first three weeks of the study. The subjects reported their anxiety levels to be higher during the second week than during the first, while the third assessment showed the lowest self-reported anxiety of the study. It is difficult to speculate why the self-reported anxiety was so low during the third week. One explanation may be that the students were experiencing a rising level of self-confidence toward the performance as they began to perfect their jury materials.

As with the physiological measures, the assessment before the dress rehearsal was higher than the levels during the first three weeks of the study. The students assessed their anxiety to be the highest on the morning of the jury, followed by a decline immediately before the performance. This pattern coincides with other research that suggests that individuals may experience lower levels of anxiety immediately before a performance due to task-oriented thinking (Epstein & Fenz, 1965; Fenz, 1975).

The repeated-measures analysis confirmed that the STAI data showed significant changes over time, and the polynomial contrasts determined that the data had linear, quadratic and quartic relationships (see Table 33). The paired samples *t*-tests for the STAI (see Table 34) showed significance differences between the scores from week 3 and the dress rehearsal, between all measures and the AM score, and between all measures except the AM score with the jury.

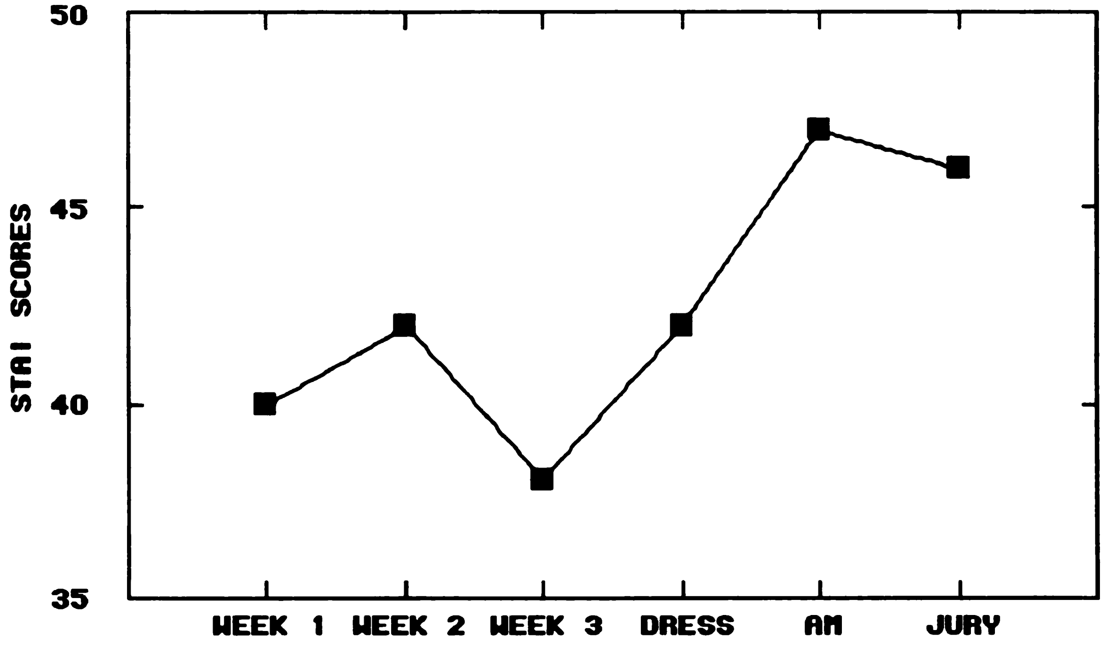

Figure 12. Mean STAI scores of the research population.

Table 32

Descriptive Statistics: STAI Scores for the Research Population

	Week 1	Week 2	Week 3	Dress	AM	Jury
N of Cases	39	39	39	39	39	39
Minimum	20.00	20.00	20.00	20.00	20.00	20.00
Maximum	67.00	68.00	58.00	67.00	76.00	69.00
Range	47.00	48.00	38.00	47.00	56.00	49.00
Mean	39.80	41.77	37.82	42.44	46.59	46.33
Variance	177.96	163.13	136.47	148.04	191.78	176.23
SD	13.34	12.77	11.68	12.17	13.85	13.28

Table 33

Repeated-Measures ANOVA: STAI Scores for the Research Population

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	1493.17	1	1493.17	17.87	0.00
Error	3175.13	38	83.56		
2 (quadratic)	209.78	1	209.78	5.50	0.02
Error	1449.07	38	38.13		
3 (cubic)	82.50	1	82.50	3.21	0.08
Error	977.90	38	25.73		
4 (quartic)	473.41	1	473.41	14.13	0.00
Error	1273.41	38	33.51		

Test Statistics

F-Statistic = 7.62 DF = 5, 34 Probability = 0.00

Table 34

Paired Samples *t*-tests Matrix of Probabilities: STAI Scores for the Research Population

	Week 1	Week 2	Week 3	Dress	AM	Jury
Week 1		0.22	0.18	0.17	0.00	0.00
Week 2			0.02	0.65	0.00	0.01
Week 3				0.01	0.00	0.00
Dress					0.01	0.00
AM						0.81
Jury						

The inexperienced/experienced comparison graph for the STAI (see Figure 13) is interesting because the inexperienced subjects reported considerably higher levels of anxiety throughout the study. The graph is supported by the independent samples *t*-tests, which determined that there were significant differences between the two samples on all measures (see Table 37). These assessments of self-reported anxiety present different results from some of the physiological measures where the patterns were less obvious. The overwhelming difference between the two samples in self-reported anxiety may again be due to the fact that the inexperienced performers did not know what to expect in the jury and therefore reported higher anxiety levels. Another reason, although somewhat related to the first, may be that the experienced subjects were highly confident about the jury, or no longer perceived it as being threatening.

The inexperienced subjects reported their highest levels of anxiety in the morning before leaving for school on the day of the jury, and then a slight decrease immediately before the performance. The experienced subjects, in contrast, reported a steady increase in anxiety beginning with the third assessment (the week before the dress rehearsal) and continuing through the jury. This finding is different from other literature that suggests that it is the experienced subjects who will generally show a decrease in anxiety immediately before a performance (Fenz, 1975).

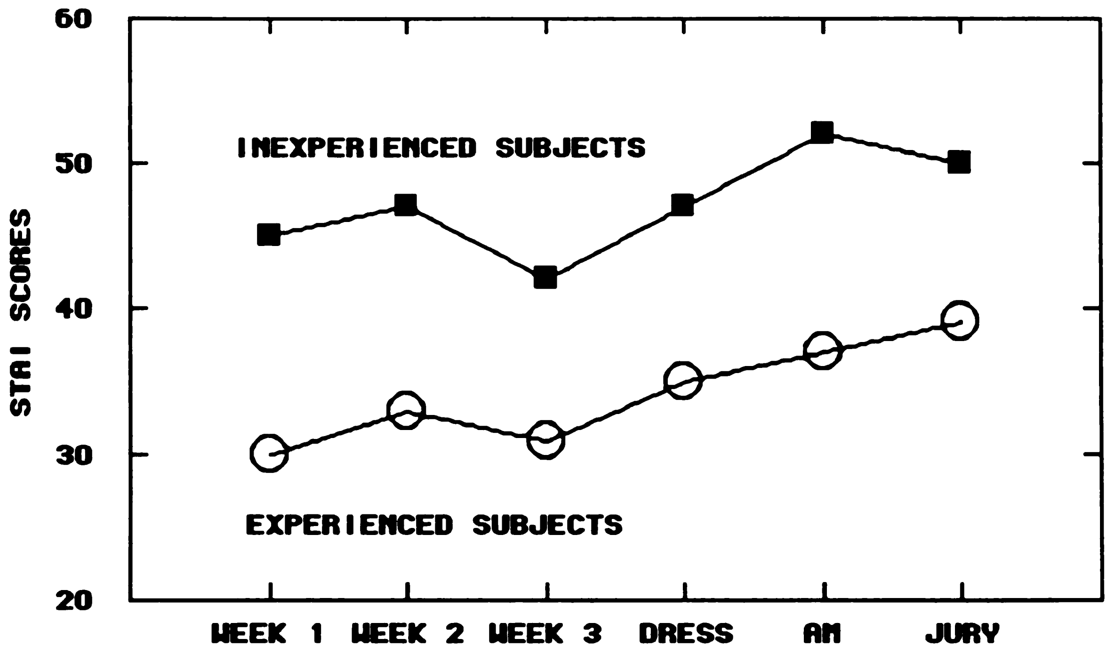

Figure 13. Mean STAI scores: A comparison between the inexperienced and experienced subjects.

Table 35

Descriptive Statistics: STAI Scores for the Inexperienced Subjects

	Week 1	Week 2	Week 3	Dress	AM	Jury
N of Cases	25	25	25	25	25	25
Minimum	23.00	25.00	20.00	20.00	20.00	20.00
Maximum	67.00	68.00	58.00	67.00	76.00	69.00
Range	44.00	43.00	38.00	47.00	56.00	49.00
Mean	45.40	46.76	41.52	46.84	52.16	50.40
Variance	156.25	136.11	125.76	115.81	161.06	165.17
SD	12.50	11.67	11.21	10.76	12.69	12.85

Table 36

Descriptive Statistics: STAI Scores for the Experienced Subjects

	Week 1	Week 2	Week 3	Dress	AM	Jury
N of Cases	14	14	14	14	14	14
Minimum	20.00	20.00	20.00	20.00	21.00	20.00
Maximum	44.00	55.00	49.00	53.00	49.00	53.00
Range	24.00	35.00	29.00	33.00	28.00	33.00
Mean	29.79	32.86	31.21	34.57	36.64	39.07
Variance	63.41	92.13	93.41	115.03	97.02	121.61
SD	7.96	9.60	9.67	10.73	9.85	11.03

Table 37

Independent Samples *t*-tests for STAI Scores Grouped by Level of Experience

Week 1

Group	Number	Mean	Standard Deviation
Inexperienced	25	45.40	12.50
Experienced	14	29.79	7.96
Pooled Variances	T = 4.20	DF = 37	Probability = 0.00

Week 2

Group	Number	Mean	Standard Deviation
Inexperienced	25	46.76	11.67
Experienced	14	32.86	9.60
Pooled Variances	T = 3.79	DF = 37	Probability = 0.00

Week 3

Group	Number	Mean	Standard Deviation
Inexperienced	25	41.52	11.21
Experienced	14	31.21	9.67
Pooled Variances	T = 2.89	DF = 37	Probability = 0.00

Table 37 (cont'd)

Dress Rehearsal			
Group	Number	Mean	Standard Deviation
Inexperienced	25	46.84	10.76
Experienced	14	34.57	10.73
Pooled Variances	T = 3.42	DF = 37	Probability = 0.00
Morning of the Jury			
Group	Number	Mean	Standard Deviation
Inexperienced	25	52.16	12.69
Experienced	14	36.64	9.85
Pooled Variances	T = 3.95	DF = 37	Probability = 0.00
Jury			
Group	Number	Mean	Standard Deviation
Inexperienced	25	50.40	12.85
Experienced	14	39.07	11.03
Pooled Variances	T = 2.77	DF = 37	Probability = 0.01

The inexperienced sample data exhibits significant changes over time, as shown by the repeated-measures ANOVA (see Table 38). In addition, the polynomial contrasts show that the erratic nature of this data pattern displays four levels of relationships, linear, quadratic, cubic, and quartic, with the quartic being the strongest effect. The paired samples *t*-tests show significant differences most consistently with the AM score (see Table 39). This finding reflects that the AM score was the peak level of anxiety for the inexperienced sample.

The repeated-measures ANOVA for the experienced sample also shows significant changes over time, however, the polynomial contrasts show only a linear trend (see Table 40). Statistically significant differences on the paired *t*-tests (see Table 41) are congregated mainly with the dress rehearsal, AM, and jury scores, thus suggesting the higher scores reported by the subjects during theses stress-provoking situations.

Table 38

Repeated-Measures ANOVA: STAI Scores for the Inexperienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	772.90	1	772.90	7.51	0.01
Error	2469.92	24	102.91		
2 (quadratic)	211.22	1	211.22	4.09	0.05
Error	1239.95	24	51.66		
3 (cubic)	161.31	1	161.31	4.70	0.04
Error	823.59	24	34.32		
4 (quartic)	524.62	1	524.62	13.31	0.00
Error	945.88	24	39.41		

Test Statistics

F-Statistic = 4.96 DF = 5, 20 Probability = 0.00

Table 39

Paired Samples *t*-tests Matrix of Probabilities: STAI Scores for the Inexperienced Sample

	Week 1	Week 2	Week 3	Dress	AM	Jury
Week 1		0.58	0.06	0.60	0.01	0.06
Week 2			0.03	0.97	0.03	0.16
Week 3				0.04	0.00	0.00
Dress					0.02	0.07
AM						0.24
Jury						

Table 40

Repeated-Measures ANOVA: STAI Scores for the Experienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	747.69	1	747.69	14.34	0.00
Error	677.80	13	52.14		
2 (quadratic)	22.59	1	22.59	1.59	0.23
Error	185.09	13	14.24		

Test Statistics

F-Statistic = 4.02 DF = 5, 9 Probability = 0.03

Table 41

Paired Samples *t*-tests Matrix of Probabilities: STAI Scores for the Experienced Sample

	Week 1	Week 2	Week 3	Dress	AM	Jury
Week 1		0.03	0.37	0.04	0.01	0.00
Week 2			0.35	0.39	0.04	0.01
Week 3				0.00	0.00	0.00
Dress					0.10	0.01
AM						0.07
Jury						

A Comparison of the Vital Signs and the STAI

Using the same dependent variables of blood pressure, pulse, respirations, and STAI, I constructed line graphs with all four variables on each graph to examine visually the interaction of the patterns of change over time. In addition, I ran Pearson correlations to determine if there were statistically significant relationships among the four variables. Separate analyses were performed for the categorical samples of the entire research population, the inexperienced subjects, and the experienced subjects.

As in the previous graphs, the assessments for weeks 1, 2, and 3 represent the levels recorded before student lessons, 4, 3, and 2 weeks respectively, prior to the jury. The next assessment is the level before the dress rehearsal. "AM" indicates the STAI scores in the morning of the jury day before the subjects left for school. No vital signs were taken at this time, so they are not displayed on the graph. The last assessment represents the levels immediately before the jury. Each assessment indicates the mean levels for each variable in each sample. As an aid to identifying the abbreviations on the graphs, "BP" indicates mean arterial blood pressure, "P" is pulse rate, "R" is respiration rate, and "SA" indicates state anxiety or the scores on the STAI.

When interpreting these line graphs, the reader must be aware that the four variables are not scaled identically. The approximate range of blood pressures in the average adult is 90/50 to 140/90 millimeters of mercury--120/80 being "normal." The average range for mean arterial pressure, then, computes to between 63 and 107, with 93 being "normal." Average adult pulse rates range from 60 to 80 beats per minute, and average respiration rates are between 12 to 20 breaths per minute. The possible range of STAI scores is from 0 to 80. Because the Y axis on each line graph is scaled from 0 to 100 to accommodate each scale, the individual lines do not show the dramatic changes that the previous sets of graphs do.

The graph for the total population (see Figure 14) depicts the pulse rates as showing the greatest increase over time, with blood pressures showing a similar rise for the last three assessments. The STAI scores, on the other hand, fluctuate over time and peak in the morning on the day of the jury. Respiration rates also show a steady but gentle rise throughout the study.

Using blood pressures as constants, the Pearson correlations show significance between blood pressures and pulse rates, and blood pressures and respiration rates in week 1; blood pressures and respiration rates, and blood pressures and the STAI in week 2; and blood pressures and pulse rates before the jury. By using pulse rates as constants, significance was found between pulse rates and respiration rates in week 1 and 3, and also before the jury (see Table 42).

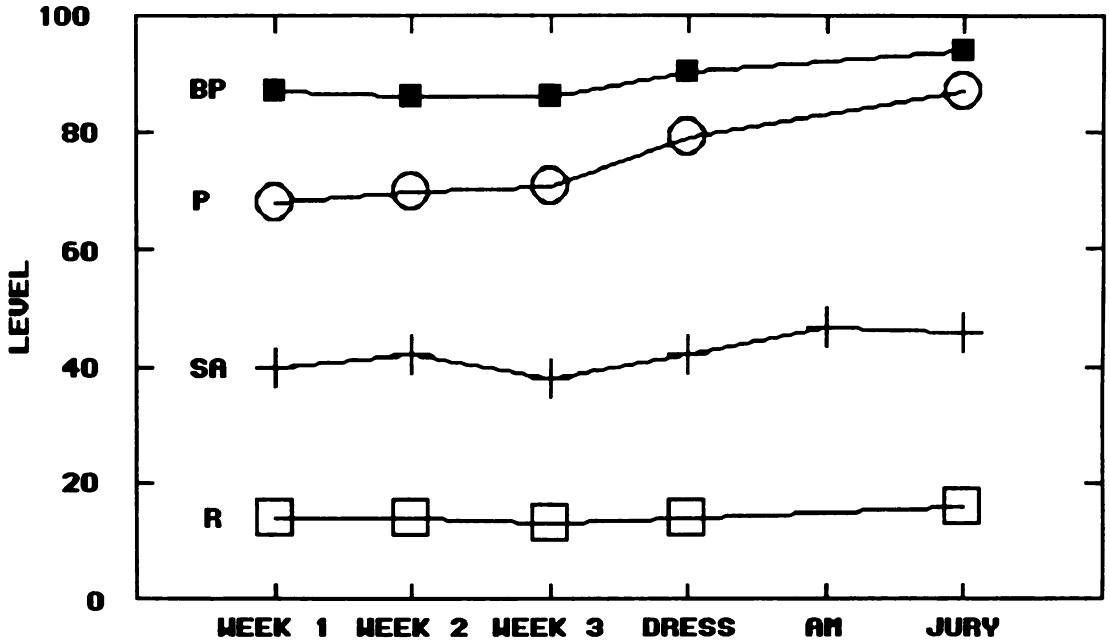

Figure 14. A comparison of vital signs and STAI scores for the research population.

Table 42

Pearson Correlations for the Research Population

Correlations using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.38	0.10	0.18	0.10	0.33
BP/R	0.43	0.31	0.04	0.08	0.26
BP/SA	-0.15	-0.34	-0.23	-0.24	0.02

Chart of Probabilities using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.02	0.53	0.28	0.54	0.04
BP/R	0.01	0.05	0.79	0.61	0.11
BP/SA	0.38	0.03	0.15	0.14	0.89

Correlations using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.39	0.13	0.32	0.27	0.36
P/SA	-0.20	0.17	-0.15	-0.20	0.13

Chart of Probabilities using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.02	0.44	0.05	0.10	0.03
P/SA	0.23	0.31	0.37	0.23	0.44

Table 42 (cont'd)

Correlations using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R	1.00	1.00	1.00	1.00	1.00
SA	-0.19	0.01	-0.03	-0.10	-0.10

Chart of Probabilities using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R	0.00	0.00	0.00	0.00	0.00
SA	0.24	0.94	0.88	0.55	0.56

The graph for the inexperienced subjects (see Figure 15) is virtually identical to the patterns in the population graph. This is again due to the greater number of subjects in the inexperienced group (25 of 39 total) influencing the population means. Although the visual patterns on the graph appear to be similar, the Pearson correlations show significance for only one pair of assessments--respiration rate with STAI scores for week 1. Most likely this is so because the inexperienced sample generally shows smaller variances and standard deviations on the vital signs and STAI scores, and hence, is more homogeneous than the total population. Because of the greater homogeneity in the inexperienced sample, the correlation coefficient is decreased and the probabilities are not statistically significant.

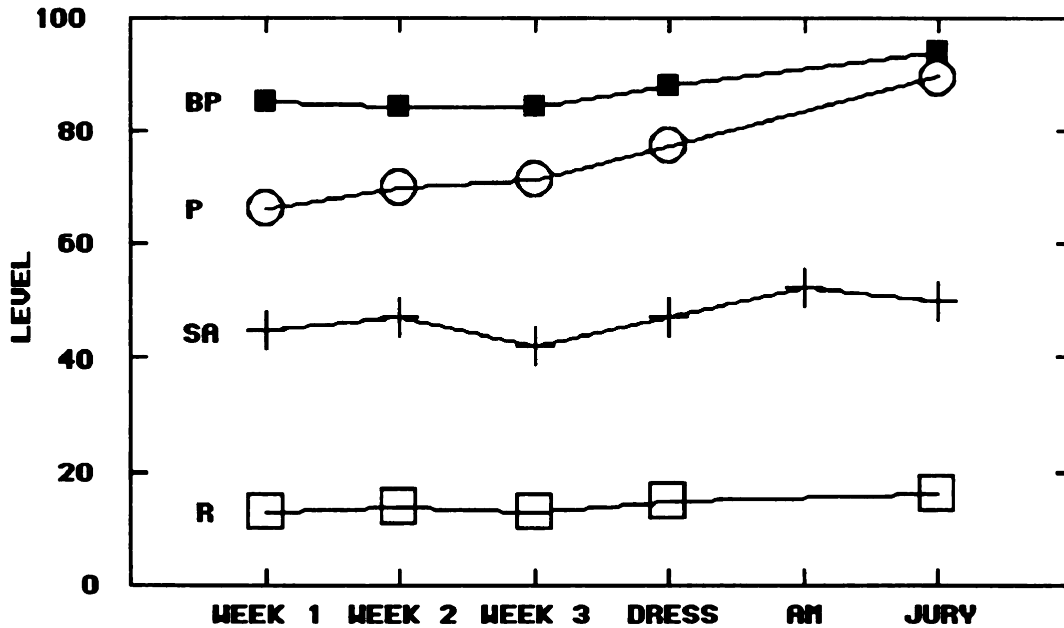

Figure 15. A comparison of vital signs and STAI scores for the inexperienced subjects.

Table 43

Pearson Correlations for the Inexperienced Sample

Correlations using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.34	-0.14	0.17	0.04	0.32
BP/R	0.24	0.16	-0.19	0.10	0.18
BP/SA	0.05	-0.07	-0.29	-0.25	0.08

Chart of Probabilities using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.10	0.51	0.41	0.86	0.12
BP/R	0.25	0.44	0.37	0.64	0.40
BP/SA	0.81	0.75	0.16	0.22	0.69

Correlations using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.24	0.07	0.24	0.15	0.20
P/SA	-0.17	0.25	-0.31	0.08	0.07

Chart of Probabilities using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.24	0.74	0.25	0.49	0.34
P/SA	0.41	0.24	0.13	0.71	0.74

Table 43 (cont'd)

Correlations using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R/SA	-0.41	-0.07	0.24	-0.02	-0.05

Chart of Probabilities using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R/SA	0.04	0.74	0.25	0.93	0.82

The experienced subjects' graph (see Figure 16) shows the most abrupt change to be the pulse rates. Blood pressures show a steady rise throughout the study, while the STAI scores fluctuate slightly over the first three assessments and rise steadily afterwards. Respiration rates show a similar rise after the first three assessments. The Pearson correlations determined statistical significance for eight pairs of variables (see Table 44). Using blood pressures as constants, significance was found between blood pressures and respiration rates in weeks 1 and 2. With pulse rates used as constants, significance was found between pulse rates and respiration rates for week 1, before the dress rehearsal, and before the jury. Significance was found between respiration rates and STAI scores for week 3, before the dress rehearsal, and before the jury.

By visually comparing the inexperienced and the experienced graphs (see Figures 15 and 16), it is evident that the STAI scores for the experienced sample are considerably lower relative to the blood pressures and respiration rates. I find this difference interesting, and offer several possible reasons for this occurrence. First is that the experienced subjects may actually have been encountering less cognitive anxiety than the inexperienced subjects because of their previous involvement with performing jury recitals. A second reason, and probably just as viable, may be that the inexperienced subjects were more consciously aware of their elevated levels of physiological arousal and consequently reported higher cognitive anxiety.

A third possibility may be that the experienced subjects were feeling considerable cognitive anxiety but denied it due to ego involvement. This explanation raises some intriguing research questions when considering the studies comparing gender differences and ego involvement (Abel & Larkin, 1990; Craske & Craig, 1984; Jones & Cale, 1989; Steptoe, 1989). These studies found that males generally reported lower levels of cognitive anxiety than did females. Since there is a lower percentage of females in the experienced sample, the STAI scores may have been influenced by the male scores. The possibility exists, however, that the majority of experienced performers in this study (not just the males) may have reported lower levels of anxiety because of ego involvement.

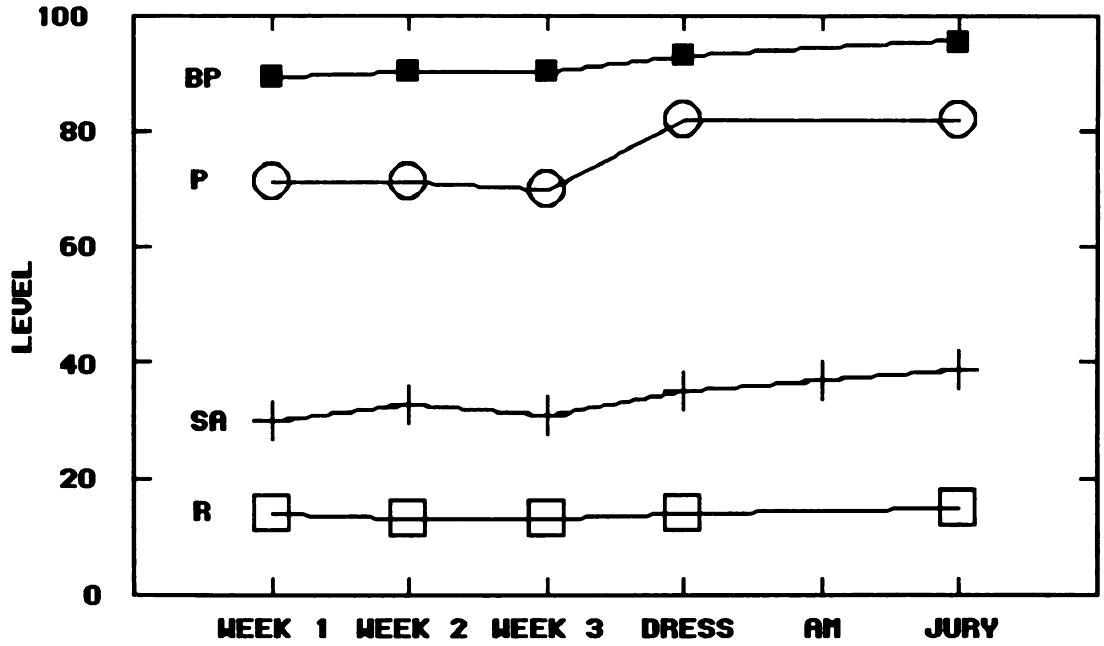

Figure 16. A comparison of vital signs and STAI scores for the experienced subjects.

Table 44

Pearson Correlations for the Experienced Sample

Correlations using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.38	0.42	0.27	0.06	0.41
BP/R	0.59	0.61	0.31	0.20	0.46
BP/SA	-0.18	-0.31	0.19	0.16	-0.01

Chart of Probabilities using Blood Pressures as Constants

	Week 1	Week 2	Week 3	Dress	Jury
BP/P	0.21	0.14	0.35	0.83	0.15
BP/R	0.03	0.02	0.29	0.49	0.10
BP/SA	0.53	0.29	0.51	0.58	0.98

Correlations using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.56	0.25	0.44	0.58	0.53
P/SA	0.19	0.16	-0.02	-0.49	-0.04

Chart of Probabilities using Pulse Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
P/R	0.04	0.40	0.12	0.03	0.05
P/SA	0.52	0.59	0.94	0.08	0.89

Table 44 (cont'd)

Correlations using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R/SA	0.08	0.06	-0.59	-0.52	-0.53

Chart of Probabilities using Respiration Rates as Constants

	Week 1	Week 2	Week 3	Dress	Jury
R/SA	0.78	0.84	0.03	0.05	0.05

Exploratory Analysis: Heart Monitor

To complete the exploratory analysis, I constructed several line graphs using the heart monitor readings for the dress rehearsal and the jury. Again, I used the categorical variables of population, inexperienced, and experienced for these graphs.

Readings were taken for five minutes before, and for five minutes during the dress rehearsal. On the day of the jury, I began the readings five minutes before each performance and continued monitoring each subject throughout the performance. Because some students finished the jury earlier than others, a full table of values for every subject was only available for 7 minutes of the allotted 15 minute performance time.

I programmed the monitor to record each subject's heart rate at 15 second intervals, and then calculated the mean heart rate for each reading in each categorical variable (entire research population, inexperienced sample, and experienced sample). I subsequently combined these 15-second readings into groups of four and computed the mean of each group. These "one-minute means" helped establish clarity in the graphs and provided the proper matrix for running an analysis of variance on repeated measures in the statistical analysis. When reading the heart monitor graphs, it must be noted that the grid marks on the graphs represent 1 minute intervals. I have inserted vertical lines at 5 minute intervals for ease of interpretation. As with the previous graphs, a corresponding table of descriptive statistics will accompany each figure.

Monitor Readings: Dress Rehearsal

The heart rate monitor readings of the dress rehearsal for the research population display a relatively jagged pattern that shows a dramatic increase at the start of the rehearsal compared to the five minute period before the rehearsal began (see Figure 17). This uneven heart rate pattern may be due to the starting and stopping in a rehearsal situation where the performer is allowed to relax momentarily for comments by the instructor.

The repeated-measures analysis determined that there were significant changes over time (see Table 46). The paired samples *t*-tests showed that the majority of statistically significant differences occurred on readings 6 and 7 (see Table 47). Relative to the graph, reading 6 is the largest upward leap, while reading 7 is the highest recorded heart rate.

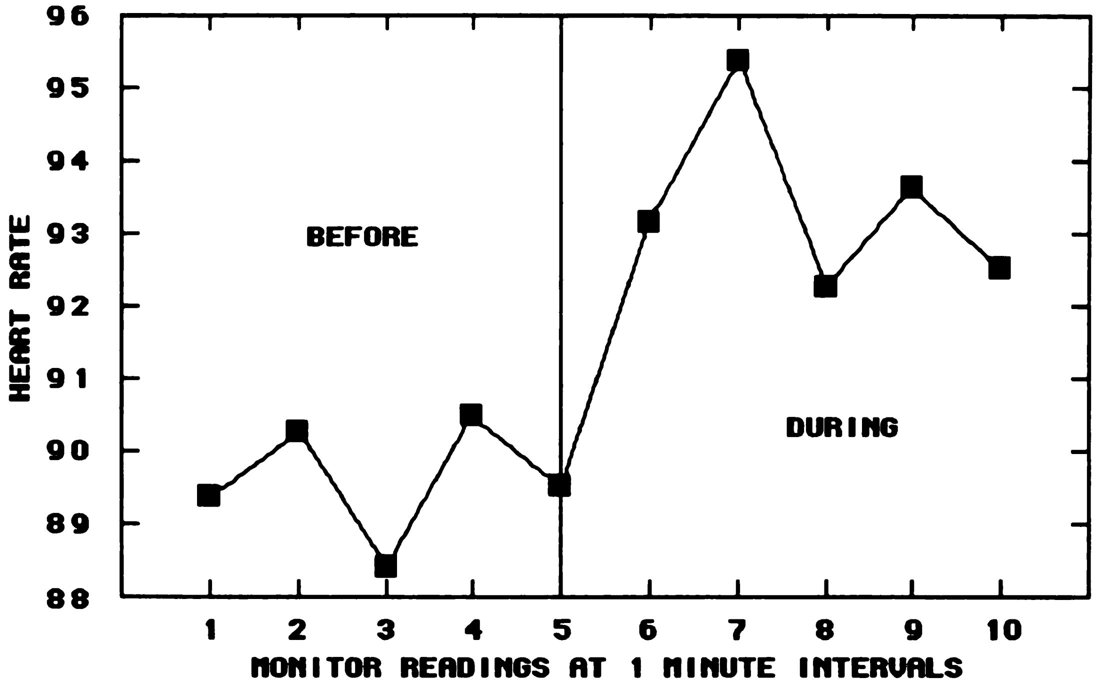

Figure 17. Heart monitor readings of the research population taken at the dress rehearsal.

Table 45

Descriptive Statistics: Monitor Readings of the Dress Rehearsal for the Research Population

Reading	**1**	**2**	**3**	**4**	**5**
N of Cases	39	39	39	39	39
Minimum	65.50	63.75	65.00	64.25	62.75
Maximum	118.25	111.25	105.25	115.50	123.25
Range	52.75	47.50	40.25	51.25	60.50
Mean	89.37	90.28	88.42	90.47	89.53
Variance	113.93	104.50	113.01	159.64	163.13
SD	10.67	10.22	10.63	12.64	12.77

Reading	**6**	**7**	**8**	**9**	**10**
N of Cases	39	39	39	39	39
Minimum	71.75	71.50	61.50	67.75	63.50
Maximum	121.75	130.00	117.00	125.25	125.75
Range	50.00	58.50	55.50	57.50	62.25
Mean	93.13	95.37	92.26	93.63	92.50
Variance	119.05	175.75	182.15	177.56	221.55
SD	10.91	13.26	13.50	13.33	14.88

Table 46

Repeated-Measures ANOVA: Monitor Readings of the Dress Rehearsal for the Research Population

Test Statistics

F-Statistic = 2.25 DF = 9, 30 Probability = 0.05

Table 47

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Dress Rehearsal for the Research Population

	1	2	3	4	5	6	7	8	9	10
1		0.47	0.53	0.52	0.92	0.02	0.00	0.17	0.04	0.14
2			0.10	0.91	0.66	0.10	0.02	0.36	0.08	0.29
3				0.11	0.37	0.00	0.00	0.05	0.01	0.05
4					0.46	0.10	0.02	0.35	0.10	0.32
5						0.04	0.01	0.16	0.04	0.15
6							0.05	0.67	0.79	0.76
7								0.13	0.41	0.24
8									0.24	0.89
9										0.29
10										

The monitor readings of the dress rehearsal comparing the inexperienced and experienced subjects (see Figure 18) shows the experienced group as having higher mean arousal levels except for the 6th and 7th measurements. During this two-minute period, which was the start of the dress rehearsal, the mean heart rates of the inexperienced performers accelerated rapidly and surpassed the experienced group. The fact that the monitor readings showed the inexperienced subjects as having lower heart rates than the experienced subjects before the dress rehearsal, is corroborated by the palpated pulse rates assessed at the same time (see Figure 8). I speculate that this dramatic rise in heart rates for the inexperienced subjects could again be explained by their cognitive uncertainty, as demonstrated by their higher STAI scores (see Figure 9).

Another interesting aspect of Figure 18 is that the experienced subjects show a steadier heart rate than the inexperienced. After a low point during the third minute of readings, the experienced subjects display a slow but steady increase in heart rate until their peak, four minutes into the dress rehearsal. Conversely, the inexperienced subjects display abrupt peaks and valleys throughout the monitored period.

Although there are visible differences between the inexperienced sample and the experienced sample on the graphs, the independent samples *t*-tests did not reveal statistically significant differences between the two groups on any of the readings (see Table 50). In addition, the repeated-measures ANOVAs for the inexperienced and experienced samples showed no significant changes over time (see Tables 51 and 53). As with the paired samples *t*-test analysis for the research population, all of the significant differences for the inexperienced sample, save one, are found in readings 6 and 7 (see Table 52). Paired samples *t*-tests for the experienced group (see Table 54) show only two significant differences, both with reading 9, which is the peak of their graph.

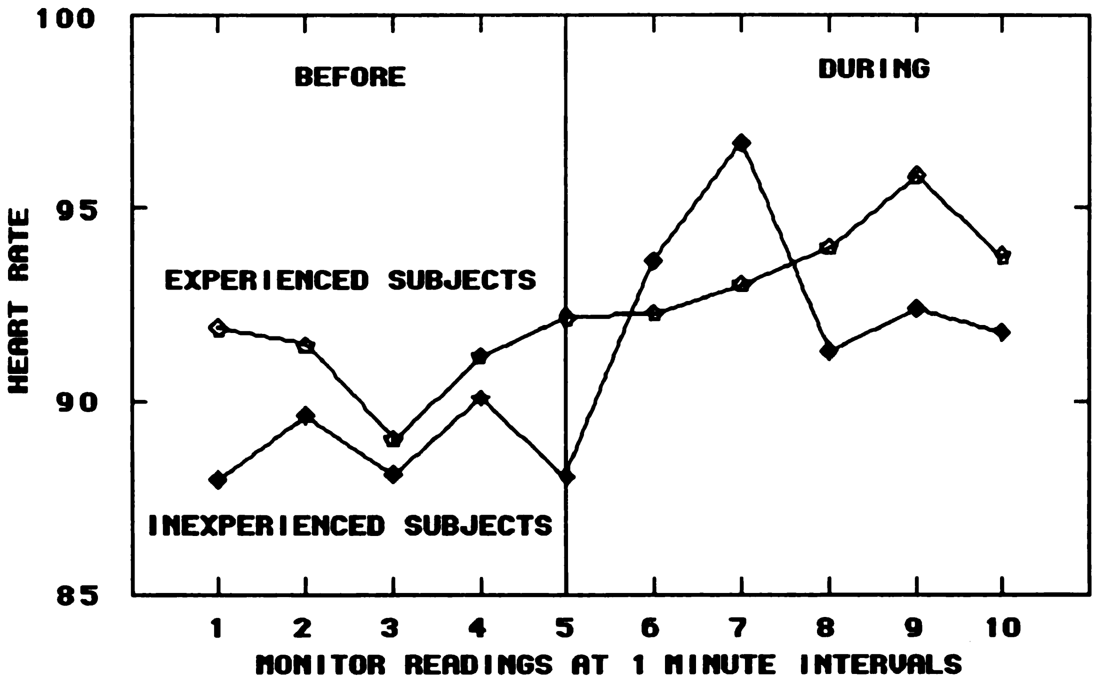

Figure 18. Heart monitor readings taken at the dress rehearsal: A comparison between the inexperienced and experienced subjects.

Table 48

Descriptive Statistics: Monitor Readings of the Dress Rehearsal for the Inexperienced Subjects

Reading	**1**	**2**	**3**	**4**	**5**
N of Cases	25	25	25	25	25
Minimum	65.50	63.75	65.00	64.25	62.75
Maximum	118.25	111.25	105.25	114.50	111.75
Range	52.75	47.50	40.25	50.25	49.00
Mean	87.95	89.61	88.10	90.08	88.06
Variance	147.30	106.97	130.12	187.66	180.15
SD	12.14	10.34	11.41	13.70	13.42

Reading	**6**	**7**	**8**	**9**	**10**
N of Cases	25	25	25	25	25
Minimum	72.75	75.25	61.50	67.75	63.50
Maximum	121.75	130.00	117.00	125.25	125.75
Range	49.00	54.75	55.50	57.50	62.25
Mean	93.62	96.68	91.28	92.39	91.79
Variance	142.33	187.34	219.75	235.88	283.14
SD	11.93	13.69	14.82	15.36	16.83

Table 49

Descriptive Statistics: Monitor Readings of the Dress Rehearsal for the Experienced Subjects

Reading	**1**	**2**	**3**	**4**	**5**
N of Cases	14	14	14	14	14
Minimum	79.00	71.50	71.50	75.00	76.25
Maximum	103.25	109.50	102.50	115.50	123.25
Range	24.25	38.00	31.00	40.50	47.00
Mean	91.89	91.46	89.00	91.16	92.16
Variance	50.36	105.61	89.56	119.37	132.64
SD	7.10	10.28	9.46	10.93	11.52

Reading	**6**	**7**	**8**	**9**	**10**
N of Cases	14	14	14	14	14
Minimum	71.75	71.50	69.25	78.25	77.50
Maximum	114.75	112.25	112.25	107.25	114.00
Range	43.00	40.75	43.00	29.00	36.50
Mean	92.25	93.02	94.02	95.84	93.77
Variance	83.93	158.62	121.55	75.35	122.18
SD	9.161	12.59	11.03	8.68	11.05

Table 50

Independent Samples *t*-tests: Monitor Readings for the Dress Rehearsal Grouped by Level of Experience

1

Group	Number	Mean	Standard Deviation
Inexperienced	25	87.95	12.14
Experienced	14	91.89	7.10
Pooled Variances	T = -1.11	DF = 37	Probability = 0.27

2

Group	Number	Mean	Standard Deviation
Inexperienced	25	89.61	10.34
Experienced	14	91.46	10.28
Pooled Variances	T = -0.54	DF = 37	Probability = 0.59

3

Group	Number	Mean	Standard Deviation
Inexperienced	25	88.10	11.41
Experienced	14	89.00	9.46
Pooled Variances	T = -0.25	DF = 37	Probability = 0.80

Table 50 (cont'd)

4

Group	Number	Mean	Standard Deviation
Inexperienced	25	90.08	13.70
Experienced	14	91.16	10.93
Pooled Variances	T = -0.25	DF = 37	Probability = 0.80

5

Group	Number	Mean	Standard Deviation
Inexperienced	25	88.06	13.42
Experienced	14	92.16	11.52
Pooled Variances	T = -0.96	DF = 37	Probability = 0.34

6

Group	Number	Mean	Standard Deviation
Inexperienced	25	93.62	11.93
Experienced	14	92.25	9.16
Pooled Variances	T = 0.37	DF = 37	Probability = 0.71

7

Group	Number	Mean	Standard Deviation
Inexperienced	25	96.68	13.69
Experienced	14	93.02	12.59
Pooled Variances	T = 0.82	DF = 37	Probability = 0.42

Table 50 (cont'd)

8

Group	Number	Mean	Standard Deviation
Inexperienced	25	91.28	14.82
Experienced	14	94.02	11.03
Pooled Variances	T = -0.60	DF = 37	Probability = 0.55

9

Group	Number	Mean	Standard Deviation
Inexperienced	25	92.390	15.36
Experienced	14	95.84	8.68
Pooled Variances	T = -0.77	DF = 37	Probability = 0.45

10

Group	Number	Mean	Standard Deviation
Inexperienced	25	91.790	16.83
Experienced	14	93.77	11.05
Pooled Variances	T = -0.39	DF = 37	Probability = 0.70

Table 51

Repeated-Measures ANOVA: Monitor Readings of the Dress Rehearsal for the Inexperienced Sample

Test Statistics

F-Statistic = 2.11 DF = 9, 16 Probability = 0.09

Table 52

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Dress Rehearsal for the Inexperienced Sample

	1	2	3	4	5	6	7	8	9	10
1		0.36	0.94	0.38	0.96	0.01	0.00	0.24	0.14	0.23
2			0.28	0.83	0.49	0.05	0.00	0.56	0.31	0.46
3				0.19	0.98	0.01	0.00	0.23	0.11	0.20
4					0.25	0.09	0.01	0.59	0.37	0.54
5						0.01	0.00	0.18	0.10	0.19
6							0.01	0.37	0.62	0.48
7								0.05	0.10	0.09
8									0.42	0.77
9										0.60
10										

Table 53

Repeated-Measures ANOVA: Monitor Readings of the Dress Rehearsal for the Experienced Sample

Test Statistics

F-Statistic = 1.04 DF = 9, 5 Probability = 0.51

Table 54

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Dress Rehearsal for the Experienced Sample

	1	2	3	4	5	6	7	8	9	10
1		0.77	0.09	0.73	0.88	0.89	0.78	0.49	0.05	0.39
2			0.21	0.91	0.80	0.82	0.74	0.46	0.07	0.39
3				0.36	0.16	0.20	0.29	0.09	0.00	0.08
4					0.55	0.70	0.63	0.44	0.12	0.36
5						0.97	0.83	0.59	0.19	0.56
6							0.76	0.59	0.21	0.64
7								0.73	0.43	0.87
8									0.40	0.95
9										0.35
10										

Monitor Readings: Jury

The graph for the research population of the jury performance (see Figure 19) shows a smoother, more steady increase in heart rate as contrasted with the jagged graph for the dress rehearsal (see Figure 17). I speculate that this is due to increased cognitive anxiety and continued physical exertion during the jury as opposed to the intermittent cognitive and physical relaxation in the dress rehearsal.

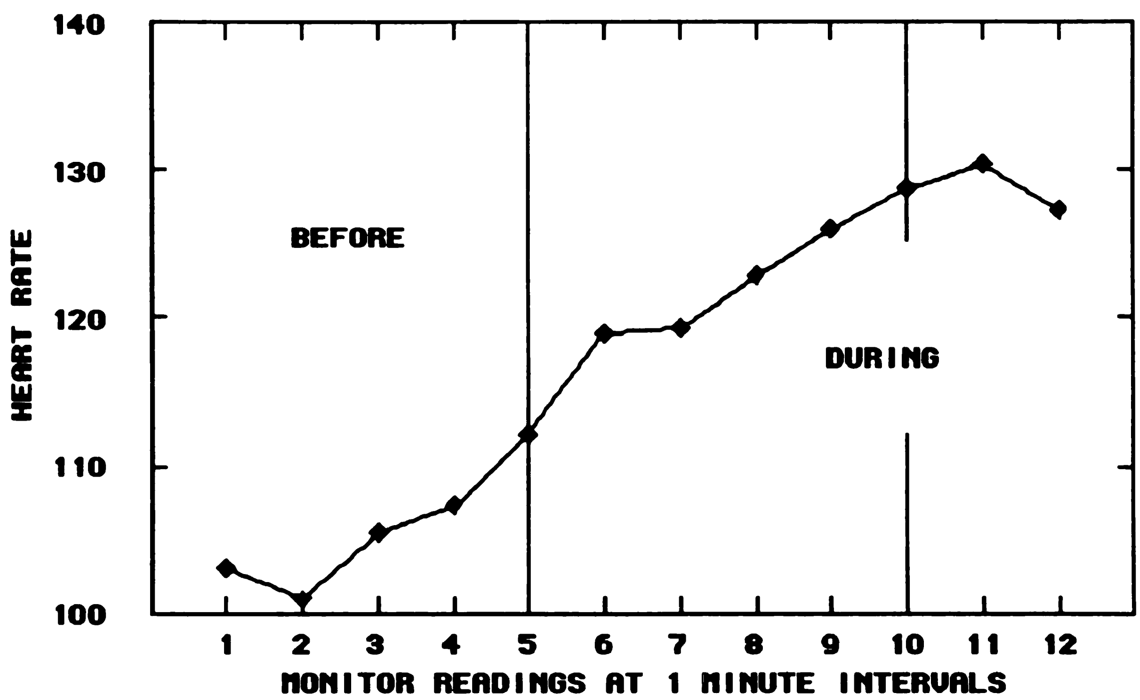

Figure 19. Heart monitor readings of the research population taken at the jury performance.

When comparing the arousal patterns of the dress rehearsal (see Figure 17) and the jury (see Figure 19), the range of the heart rates must be considered. In the dress rehearsal the range was from 88.42 to 95.37 beats per minute--a difference of 6.95 beats per minute. In the jury situation, however, the lowest mean heart rate was 100.97, which was 5.6 beats per minute above the maximum mean heart rate for the dress rehearsal. The range of heart rates for the jury performance was from 100.97 to 130.46--a difference of 29.49 beats per minute. This difference in heart rates between the two situations makes the vertical scaling of the two graphs very different. The scale for the jury performance is much larger than the dress rehearsal, and consequently, has a smoothing effect on the line. A graph depicting the difference in heart rate ranges of the research population between the dress rehearsal and the jury performance is presented in Figure 20.

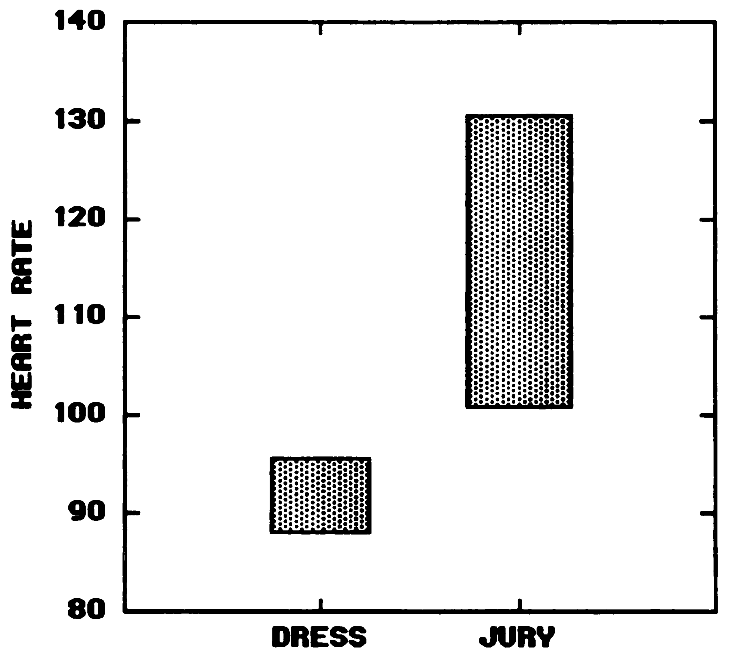

Figure 20. A comparison of heart rate ranges for the research population between the dress rehearsal and the jury.

The repeated-measures ANOVA shows that there are significant changes over time, and the polynomial contrasts reveal both linear and cubic trends for the data (see Table 56). Paired samples *t*-tests run on these data show a higher percentage of significant differences than were found with any of the other variables (see Table 57). I believe that this reflects the wide range and rapid increase of heart rates that were assessed by the monitor.

Table 55

Descriptive Statistics: Monitor Readings of the Jury for the Research Population

Reading	**1**	**2**	**3**	**4**	**5**	**6**
N of Cases	39	39	39	39	39	39
Minimum	62.25	63.75	71.25	71.00	75.75	77.75
Maximum	136.75	140.50	147.75	155.25	160.25	170.00
Range	74.50	76.75	76.50	84.25	84.50	92.25
Mean	103.12	100.97	105.49	107.32	112.23	118.94
Variance	239.23	290.54	274.44	294.46	371.53	395.23
SD	15.47	17.05	16.57	17.16	19.28	19.88

Reading	**7**	**8**	**9**	**10**	**11**	**12**
N of Cases	39	39	39	39	39	39
Minimum	74.50	87.00	86.75	87.50	86.50	80.75
Maximum	172.00	175.50	178.50	184.75	184.00	177.50
Range	97.50	88.50	91.75	97.25	97.50	96.75
Mean	119.40	122.89	126.01	128.73	130.46	127.27
Variance	383.85	494.90	437.64	451.62	497.20	471.16
SD	19.59	22.25	20.92	21.25	22.30	21.71

Table 56

Repeated-Measures ANOVA: Monitor Readings of the Jury for the Research Population

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	45791.71	1	45791.71	94.74	0.00
Error	18367.89	38	483.37		
2 (quadratic)	615.83	1	615.83	1.17	0.29
Error	20039.12	38	527.35		
3 (cubic)	1551.67	1	1551.67	5.82	0.02
Error	10140.18	38	266.85		
4 (quartic)	36.73	1	36.73	0.50	0.48
Error	2798.35	38	73.64		

Test Statistics

F-Statistic = 11.42 DF = 11, 28 Probability = 0.00

Table 57

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Jury for the Research Population

	1	2	3	4	5	6	7	8	9	10	11	12
1		0.09	0.20	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2			0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3				0.38	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4					0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5						0.00	0.00	0.00	0.00	0.00	0.00	0.00
6							0.73	0.08	0.00	0.00	0.01	0.06
7								0.07	0.00	0.00	0.01	0.06
8									0.08	0.01	0.12	0.36
9										0.07	0.34	0.78
10											0.70	0.74
11												0.03
12												

In the jury situation, both the inexperienced and experienced groups show relatively steady increases in heart rates throughout the monitored period (see Figure 21), with both groups peaking at the same time--approximately 6 minutes into the performance. An interesting aspect of this graph, in relation to the graph of the dress rehearsal, is that the inexperienced and experienced groups are closer together and their arousal patterns are very similar. The experienced group is again higher for the majority of the readings. As with the dress rehearsal statistics, the independent samples *t*-tests revealed no significant differences between the two groups (see Table 60).

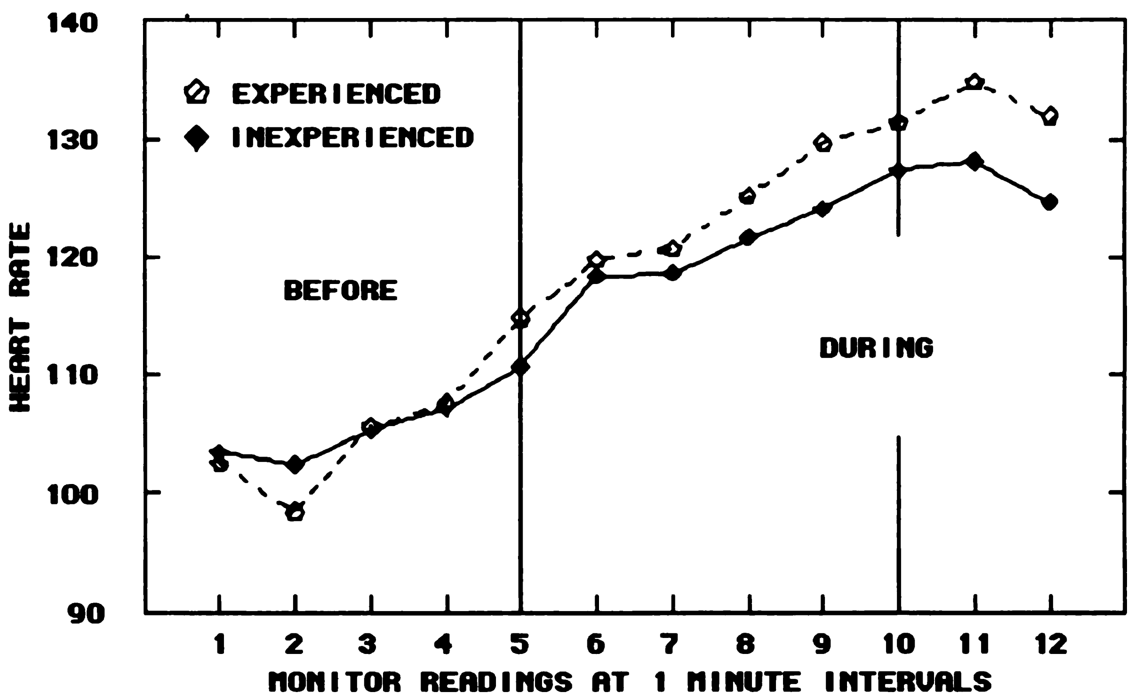

Figure 21. Heart monitor readings taken at the jury performance: A comparison between the inexperienced and experienced subjects.

Table 58

Descriptive Statistics: Monitor Readings of the Jury for the Inexperienced Subjects

Reading	**1**	**2**	**3**	**4**	**5**	**6**
N of Cases	25	25	25	25	25	25
Minimum	78.75	70.75	83.50	71.000	75.750	77.75
Maximum	136.75	140.50	139.25	148.500	160.250	152.00
Range	58.00	69.75	55.75	77.500	84.500	74.25
Mean	103.45	102.42	105.37	107.140	110.790	118.43
Variance	199.95	253.99	177.50	265.036	310.754	327.27
SD	14.14	15.94	13.32	16.280	17.638	18.09

Reading	**7**	**8**	**9**	**10**	**11**	**12**
N of Cases	25	25	25	25	25	25
Minimum	83.25	87.00	86.75	87.50	86.50	80.75
Maximum	146.50	159.25	173.25	173.00	177.50	177.50
Range	63.25	72.25	86.50	85.50	91.00	96.75
Mean	118.68	121.67	124.00	127.24	128.02	124.68
Variance	308.82	454.07	399.87	390.19	547.41	538.31
SD	17.57	21.31	19.10	19.75	23.40	23.20

Table 59

Descriptive Statistics: Monitor Readings of the Jury for the Experienced Subjects

Reading	**1**	**2**	**3**	**4**	**5**	**6**
N of Cases	14	14	14	14	14	14
Minimum	62.25	63.75	71.25	74.00	80.25	82.75
Maximum	132.50	132.75	147.75	155.25	156.50	170.00
Range	70.25	69.00	76.50	81.25	76.25	87.25
Mean	102.54	98.39	105.70	107.64	114.80	119.86
Variance	329.56	369.15	474.43	371.28	501.20	549.68
SD	18.15	19.21	21.78	19.27	22.39	23.44

Reading	**7**	**8**	**9**	**10**	**11**	**12**
N of Cases	14	14	14	14	14	14
Minimum	74.50	90.00	101.25	97.50	108.00	106.50
Maximum	172.00	175.50	178.50	184.75	184.00	174.25
Range	97.50	85.50	77.25	87.25	76.00	67.75
Mean	120.68	125.07	129.59	131.39	134.80	131.89
Variance	549.13	600.36	519.49	587.87	410.99	347.52
SD	23.43	24.50	22.79	24.25	20.27	18.64

Table 60

Independent Samples *t*-tests: Monitor Readings of the Jury Grouped by Level of Experience

1

Group	Number	Mean	Standard Deviation
Inexperienced	25	103.45	14.14
Experienced	14	102.54	18.15
Pooled Variances	T = 0.18	DF = 37	Probability = 0.86

2

Group	Number	Mean	Standard Deviation
Inexperienced	25	102.42	15.94
Experienced	14	98.39	19.21
Pooled Variances	T = 0.70	DF = 37	Probability = 0.49

3

Group	Number	Mean	Standard Deviation
Inexperienced	25	105.37	13.32
Experienced	14	105.70	21.78
Pooled Variances	T = -0.06	DF = 37	Probability = 0.95

Table 60 (cont'd)

4

Group	Number	Mean	Standard Deviation
Inexperienced	25	107.14	16.28
Experienced	14	107.64	19.27
Pooled Variances	T = -0.09	DF = 37	Probability = 0.93

5

Group	Number	Mean	Standard Deviation
Inexperienced	25	110.79	17.63
Experienced	14	114.80	22.39
Pooled Variances	T = -0.62	DF = 37	Probability = 0.54

6

Group	Number	Mean	Standard Deviation
Inexperienced	25	118.43	18.09
Experienced	14	119.86	23.45
Pooled Variances	T = -0.21	DF = 37	Probability = 0.83

7

Group	Number	Mean	Standard Deviation
Inexperienced	25	118.68	17.57
Experienced	14	120.68	23.43
Pooled Variances	T = -0.30	DF = 37	Probability = 0.76

Table 60 (cont'd)

8

Group	Number	Mean	Standard Deviation
Inexperienced	25	121.67	21.31
Experienced	14	125.07	24.50
Pooled Variances	T = -0.45	DF = 37	Probability = 0.65

9

Group	Number	Mean	Standard Deviation
Inexperienced	25	124.00	19.10
Experienced	14	129.59	22.79
Pooled Variances	T = -0.80	DF = 37	Probability = 0.43

10

Group	Number	Mean	Standard Deviation
Inexperienced	25	127.24	19.75
Experienced	14	131.39	24.25
Pooled Variances	T = -0.58	DF = 37	Probability = 0.57

11

Group	Number	Mean	Standard Deviation
Inexperienced	25	128.02	23.40
Experienced	14	134.80	20.27
Pooled Variances	T = -0.91	DF = 37	Probability = 0.37

Table 60 (cont'd)

12

Group	Number	Mean	Standard Deviation
Inexperienced	25	124.68	23.20
Experienced	14	131.89	18.64
Pooled Variances	T = -0.10	DF = 37	Probability = 0.33

The repeated-measures ANOVAs revealed that both the inexperienced and experienced samples showed significant changes over time and the data for both samples showed strong linear trends (see Tables 61 and 63). In addition, both groups showed high percentages of significant differences for the paired samples *t*-tests (see Table 62 and 64). Again, I believe this is due to the wide range of heart rate readings and the rapid increase in arousal. An interesting observation is that the comparisons between measurement 8 through 12 on both the inexperienced and experienced matrix (with one exception) do not show significance. Relative to the graph (see Figure 21), this is the area were the arousal levels peaked and began their downward curve, thus making these readings closer together than the rest of the graph.

Table 61

Repeated-Measures ANOVA: Monitor Readings of the Jury for the Inexperienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	23560.50	1	23560.50	47.79	0.00
Error	11831.56	24	492.98		

Test Statistics

F-Statistic = 7.62 DF = 11, 14 Probability = 0.00

Table 62

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Jury for the Inexperienced Sample

	1	2	3	4	5	6	7	8	9	10	11	12
1		0.54	0.42	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2			0.18	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3				0.51	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4					0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5						0.00	0.01	0.01	0.00	0.00	0.01	0.02
6							0.89	0.28	0.04	0.00	0.10	0.27
7								0.26	0.06	0.00	0.09	0.28
8									0.23	0.04	0.34	0.65
9										0.12	0.51	0.91
10											0.89	0.66
11												0.13
12												

Table 63

Repeated-Measures ANOVA: Monitor Readings of the Jury for the Experienced Sample

Within Subjects Effects

Single Degree-of-Freedom Polynomial Contrasts

Degree	SS	DF	MS	F	P
1 (linear)	23117.29	1	23117.29	53.19	0.00
Error	5650.26	13	434.64		

Test Statistics

F-Statistic = 21.26 DF = 11, 3 Probability = 0.01

Table 64

Paired Samples *t*-tests Matrix of Probabilities: Monitor Readings of the Jury for the Experienced Sample

	1	2	3	4	5	6	7	8	9	10	11	12
1		0.03	0.28	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2			0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3				0.58	0.06	0.01	0.01	0.01	0.00	0.00	0.00	0.00
4					0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5						0.21	0.19	0.05	0.02	0.01	0.01	0.01
6							0.69	0.14	0.01	0.00	0.04	0.08
7								0.11	0.01	0.00	0.05	0.10
8									0.21	0.07	0.18	0.31
9										0.39	0.50	0.76
10											0.65	0.94
11												0.03
12												

The monitor readings in Figures 19 and 21 ended at the peak period of arousal during the jury, but I wanted to determine if the subjects "got comfortable" in the performance and showed a decrease in heart rate. Enough data was available to complete the jury graphs for the entire 15 minutes of the performance (see Figures 22 and 23). The reader must be aware, however, that there are missing values in these data beginning with reading 13. Some subjects finished their performance before the 15 minute time limit and could no longer contribute data.

In the population graph (see Figure 22) there was a total of 39 subjects for readings 1-12, and the number gradually diminished to 21 subjects by reading 20. The graph shows a distinct inverted-V shaped pattern, with a steady increase in heart rate to reading 11 (about 6 minutes into the performance) and a rapid decrease afterwards.

On the inexperienced/experienced comparison graph (see Figure 23), there were 25 inexperienced subjects for readings 1-12 and 13 available for measurement 20. Fourteen subjects comprised the experienced group for readings 1-12 and only 8 were available by reading 20. Although the number of subjects after reading 12 gradually declined, the graph clearly depicts the inexperienced subjects showing a more rapid decrease in heart rate than the experienced. The experienced subjects begin their decrease at the same time as the inexperienced, but do not begin to decline rapidly until after 10 minutes into the performance.

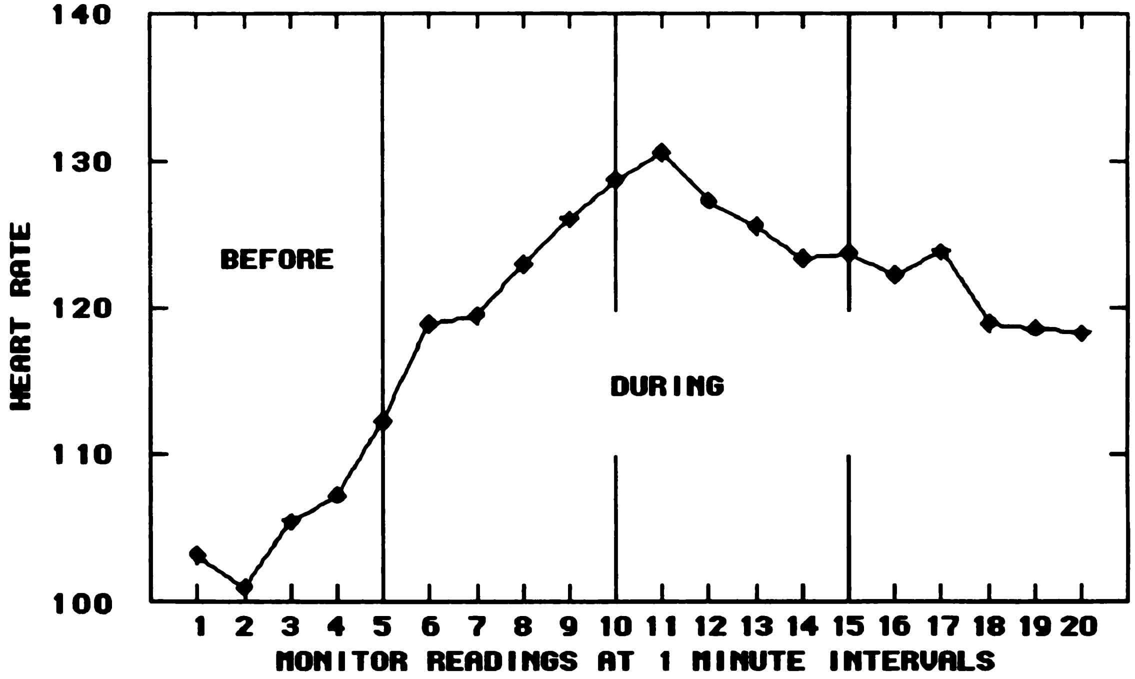

Figure 22. Heart monitor readings of the research population taken at the jury performance (entire 15 minutes).

Table 65

Descriptive Statistics: An Additional 8 Monitor Readings of the Jury for the Research Population

Reading	**13**	**14**	**15**	**16**
N of Cases	38	36	36	36
Minimum	68.75	77.00	77.00	77.50
Maximum	179.75	181.00	176.75	175.50
Range	111.00	104.00	99.75	98.00
Mean	125.43	123.23	123.56	122.15
Variance	626.07	608.01	587.04	606.69
SD	25.02	24.66	24.23	24.63

Reading	**17**	**18**	**19**	**20**
N of Cases	33	30	27	21
Minimum	70.00	73.50	72.75	84.25
Maximum	178.50	178.50	185.50	174.25
Range	108.50	105.00	112.75	90.00
Mean	123.68	118.80	118.53	118.30
Variance	707.10	549.67	508.73	395.06
SD	26.61	23.45	22.56	19.88

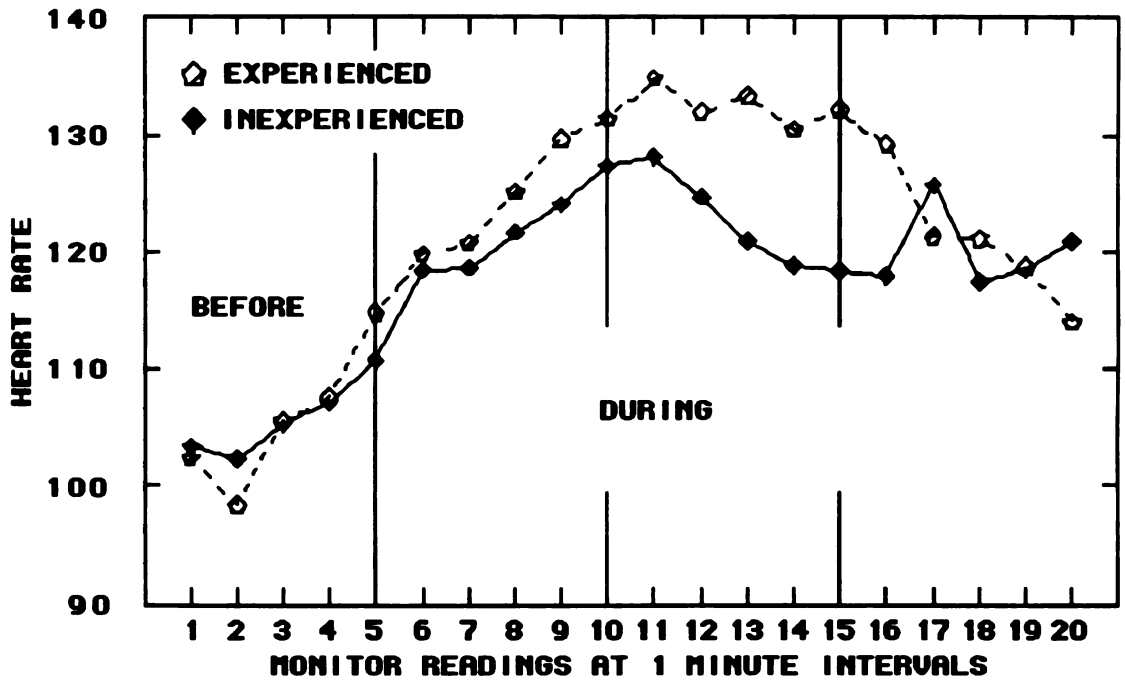

Figure 23. Heart monitor readings for the jury (entire 15 minutes): A comparison between the inexperienced and experienced subjects.

Table 66

Descriptive Statistics: An Additional 8 Monitor Readings of the Jury for the Inexperienced Subjects

Reading	**13**	**14**	**15**	**16**
N of Cases	24	22	22	22
Minimum	68.75	77.00	77.00	77.50
Maximum	174.25	169.75	164.00	161.25
Range	105.50	92.75	87.00	83.75
Mean	120.88	118.67	118.17	117.81
Variance	658.54	580.09	547.52	477.51
SD	25.66	24.09	23.40	21.85

Reading	**17**	**18**	**19**	**20**
N of Cases	19	18	16	13
Minimum	85.00	90.50	91.50	106.50
Maximum	171.75	175.25	159.75	152.25
Range	86.75	84.75	68.25	45.75
Mean	125.59	117.32	118.48	120.89
Variance	648.04	476.86	264.72	177.78
SD	25.46	21.84	16.27	13.33

Table 67

Descriptive Statistics: An Additional 8 Monitor Readings of the Jury for the Experienced Subjects

Reading	13	14	15	16
N of Cases	14	14	14	14
Minimum	93.00	82.25	86.50	84.50
Maximum	179.75	181.00	176.75	175.50
Range	86.75	98.75	90.25	91.00
Mean	133.23	130.39	132.04	128.96
Variance	512.92	609.46	569.53	780.22
SD	22.65	24.69	23.87	27.93

Reading	17	18	19	20
N of Cases	14	12	11	8
Minimum	70.00	73.50	72.75	84.25
Maximum	178.50	178.50	185.50	174.25
Range	108.50	105.00	112.75	90.00
Mean	121.08	121.02	118.59	114.09
Variance	832.88	703.20	925.60	791.36
SD	28.86	26.52	30.42	28.13

Coping with Performance Anxiety Questionnaire

After each subject completed his or her jury performance, they were asked to fill out a questionnaire regarding the methods that they may have used to cope with their performance anxiety problems. The results of this questionnaire are found in Table 68. All 42 subjects are reported in the results, including those whose data was not used in the analysis because of medical exclusion.

The table is organized by coping strategies with the response frequencies for the inexperienced and experienced samples directly below each strategy. The list is organized in order of the number of people who claimed that they tried a particular coping strategy. The numbers of people that have tried a given method are listed under the "Tried" columns with the designation "Yes" or "No." To the right of the "Tried" columns are the "Effectiveness" columns. These are based on a 5-point Likert-type scale with 1 being ineffective and 5 being most effective. The numbers listed under each column are the number of people who specified that particular level of effectiveness.

The coping techniques tried most often by the students in this study were: (a) talking to friends, N = 36; (b) rest-stop playing, N = 29; (c) self-talk, N = 28; and (d) imagery and talking to family, N = 24 each. Of these, perhaps self-talk was found to be most effective. The majority of people who tried this technique seemed to think that it had a positive affect on controlling their anxiety.

Table 68

Responses from the Coping with Performance Anxiety Questionnaire

Coping Strategy	Tried		Effectiveness				
	Yes	No	1	2	3	4	5
Talking to friends							
Inexperienced	22	3	0	8	7	4	3
Experienced	14	3	1	3	2	7	1
Rest--stop playing							
Inexperienced	16	9	3	2	5	2	4
Experienced	13	4	0	2	6	4	1
Self-talk							
Inexperienced	15	10	0	3	5	6	1
Experienced	13	4	0	3	3	6	1
Imagery							
Inexperienced	14	11	0	4	3	4	3
Experienced	10	7	1	0	5	1	3
Talking to family							
Inexperienced	16	9	2	2	8	3	1
Experienced	8	9	2	0	2	3	1
Progressive Relaxation							
Inexperienced	9	16	0	1	4	2	2
Experienced	6	11	0	0	4	2	0
Massage							
Inexperienced	7	18	0	1	3	1	2
Experienced	5	12	0	1	1	3	0
Meditation							
Inexperienced	7	18	0	3	3	0	1
Experienced	4	13	0	1	1	2	0
Aerobic Exercise							
Inexperienced	6	19	0	0	2	0	4
Experienced	4	13	0	1	1	2	0
Counseling							
Inexperienced	2	23	1	1	0	0	0
Experienced	2	15	0	0	2	0	0
Beta-blockers							
Inexperienced	0	25	0	0	0	0	0
Experienced	2	15	0	0	0	1	1

Table 68 (cont'd)

Coping Strategy	Tried		Effectiveness				
	Yes	No	1	2	3	4	5
Other prescribed meds							
Inexperienced	1	24	0	0	1	0	0
Experienced	1	16	0	0	1	0	0
Biofeedback							
Inexperienced	0	25	0	0	0	0	0
Experienced	1	16	0	0	0	1	0
Hypnosis							
Inexperienced	0	25	0	0	0	0	0
Experienced	1	16	0	1	0	0	0
Alcohol							
Inexperienced	0	25	0	0	0	0	0
Experienced	1	16	0	0	0	1	0
Nonprescribed meds							
Inexperienced	0	25	0	0	0	0	0
Experienced	0	17	0	0	0	0	0

CHAPTER 5: DISCUSSION

Research that has been conducted in the field of music and in other disciplines has provided considerable evidence that performance anxiety is a widespread problem that can manifest itself in cognitive, behavioral, and/or physiological ways. It has been reported that the symptoms of anxiety can occur simultaneously in all three of these realms (synchrony), or separately (desynchrony). Research evidence is still equivocal, however, as to exactly how these areas interact, or if they interact at all.

In the present research, I have examined the cognitive and physiological effects of music performance anxiety over a five week period culminating with a graded "jury" performance. I reported the results of the raw data collection and statistical analysis in Chapter 4. In Chapter 5, I will discuss these results by presenting separately each of the physiological measures (blood pressures, pulse rates, and respiration rates) and the psychological measures (State-Trait Anxiety Inventory [STAI] scores). A discussion of response synchrony and desynchrony between the physiological and psychological measures will follow. Each area will be examined in the context of the entire research population, and a comparison of the inexperienced performers (freshmen and sophomores) with the experienced performers (juniors, seniors, and graduate students). Finally, I will discuss the results obtained by the Vantage XL Heart Rate Monitor during the dress rehearsal and the jury performance. In conclusion, I will present some suggestions for future research.

Vital Signs and STAI

Population

The important results of the vital signs and STAI assessments for the research population (see Figures 5, 7, 10, & 12) are their marked increases before the dress rehearsal and again before the jury. A certain degree of this increase may be attributed to the natural "psyching-up" process, which ordinarily occurs before a performance. Judging by the extent of the increases, however, I would conclude that the students actually considered the dress rehearsal and jury performance to be relatively stressful situations. Another fact is that the repeated-measures analyses for each variable demonstrated statistically significant changes over time (see Tables 2, 12, 22, & 33). A separate examination of each variable will clarify these points.

The average of the first three weeks of blood pressure assessments for the population (those taken before "nonstressful" lessons) was 86.34 millimeters of mercury (mm Hg). The stability of these assessments is evident in the paired samples *t*-tests where statistical significance was not achieved between week 1 and week 2 or between week 2 and week 3 (see Table 3). An increase of 3.81 mm Hg was recorded before the dress rehearsal, and another increase of 3.93 mm Hg before the jury--a total increase of 7.74 mm Hg (see Figure 5). Both of these increases were found to be significant by the paired samples *t*-tests in Table 3.

Pulse rate assessments showed an even more pronounced increase, as they rose steadily throughout the entire research period. The average pulse rate for the first three weeks was 69.74 beats per minute. This average increased by 9.23 before the dress rehearsal, and an additional 7.59 beats per minute before the jury. The total increase between the lesson situations and the jury was 16.82 beats per minute (see Figure 7). Similar to the blood pressure assessments, the paired samples *t*-tests showed no significant changes among the first three assessments, but were significant before the dress rehearsal and jury performance--again demonstrating the stability of the first three assessments relative to the performance situations.

Respiration rates for the population also showed an increase before the last two assessments, but their increases were not as dramatic. The average respiration rate for the first three weeks was 13.54 breaths per minute. The rate before the dress rehearsal was 14.46, and before the jury, it was 15.80--a total increase of 2.30 breaths per minute (see Figure 10). Statistical significance was demonstrated by the paired samples *t*-tests only between week 3 and the dress rehearsal, although the difference between the dress and jury was close at a .06 probability (see Table 23).

The STAI scores also yielded some interesting results. The most intriguing was that the highest level of self-reported anxiety was on the morning of the jury before leaving for school (the "AM" score). A slight decrease immediately before the jury performance followed (see Figure 12). The STAI scores, as demonstrated by the paired samples *t*-tests, were the least stable of all the variables (see Table 34). Significant changes from week to week were found between week 2 and week 3, week 3 and the dress rehearsal, and the dress rehearsal and the "AM" score. If the "AM" STAI score is eliminated, the pattern of assessments is very similar to the vital sign assessment patterns that showed marked increases before the dress rehearsal and again before the jury.

The average STAI score for the first three weeks was 39.80. The mean score that was reported before the dress rehearsal was 42.44, an increase of 2.64. Before the jury, the mean score was 46.33, which was an additional increase of 3.90. The total increase of the mean STAI scores between the average of the first three weeks and the jury performance was 6.53.

An additional interesting fact is that the national normative mean scores for college students, as reported by Spielberger, Gorusch, Lushene, Vagg, and Jacobs (1983), was 36.47 for males and 38.76 for females. These scores were gathered during nonstress-provoking situations. The 27 males in the present study had an average score of 36.64 for the first three assessments (the "nonstressful" situations), which was slightly higher than the national average. The 12 females participating in the present study reported an average score of 46.89 for the first three assessments, which is well above the national average. The higher scores obtained by the females in this study are consistent with other research that has specifically compared gender differences on self-reported anxiety measurements (Abel & Larkin, 1990; Craske & Craig, 1984; Jones & Cale, 1989; Steptoe, 1989). These studies all found that females generally reported higher levels of anxiety, and often lower levels of self-confidence, than males.

Comparison of the Inexperienced and Experienced Performers

Among the research studies involving levels of experience, evidence of significant differences between inexperienced and experienced performers is largely equivocal. Mahoney and Avener (1977) and Fenz (1975) found support for experience differences, but other researchers have not (Gould, Horn, & Spreemann, 1983; Gould, Petlichkoff, & Weinberg, 1984; Highlen & Bennett, 1979).

In this study, I determined that the basic patterns of anxiety and arousal between inexperienced and experienced performers closely resembled each other before and during the stressful situations of the dress rehearsal and jury. Other similarities between the two groups were that all the vital sign assessments reached their highest points immediately before the jury performance.

I have also found important differences to exist between the inexperienced and experienced performers. Probably the most noteworthy were the distinct levels of anxiety and arousal that separated the two samples, as well as the expanded range and abrupt increases in the inexperienced group. In the following sections I will highlight these and other specific differences and similarities that distinguished the inexperienced from the experienced performers.

Vital Signs

On all the vital signs assessments except blood pressure, the inexperienced performers showed higher terminal levels of arousal than did the experienced performers (see Figures 6, 8, & 11). For all the blood pressure assessments, however, the experienced performers were higher. I feel that, when interpreting the vital sign assessments, the most important consideration must be a comparison of the degree of change throughout the study. In each case, the inexperienced performers displayed a much greater increase between the average of the first three assessments and the jury performance.

The independent samples *t*-tests for the blood pressure assessments showed the experienced performers to be significantly higher on all assessments except for week 1 and the jury (see Table 6). The inexperienced performers had an average blood pressure of 84.31 mm Hg for the first three assessments, which did not show significant changes by the paired samples *t*-tests in Table 8. This average increased 9.45 mm Hg to an assessment of 93.76 before the jury, which was statistically significant. The experienced performers, conversely, had an average blood pressure of 89.95 mm Hg for the first three assessments and rose to 94.64 before the jury. This was an increase of only 4.69 mm Hg--about half the amount demonstrated by the inexperienced performers. The repeated-measures analyses showed the inexperience performers to have significant changes over time, while the experienced performers did not.

The comparison of palpated pulse rates for the inexperienced and experienced performers throughout the study also exhibited noteworthy patterns (see Figure 8). Most interesting was that the experienced performers showed relatively stable pulse rates for the first three assessments. These were followed by an abrupt increase before the dress rehearsal and then only a .14 beat per minute increase before the jury. The paired samples *t*-tests corroborate the graph by showing a significant change only between week 3 and the dress rehearsal. Conversely, the inexperienced performers displayed constant increases for the duration of the study, finishing 7.34 beats per minute higher than the experienced performers. This pattern could certainly indicate that the experienced performers were less anxious than the inexperienced due to their decreased level of arousal. Both groups showed significant changes over time by the repeated-measures analysis.

The respiration rates demonstrated most clearly the increased range of arousal in the inexperienced performers. The average respiration rate for both groups for the first three assessments was nearly the same, 13.55 for the inexperienced and 13.52 for the experienced, which provided an excellent baseline for comparison. The inexperienced subjects were assessed at 16.32 breaths per minute before the jury, which was an increase of 2.77; while the experienced performers showed only a 1.34 breath per minute increase (to 14.86) between the "nonstressful" lessons and the jury performance. These findings are statistically confirmed by the repeated-measures analysis that showed significance for the inexperienced performers but not for the experienced (see Tables 27 & 29). Neither group showed significant week to week changes on the paired samples *t*-tests (see Tables 28 & 30).

State-Trait Anxiety Inventory

The results of the STAI showed that self-reported anxiety levels of the inexperienced performers were significantly higher than the experienced performers on all assessments (see Figure 13 and Table 37). The STAI scores revealed even more distinct separation between the two groups than did the blood pressure assessments.

An important observation for the STAI scores is that the self-reported anxiety patterns (not the levels) of both groups were nearly identical; the exception being the "AM" score taken in the morning on the day of the jury. This was the peak period of anxiety for the inexperienced performers, who then reported a decrease in anxiety before the jury. Conversely, the experienced subjects indicated a steady increase in anxiety beginning with the third assessment and continuing to the jury performance. Both the inexperienced and experienced samples showed significant changes over time on the repeated-measures analyses (see Tables 38 & 40). These patterns contradict the findings of Fenz (1975) who reported opposite anxiety patterns for the same two assessments between his inexperienced and experienced subjects.

If self-report psychological tests are more indicative of anxiety than physiological measures, as indicated by some test-anxiety researchers (Deffenbacher & Hazaleus, 1985; Holroyd & Appel, 1980), then the inexperienced performers were, without a doubt, considerably more anxious about the jury than the experienced performers.

Response Synchrony and Response Desynchrony

Agreement on the correlation between physiological and psychological measurements is largely equivocal. Some researchers have shown a significant correlation between the two domains (Kelly & Walter, 1968; McLeod et al., 1986), while other studies have shown little correlation (Pennebaker, 1982; Ray, Cole, & Raczynski, 1983). One of the major research concerns of this study was to compare physiological measures (the vital signs, including blood pressure, pulse rate and respiration rate) and psychological measures (STAI scores--self-reported anxiety) to determine if, when taken concurrently,

they showed the same patterns of anxiety and arousal. Response synchrony is achieved when measurements are all moving in the same direction but not necessarily parallel to each other. Response desynchrony occurs when the measurement patterns are moving in opposite directions. In the following discussion, I have ignored the "AM" scores of the STAI because there were no concurrent vital sign assessments.

As a general observation, response desynchrony was recorded for the "nonstressful" lesson situations--the first three assessments. Response synchrony was noted for the dress rehearsal and jury assessments among all four variables (blood pressure, pulse rate, respiration rate, and STAI). This analysis was comparable within each sample; the research population, the inexperienced performers, and the experienced performers (see Figures 14, 15, & 16). These results concur with Lang, Miller, and Levin (1988) who found that response synchrony occurs under conditions of extreme anxiety, while response desynchrony will occur in relatively less anxious conditions.

Comparisons between the vital signs assessments and the self-reported anxiety measurements did not show a high degree of statistical significance by the Pearson correlations (see Tables 42, 43, & 44). All methods of measurement (blood pressures, pulse rates, respiration rates, and STAI scores), however, demonstrated elevated levels before the stress provoking situations of the dress rehearsal and jury performance. Because of the range of elevation found in these patterns, I am convinced that physiological and psychological measurements are both valid predictors of music performance anxiety and will show response synchrony in stressful situations. The results of the comparisons between physiological and psychological patterns in this study support the definition of anxiety offered by Spielberger (1966): Anxiety is "characterized by subjective, consciously perceived feelings of apprehension

and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (p. 17).

Perhaps the most remarkable comparison between the vital signs assessments and the self-reported anxiety measurements were the lower STAI scores relative to the blood pressures and pulse rates in the experienced sample (see Figures 15 and 16). As indicated in Chapter 4, these results may have been due to actual lower levels of anxiety in the experienced sample, more cognitive attention paid to physiological arousal by the inexperienced sample, or gender differences and ego involvement by the experienced sample.

Heart Rate Monitor

I found the graphs of the heart monitor readings from the dress rehearsal and jury performance extremely informative (see Figures 17 - 23). Because I was able to monitor the student's heart rates during the performances, I have documented objective levels of arousal throughout an actual graded performance that was not contrived for the research. This is extremely significant in that I have not discovered such a study in the music performance anxiety literature.

When interpreting the patterns assessed by the heart rate monitor, it is important to remember that the levels of recorded heart rates are probably due to a combination of both performance anxiety and physical exertion; obviously, it is difficult to segregate the two completely.

Heart Rates in the Dress Rehearsal

The graph of the dress rehearsal for the research population showed a sporadic pattern for the first five minutes. This was the period before the subjects began the dress rehearsal. Upon the start of the rehearsal there was a dramatic increase in heart rate, which was followed by an equally sharp decrease about two minutes into the performance. A smaller increase and another decrease followed. I speculate that the dramatic increase in heart rate at the start of the dress rehearsal can be attributed primarily to anxiety, because, for many of the subjects (primarily the inexperienced), this was the first time that they performed with their accompanist in the presence of the instructor. The smaller fluctuations, however, can possibly be accounted for by considering the starting and stopping that transpires in a rehearsal situation. The dramatic increases for readings 6 and 7 are confirmed by statistical significance for the two periods on the paired *t*-test analysis (see Table 47).

The pattern displayed by the inexperienced subjects during the dress rehearsal was nearly identical to that of the population (see Figures 17 & 18). Along with the reasons given above for the sudden increase in heart rate during the first minutes of the performance, another possibility may be that five subjects in the inexperienced sample were markedly tachycardic (abnormally rapid heart rate) during this period. Their individual heart rates were monitored between 127 and 138 beats per minute, and could have easily skewed the data. Although statistical significance was found on the paired *t*-test analysis for readings 5 with 6, 6 with 7, and 7 with 8, the repeated-measures analysis did not demonstrate significant changes over time.

The graph for the experienced subjects (see Figure 18) shows their heart rates to be higher than those of the inexperienced; the exception being the "spike" in the inexperienced graph for minutes 6 and 7. What is more important, however, is that the pattern shown by the experienced subjects is much smoother in relation to the inexperienced and did not show statistically significant changes over time (see Table 53). I speculate that this smoothness may be evidence that the experienced subjects were more self-confident about the upcoming jury performance. By knowing what to expect in the jury, the experienced subjects may have practiced to meet the goals of the jury, and therefore, approached the dress rehearsal with a higher degree of self-efficacy. In addition, many of the experienced subjects were preparing music to be performed on recitals during the following term and were using the jury as a type of "dress-rehearsal." Because of this ultimate goal, they had rehearsed with their accompanists more often under the tutelage of their instructors, and were generally more prepared for the upcoming jury than were the inexperienced subjects.

An interesting note is the difference in range between the two samples. The lowest mean heart rate for the inexperienced performers was 87.95, taken on the first reading. Their highest point was 96.68, which was taken approximately two minutes into the dress rehearsal. Conversely, the low point for the experienced subjects was 89.00 during the third minute of monitoring. Their highest reading was 95.84, which was taken approximately four minutes into the performance. The range for the experienced subjects was only 6.84 beats per minute, as compared to a range of 8.73 for the inexperienced--not a large difference when compared to the range of the palpated pulse rates (see Figure 9),

Heart Rates in the Jury Performance

By following the heart monitor readings through the entire jury performance, I have determined that the absolute peak level of arousal occurred for both the inexperienced and experienced subjects at approximately six minutes into the performance and decreased steadily afterwards. The graph for the population (see Figure 22) and the graph for the inexperienced sample (see Figure 23) showed distinct inverted-V shaped patterns, which exhibited a rapid decrease in heart rate after the peak. The experienced performers displayed an inverted-U shaped pattern that indicated a slower rate of relaxation after the peak of arousal and a more gradual decline in heart rate (see Figure 23). Statistically significance was achieved on the repeated-measures analysis for all three samples (see Tables 56, 61, & 63).

This peak of arousal that occurred six minutes into the performance contradicts the reports of several test anxiety researchers (Doctor & Altman, 1969; Geen, 1980; Liebert & Morris, 1967; Morris & Liebert, 1970; Sarason, 1960) who found that arousal (emotionality in their terms) peaked immediately before the evaluative situation and was followed by a rapid decline. I attribute this striking difference in results to the nature of the evaluative situation. In a test anxiety setting, the constant emotional and physical demands needed for a successful music performance are not imposed upon the subject. He or she may concentrate solely on taking the test, become increasingly task-oriented, and consequently, experience less anxiety.

For the majority of readings, the experienced performers recorded a more rapid heart rate than the inexperienced, although the independent samples *t*-test comparison of the two samples showed no significant differences (see Table 60). I found the elevated heart rates of the experienced sample to be unusual because I hypothesized that they would have been more task-oriented, and as suggested by the sports researchers Mahoney and Avener (1977), and Meyers, Cooke, Cullen, & Liles (1979), assessed with less anxiety. I speculate that this difference was not necessarily due to the inexperienced performers being less anxious. The increased heart rates of the experienced performers may have been attributed to more physical exertion and increased anxiety for two specific reasons. First, the music of the experienced performers was, in most cases, more technically and physically demanding. The second reason is that the experienced subjects may have felt a psychological need to perform well for the brass faculty, thus producing an elevated heart rate. The latter situation was exacerbated because two members of the faculty were new and the experienced subjects may have felt a need to impress them. Indeed, I overheard several of the experienced subjects discussing this very topic before their performances.

Comparison of the Dress Rehearsal and Jury Performance

A comparison of the heart rate monitor graphs of the dress rehearsal and jury performance yield a number of interesting differences. These differences are observed in the graphs of the inexperienced and experienced samples, and evident in the population graphs as well. Because of the general similarity of heart rate patterns in all three samples, I will only discuss the graphs for the population.

The first difference is the rapidity at which the heart rates increased during the jury situation. The dress rehearsal readings were sporadic for the five minutes before the rehearsal and rose abruptly to a peak two minutes later. The jury graph, on the other hand, started a steady climb that began almost immediately and peaked during the sixth minute of the performance.

An important difference between the inexperienced and experienced graph of the dress rehearsal must be recognized before continuing. The pattern displayed by the inexperienced sample was almost identical to that of the population, while the experienced subjects showed a very slow and smooth increase throughout the dress rehearsal and peaked two minutes later than the inexperienced performers. This slow rate of change in the experienced sample provided for an even more noticeable contrast between the dress rehearsal and the jury.

Another difference displayed by the population is the smoothness of the jury graph relative to the dress rehearsal graph. I believe this demonstrates a more constant level of arousal, possibly due to higher levels of anxiety. Another explanation may be a greater level of task or goal-oriented thinking that produced a more consistent level of arousal.

Perhaps the most significant difference between the dress rehearsal and the jury graphs was the range and level of heart rates (see Figure 20). The range of the dress rehearsal (see Figure 17) was from 88.42 to 95.37 beats per minute--a difference of 6.95 beats per minute. The range for the jury performance (see Figure 19) showed a low of 100.97 (taken on the second reading), which was 5.6 beats per minute higher than the peak heart rate during the dress rehearsal, and ranged to a mean high of 130.46 beats per minute--a difference of 29.49 beats per minute.

I must highlight a small research concern at this point. The last palpated pulse rate, assessed before the subjects were to perform the jury, was 86.56 beats per minute (see Figure 7). The first recorded heart rate from the monitor was 103.12 (see Figure 19)--a difference of 16.56 beats per minute. This difference is accounted for because an unspecified amount of time elapsed between the assessment of the vital signs and when the subjects actually walked into the performance room. This was a factor I could not control for because the jury performance times were not consistent from subject to subject. I do not feel that this gap in the continuity of pulse rates was detrimental to the study, but only reinforced the accelerated rate at which pulses quickened anticipating the approach of the performance.

The most incredible data found during this research was that the heart rates for several subjects were being recorded in the 170s and 180s range during the peak period of the jury. The highest recorded individual heart rate was 188 beats per minute. This is an amazing figure considering that the average resting adult heart rate is between 60 and 80 beats per minute. In addition, the theoretical maximum heart rate for an average 20 year old, as recognized by the American College of Sports Medicine, is 200 beats per minute. The recommended cardiorespiratory training range for exercise is between 75 to 90 percent of this theoretical maximum, which is 150 to 180 beats per minute for an average 20 year old (American College of Sports Medicine, 1986). Perhaps individuals who are tachycardic to this extent are viable candidates for the controlled use of beta-blockers.

Suggestions for Future Research

A vast amount of study involving anxiety and arousal has been done outside the field of music, and that research has not yet been fully employed by music performance anxiety researchers. Unfortunately, due to situation-specific criteria, it is often difficult to draw conclusions on music performance anxiety by utilizing this research; the multi-faceted emotional, physical, and aesthetic demands placed on performing musicians make them vulnerable to stresses not recognized in other endeavors. For this reason it is imperative that continued research be accomplished, exploring both the psychological and physiological effects specific to music performance anxiety. To this end, I offer several suggestions, in addition to the ones previously recommended, for expanded research. I have drawn these ideas from my own research, and from research in other disciplines that could be adapted to music performance.

First and foremost, this study should be replicated in the junior and senior high school setting. The majority of the music performance anxiety studies are accomplished using university musicians because they are readily available, are exposed to research, and are adults who are able to give consent. Although doing research with a younger student would involve additional time and preparation, I believe this important area is largely unexplored in the music performance anxiety literature.

Not only would it be useful to compare the patterns of arousal and anxiety across a variety of ages, but also beneficial to determine if it is in the junior and senior high schools that the roots of performance anxiety actually begin. Perhaps through unfavorable performance experiences at solo and ensemble festivals, the music profession has lost students who were ill-prepared or overwhelmed by the ordeal and are now afraid to perform. These may have been good students, excellent players, and promising future teachers who chose not to continue a career in music because of their deleterious experiences. Perhaps an informative study would be to survey incoming college students who were involved with music in high school and are now pursuing other interests. Questions on the survey could be structured to determine if performance anxiety was an important factor in circumventing further participation in musical activities.

By utilizing graded performance situations, either a jury performance, a concerto competition, or a high school solo and ensemble festival, a study could be done comparing how the subjects fared while being evaluated. Several studies from the sports literature have compared successful and unsuccessful performers, or finalists and nonfinalists in competition (Fenz, 1975; Highlen and Bennett, 1979; Mahoney and Avener, 1977; Meyers, Cooke, Cullen, & Liles, 1979). These studies compared the anxiety and/or arousal levels of successful and unsuccessful performers before and during competition, their anxiety coping strategies, and their training habits.

Replication of these studies in a music performance setting would be highly applicable. A relevant adaptation of the sports investigations could be a comparison of those students receiving "Superior" and "Fair" ratings during a solo and ensemble festival, or finalists and nonfinalists in a concerto competition. Research questions that could be addressed are: what techniques or strategies the two groups use to cope with their anxiety, what are their levels of self-efficacy, and how much time do members of each group spend on preparation for the performance. An additional area might be to explore anxiety and arousal levels before and during performance by replicating the techniques of this study, but compare successful and unsuccessful performers rather than the inexperienced and experienced.

Additional follow-up studies addressing the cognitive processes of inexperienced and experienced individuals (or successful and unsuccessful individuals) may be beneficial in the assessment of performance anxiety specifically in music school jury performance situations. Research problems could range from the role of the faculty to the psychological mind-set of the performer. Do upperclassmen have an overwhelming need to impress the adjudicating faculty? Do they feel that they have a standard to live up to, or a reputation as a performer to maintain in the faculty's eyes? What are the thoughts of the freshmen preparing for their first juries? What are their thoughts during the actual performance? Answers to these questions, juxtaposed with heart monitor readings during the jury performance, may yield valuable insights as to the differences in the levels of arousal between the inexperienced and experienced performers found in the present study.

Future studies could also approach experience levels from the standpoint of ego involvement. Several researchers (Abel & Larkin, 1990; Craske & Craig, 1984; Jones & Cale, 1989; Steptoe, 1989) have already addressed gender differences relative to anxiety and arousal and found that ego involvement may have played an important role. Perhaps research focused on ego involvement between inexperienced and experienced individuals may be beneficial. Such a study could possibly answer the questions posed in this study regarding the lower STAI scores of the experienced sample in the comparison of Figures 15 and 16.

Given the magnitude of the heart rates recorded by the heart monitor in this study, I propose that the measurement of heart rates during a performance is a viable indicator of arousal and anxiety. In future research utilizing a heart rate monitor, it would be beneficial to have the subjects complete a post-performance STAI to indicate their perceived arousal during the performance. I believe it would be interesting to determine if there is a correlation between perceived anxiety and the actual state of arousal. Such a study may seriously challenge the findings of Morris and Leibert (1970) and Pennebaker (1982) who concluded that perceived elevation of somatic arousal and actual increases are poorly correlated.

A similar study may also attempt to segregate the physical and emotional elements causing an elevated heart rate. If the monitor recorded a high heart rate and the post-performance STAI indicated a low level of perceived anxiety, perhaps the high heart rate could be attributed to physical exertion. Conversely, if the monitor recorded a high heart rate and the post-performance STAI indicated a high level of perceived anxiety, it could be concluded that the elevated heart rate was due to anxiety.

Other attempts to segregate physical and cognitive elements might yield answers to the question regarding which of these symptoms occurs first. Wine (1971) and Kohut (1977) speculated that physiological arousal may occur first and precipitate worry and cognitive overawareness of that arousal. Other studies (Ellis, 1977; Fishbein & Middlestadt, 1988; Steptoe, 1989; Steptoe & Fidler, 1987), however, have indicated that negative cognitions may be the major factor in the onset of performance anxiety. I feel that this issue must be clarified in order to assist researchers who are attempting to treat performance anxiety problems, especially those prescribing beta-blockers. With beta-blockading medications, the physiological symptoms of anxiety are eliminated without considering the cognitive aspects. Perhaps, with the aid of a heart monitor, a study could be conducted to determine if physiological symptoms are controllable with psychological treatment.

Further research is obviously needed to explore more thoroughly the many complex variables associated with music performance anxiety. Effective treatment of its debilitating effects can only be accomplished if we completely understand its causes, be they psychological or physiological, and in which sample of the population do the symptoms occur at the greatest levels.

Conclusion

With the results of this study, I have determined that the patterns of anxiety between inexperienced and experienced performers are relatively similar. There are, however, significant differences that exist in the levels of anxiety and arousal between the two samples. I determined these differences to be present among the physiological, as well as the psychological measurements.

Using the patterns of anxiety and arousal taken over time, I have demonstrated that physiological and psychological measures exhibit response synchrony during stress-provoking situations, but during nonstressful situations, the results are equivocal. Because the response patterns were similar among the vital signs and the STAI scores, I have concluded that both physiological and psychological measures are viable indicators of anxiety and arousal.

The Polar Vantage XL Heart Rate Monitor proved a reliable measurer of arousal during the dress rehearsal and jury performance. Accurate heart rates were recorded with a minimum of discomfort and inconvenience to the students wearing the monitor. The results of the heart monitor were extremely informative and could be used by future researchers who need a simple, nonintrusive instrument to record physiological response.

This exploratory research, or variations thereof, must be replicated and refined. An equal number of inexperienced and experienced performers, as well as an equal representation of males and females would be an ideal situation, and might yield different results.

I am confident that the outcomes of this study will be beneficial to future researchers. I also hope that the results will have significant ramifications toward the study of anxiety reduction techniques, as well as the efficacy of using beta-blockers and anxiolytic medications for controlling the debilitating physiological effects of performance anxiety.

APPENDICES

APPENDIX A

Instructions for Wearing and Operating the Polar Vantage XL Heart Rate Monitor

There are three components to the *Polar Vantage XL Heart Rate Monitor:* (1) the elastic chest band which contains the conductive electrodes and transmitter connectors, (2) the sensor/transmitter that snaps on to the chest band, and (3) the wrist monitor, the system's computer, which is worn like a wrist watch.

There will be five minutes allotted before your performance to put on the heart monitor. The restrooms on the first floor of the Music Practice Building will provide privacy to accomplish this. A research assistant will be available to help if needed. Be sure to wear clothing that will allow you easy access to the lower portion of your chest.

The diagrams used in these instructions are reproduced from the *Users Instruction Manual* that accompanies the Polar Vantage XL Heart Rate Monitor. Polar CIC: Port Washington, NY. Reproduced by permission.

Wearing the Sensor/Transmitter

The instructions needed to operate the *Polar Vantage XL Heart Rate Monitor* have been obtained from the *Polar Vantage XL Heart Rate Monitor User's Instruction Manual* (1989).

1. Adjust the elastic chest band so that it fits snugly, but not too tight.
2. With the plastic end of the band in your left hand, and the elastic end in your right, insert the round end of the band into the buckle and snap it into place on a bare chest.

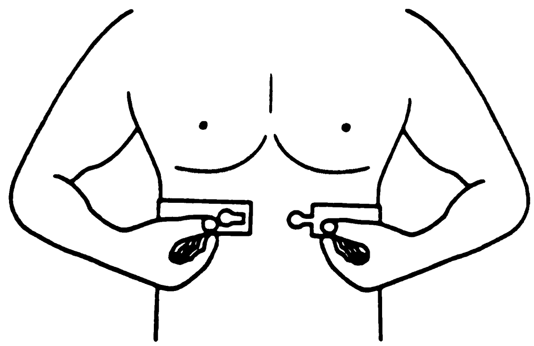

Figure 24. Positioning the chest band.

3. Center the plastic portion of the chest band on the lower part of your chest, approximately 1-2 inches below the pectoral muscles (breasts).

4. Snap the transmitter onto the chest band. Be certain that the red snap is on your left, and the black snap is on your right ("Polar Transmitter" is printed on the front of the transmitter. Simply ensure that the printing is right-side-up and the transmitter will be snapped on correctly).

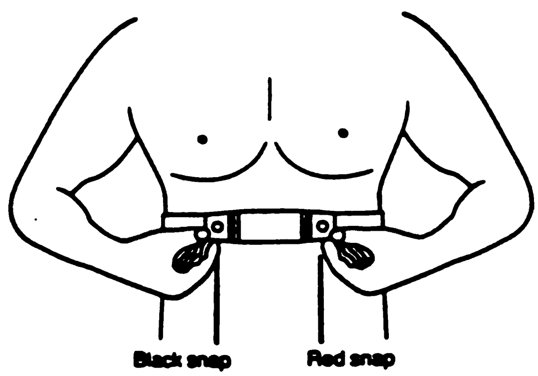

Figure 25. Snapping the transmitter on to the chest band.

5. Pull the unit away from your chest by stretching the belt. Moisten (with water) the area of your skin where the conductive electrode strips will contact

your chest. This process must be done to insure a good electrical contact between your body and the electrodes.

6. Put the wrist monitor on as you would an ordinary wrist watch.

7. The transmitter will switch on automatically when you are wearing it. It will also turn itself off when your remove it from your body.

Operating the Wrist Monitor

The Polar Vantage XL is designed to monitor athletic workouts, consequently, the wrist monitor can be programmed to perform several different functions. For the purposes of this study, all that will be needed is to record your heart rate at 15 second intervals. The monitor will be programmed in advance to perform this function.

When you receive the preprogramed wrist monitor it will be set to start recording your heart rate. On the face of the monitor you will see three rows of numbers: The top row is the time of day, the middle row is a stopwatch that will be set at 0:00oo, and the bottom row will automatically be monitoring (but not recording) your heart rate in beats per minute.

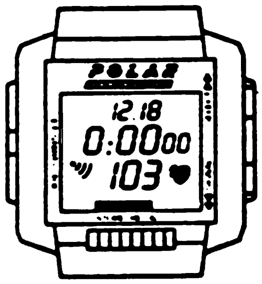

Figure 26. The face of the wrist monitor.

A flashing heart will be seen to the right of the heart rate display, it is flashing at the speed of your pulse. To the left of the heart rate display is an alarm indicator. The alarm will be turned off and will not be visible. If it is accidentally activated, it can be turned off again by pressing the lower button on the right side of the watch. The alarm function is designed to beep during a workout when your heart rate goes above or below a preprogramed "target zone." This function is not necessary for our purposes and the target zone will be preprogramed to an extremely high and low range. Therefore, even if the function is accidently activated, it will not emit a distracting beep in the middle of your performance.

To begin recording your heart rate, simply press the Set/Start/Stop button on the left side of the monitor. The stopwatch will be activated and your heart rate will start to be recorded at 15 second intervals. To stop recording, simply press the Set/Start/Stop button once again. The stopwatch will stop and the monitor will quit recording your heart rate. The flashing heart will continue, however, and the beats per minute display will continue to function until the belt and transmitter are removed from your chest. **Do not start or stop the monitor until told to do so.**

Removing the Sensor/Transmitter

1. Unsnap the transmitter and lay it in a safe place.
2. Lift the unit away from your chest and turn the round end of the buckle with your right hand.
3. Thoroughly dry both the transmitter and the conductive electrodes.
4. Return the unit to room 102 MPB.

APPENDIX B

Description of Procedures Involved

If you decide that you are interested in volunteering to participate in this study, you must first read and sign an agreement to participate form. In addition, you will be asked to complete a confidential form indicating your general health and medications that you are presently taking. This is necessary because the research involves assessment of your vital signs (blood pressure, pulse rate, and respiration rate) and certain health conditions and medications may affect these measurements. The health and medications questionnaire will be screened by a medical doctor to determine your eligibility to participate.

Once you have been cleared to participate in the study, your baseline vital signs will be obtained and the initial State-Trait Anxiety Inventory (STAI) will be administered, at your convenience, during the third week of the term. (All vital signs and other medical assessments will be conducted by licensed medical care professionals and will be confidential.) Vital signs will continue to be monitored and additional STAIs will be administered once a week during relatively low stress practice sessions. Dates and times to obtain vital signs will be set up with you in advance.

A heart monitor, which will be demonstrated for you, will be worn in practice sessions several weeks before the jury for purposes of familiarization only. The data from these sessions will not be used in the research. A detailed description of how to wear and operate the monitor will be provided for you.

An additional set of vital signs and an STAI will be obtained at your lesson (dress rehearsal situation) during the week prior to the jury. The STAI will be administered fifteen minutes before the lesson, and your vital signs will be obtained five minutes before and five minutes after the lesson. Your pulse will be monitored via the heart monitor during the lesson, and for five minutes before and after.

On the day of the jury, vital signs and STAIs will be obtained at the following times:

1. An STAI will be completed in the morning before leaving for school. No vital signs will be assessed at this time.

2. Upon arrival at the School of Music (please report to room 102 MPB).

3. Prior to the performance. Please report to room 102 MPB no later than 20 minutes prior to your assigned performance time; 5 minutes to put on the heart monitor (restrooms are next to the performance room for privacy), 10 minutes to complete the STAI, and an additional 5 minutes to obtain vital signs.

4. Five minutes after the performance (vital signs only--the STAI will not be administered at this time).

5. Pulse rate will be monitored during the performance, and for five minutes before and after, via the heart monitor.

6. After the final set of vital signs are obtained, you will be asked to complete a questionnaire regarding: "How do you cope with performance anxiety?" At the end of the questionnaire, you will be asked to comment on the events that transpired during the study and to suggest improvements that may benefit future research.

APPENDIX C

Agreement to Participate Form

Name ____

Phone # ____

I, «Student's Name» if selected to participate in this study, choose do so voluntarily and without coercion. I may choose not to participate at all, may refuse to participate in certain procedures or answer certain questions, or may discontinue participation at any time without penalty.

I agree that I will not consume caffeine (coffee, tea, soft drinks, chocolate, etc.), and will refrain from vigorous exercise for at least three hours prior to each assessment of vital signs. In addition, I agree to abstain from alcohol for at least 12 hours prior to each assessment.

I understand that all data gathered in this research is strictly confidential, and no one, except Philip Tartalone, author of the study; Dr. Albert LeBlanc, faculty supervisor of the study; and the licensed medical professionals who will be assessing vital signs, will have access to information that can personally identify me.

I further understand that I may obtain a copy of the results of this research through a written request to the author.

Student's signature ___________________________________

Date ___________________________

APPENDIX D

Medical Health and Present Medications Form

Due to the nature of this study, which involves the assessment of physiological measurements, students wishing to participate must meet specific medical criteria. As certain health conditions and prescribed medications will affect blood pressure, heart rate, and respirations, interested students will be screened to insure their eligibility for the study. The screening of this questionnaire will be done by a medical doctor. Each subject can be insured of complete confidentiality. No one will have access to this information except the medical doctor for screening, the author of the study, and the faculty supervisor of the study.

Please answer the following questions truthfully.

1. Are you a smoker? Yes No

   If yes, how much/often do you smoke? ____________________

   ____

2. Is your blood pressure consistently abnormal? Yes No

   If yes, is it high _____ or low _____

3. Is your pulse rate consistently abnormal? Yes No

   If yes, please explain your condition. ____________________

   ____

4. Do you have respiratory problems? Yes No

   If yes, please explain your condition. ____________________

   ____

5. Are you taking asthma medications? Yes No

   If yes, please list medications. ________________________

   ____

6. Are you taking cardiovascular medications? Yes No

   If yes, please list medications. ____________________________

   ____

7. Are you taking beta-blocking or anxiolytic medication? Yes No

   If yes, please list medications. ____________________________

   ____

8. Do you have any other medical condition, or are you taking any other medications that have not been mentioned that may affect the data that is collected? Please list medications and/or explain condition. ____

   ____

APPENDIX E

Coping With Performance Anxiety Questionnaire

The presence of stage fright is common, in varying degrees, in all musicians. In some performers, it may manifest itself as an obvious overt physiological response, in others it may be simply a minor cognitive issue that is imperceptible to an audience. Treatments of stage fright are numerous, and vary in their aggressiveness relative to an individual's needs.

The following list are some of the more common treatments. Please check the ones that you have tried (yes or no), and indicate their effectiveness (1 is ineffective, 5 is effective).

Class: Freshman Sophomore Junior Senior

Treatment	Tried?		Effectiveness?				
Imagery	Yes	No	1	2	3	4	5
Self-talk	Yes	No	1	2	3	4	5
Talking to friends	Yes	No	1	2	3	4	5
Talking to family	Yes	No	1	2	3	4	5
Counseling	Yes	No	1	2	3	4	5
Rest--stop playing	Yes	No	1	2	3	4	5
Aerobic Exercise	Yes	No	1	2	3	4	5
Progressive Relaxation	Yes	No	1	2	3	4	5
Biofeedback	Yes	No	1	2	3	4	5
Massage	Yes	No	1	2	3	4	5
Meditation	Yes	No	1	2	3	4	5
Hypnosis	Yes	No	1	2	3	4	5
Beta-Blockers	Yes	No	1	2	3	4	5
Other prescribed medication	Yes	No	1	2	3	4	5
Non-prescribed medication	Yes	No	1	2	3	4	5
Alcohol	Yes	No	1	2	3	4	5

Other treatments?--please list below

Treatment	Effectiveness?				
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

Comments on the Events During the Research

With the remaining space left on this page, please comment on your experiences during this research and provide possible suggestions that may benefit future research.

APPENDIX F

Individual Student Record

Name ______________________________

Campus Address ______________________________

____

Research Number ______________

Campus Phone ______________

Instrument ______________

	Lessons			Dress	Jury Day		
Date				Before	AM	SOM	Before
STAI							
Blood Pressure					----------		
Pulse					----------		
Respirations					----------		

APPENDIX G

Paired *t*-tests Analyses

Paired *t*-tests: Blood Pressures for the Research Population

Week 1 with Week 2

Mean Difference = 0.72

SD Difference = 7.27

T = 0.62 DF = 38 Probability = 0.54

Week 2 with Week 3

Mean Difference = 0.10

SD Difference = 6.50

T = 0.10 DF = 38 Probability = 0.92

Week 3 with Dress

Mean Difference = -4.13

SD Difference = 7.42

T = -3.48 DF = 38 Probability = 0.00

Dress with Jury

Mean Difference = -3.92

SD Difference = 7.81

T = -3.14 DF = 38 Probability = 0.00

Paired *t*-tests: Blood Pressures for the Inexperienced Sample

---

Week 1 with Week 2

Mean Difference = 1.60

SD Difference = 7.21

T = 1.11   DF = 24   Probability = 0.28

Week 2 with Week 3

Mean Difference = 0.32

SD Difference = 5.77

T = 0.28   DF = 24   Probability = 0.78

Week 3 with Dress

Mean Difference = -4.76

SD Difference = 6.81

T = -3.49   DF = 24   Probability = 0.00

Dress with Jury

Mean Difference = -5.44

SD Difference = 7.22

T = -3.77   DF = 24   Probability = 0.00

Paired *t*-tests: Blood Pressures for the Experienced Sample

Week 1 with Week 2

Mean Difference = -0.86

SD Difference = 7.38

T = -0.43 DF = 13 Probability = 0.67

Week 2 with Week 3

Mean Difference = -0.29

SD Difference = 7.85

T = -0.14 DF = 13 Probability = 0.89

Week 3 with Dress

Mean Difference = -3.00

SD Difference = 8.54

T = -1.31 DF = 13 Probability = 0.21

Dress with Jury

Mean Difference = -1.21

SD Difference = 8.36

T = -0.54 DF = 13 Probability = 0.60

Paired *t*-tests: Pulse Rates for the Research Population

Week 1 with Week 2

Mean Difference = -2.46

SD Difference = 13.32

T = -1.15 DF = 38 Probability = 0.26

Week 2 with Week 3

Mean Difference = -0.31

SD Difference = 14.55

T = -0.13 DF = 38 Probability = 0.90

Week 3 with Dress

Mean Difference = -8.21

SD Difference = 13.45

T = -3.81 DF = 38 Probability = 0.00

Dress with Jury

Mean Difference = -7.59

SD Difference = 16.46

T = -2.88 DF = 38 Probability = 0.01

Paired *t*-tests: Pulse Rates for the Inexperienced Sample

Week 1 with Week 2

Mean Difference = -4.00

SD Difference = 15.23

T = -1.31 DF = 24 Probability = 0.20

Week 2 with Week 3

Mean Difference = -1.28

SD Difference = 15.57

T = -0.41 DF = 24 Probability = 0.68

Week 3 with Dress

Mean Difference = -6.08

SD Difference = 11.67

T = -2.61 DF = 24 Probability = 0.02

Dress with Jury

Mean Difference = -11.76

SD Difference = 14.66

T = -4.01 DF = 24 Probability = 0.00

Paired *t*-tests: Pulse Rates for the Experienced Sample

Week 1 with Week 2

Mean Difference = 0.29

SD Difference = 8.80

T = 0.12   DF = 13   Probability = 0.91

Week 2 with Week 3

Mean Difference = 1.43

SD Difference = 12.90

T = 0.41   DF = 13   Probability = 0.69

Week 3 with Dress

Mean Difference = -12.00

SD Difference = 15.90

T = -2.82   DF = 13   Probability = 0.01

Dress with Jury

Mean Difference = -0.14

SD Difference = 17.39

T = -0.03   DF = 13   Probability = 0.98

Paired *t*-tests: Respiration Rates for the Research Population

Week 1 with Week 2

Mean Difference = -0.10

SD Difference = 2.83

T = -0.23 DF = 38 Probability = 0.82

Week 2 with Week 3

Mean Difference = 0.21

SD Difference = 2.89

T = 0.44 DF = 38 Probability = 0.66

Week 3 with Dress

Mean Difference = -1.03

SD Difference = 3.14

T = -2.04 DF = 38 Probability = 0.05

Dress with Jury

Mean Difference = -1.33

SD Difference = 4.34

T = -1.92 DF = 38 Probability = 0.06

Paired *t*-tests: Respiration Rates for the Inexperienced Sample

Week 1 with Week 2

Mean Difference = -0.32

SD Difference = 2.81

T = -0.57 DF = 24 Probability = 0.57

Week 2 with Week 3

Mean Difference = 0.32

SD Difference = 3.04

T = 0.53 DF = 24 Probability = 0.60

Week 3 with Dress

Mean Difference = -1.28

SD Difference = 3.41

T = -1.88 DF = 24 Probability = 0.07

Dress with Jury

Mean Difference = -1.60

SD Difference = 4.90

T = -1.63 DF = 24 Probability = 0.12

Paired *t*-tests: Respiration Rates for the Experienced Sample

Week 1 with Week 2

Mean Difference = 0.29

SD Difference = 2.92

T = 0.37 DF = 13 Probability = 0.72

Week 2 with Week 3

Mean Difference = 0.00

SD Difference = 2.72

T = 0.00 DF = 13 Probability = 1.00

Week 3 with Dress

Mean Difference = -0.57

SD Difference = 2.65

T = -0.81 DF = 13 Probability = 0.43

Dress with Jury

Mean Difference = -0.86

SD Difference = 3.21

T = -1.00 DF = 13 Probability = 0.34

Paired *t*-tests: STAI Scores for the Research Population

Week 1 with Week 2

Mean Difference = -1.97

SD Difference = 9.96

T = -1.24 DF = 38 Probability = 0.22

Week 2 with Week 3

Mean Difference = 3.95

SD Difference = 10.04

T = 2.46 DF = 38 Probability = 0.02

Week 3 with Dress

Mean Difference = -4.62

SD Difference = 9.99

T = -2.88 DF = 38 Probability = 0.01

Dress with AM

Mean Difference = -4.15

SD Difference = 8.94

T = -2.90 DF = 38 Probability = 0.01

AM with Jury

Mean Difference = 0.26

SD Difference = 6.77

T = 0.24 DF = 38 Probability = 0.81

Paired *t*-tests: STAI Scores for the Inexperienced Sample

Week 1 with Week 2

Mean Difference = -1.36

SD Difference = 12.03

T = -0.57   DF = 24   Probability = 0.58

Week 2 with Week 3

Mean Difference = 5.24

SD Difference = 11.53

T = 2.27   DF = 24   Probability = 0.03

Week 3 with Dress

Mean Difference = -5.32

SD Difference = 12.26

T = -2.17   DF = 24   Probability = 0.04

Dress with AM

Mean Difference = -5.32

SD Difference = 10.60

T = -2.51   DF = 24   Probability = 0.02

AM with Jury

Mean Difference = 1.76

SD Difference = 7.35

T = 1.20   DF = 24   Probability = 0.24

Paired *t*-tests: STAI Scores for the Experienced Sample

Week 1 with Week 2

Mean Difference = -3.07

SD Difference = 4.55

T = -2.53 DF = 13 Probability = 0.03

Week 2 with Week 3

Mean Difference = 1.64

SD Difference = 6.37

T = 0.97 DF = 13 Probability = 0.35

Week 3 with Dress

Mean Difference = -3.36

SD Difference = 3.43

T = -3.66 DF = 13 Probability = 0.00

Dress with AM

Mean Difference = -2.07

SD Difference = 4.36

T = -1.78 DF = 13 Probability = 0.10

AM with Jury

Mean Difference = -2.43

SD Difference = 4.69

T = -1.94 DF = 13 Probability = 0.07

LIST OF REFERENCES

LIST OF REFERENCES

Abel, J. L., & Larkin, K. T. (1990). Anticipation of performance among musicians: Physiological arousal, confidence, and state-anxiety. *Psychology of Music, 18,* 171-182.

Agnew, N., & Agnew, M. (1963). Drive level effects on tasks of narrow and broad attention. *Quarterly Journal of Experimental Psychology, 15,* 58-62.

American College of Sports Medicine. (1986). *Guidelines for exercise testing and prescription* (3rd ed.). Philadelphia: Lea & Febiger.

Appel, S. (1976). Modifying solo performance anxiety in adult pianists. *Journal of Music Therapy, 13,* 2-16.

Ayres, J. (1986). Perceptions of speaking ability: An explanation for stage fright. *Communication Education, 35,* 275-287.

Bahrick, H. P. (1954). Incidental learning under two incentive conditions. *Journal of Experimental Psychology, 47,* 170-172.

Bahrick, H. P., Fitts, P. M., & Rankin, R. E. (1952). Effects of incentives upon reactions to peripheral stimuli. *Journal of Experimental Psychology, 44,* 400-406.

Bandura, A. (1977). Self-efficacy: Towards a unifying theory of behavior change. *Psychological Review, 84,* 191-215.

Bartlett, F. (1950). Program for experiments on thinking. *Quarterly Journal of Experimental Psychology, 2,* 145-152.

Bartlett, M. S. (1947). Multivariate analysis. *Journal of the Royal Statistical Society, Series B, 9,* 176-197.

Behnke, R. R., & Carlile, L. W. (1971). Heart rate as an index of speech anxiety. *Speech Monographs, 38,* 65-69.

Bejjani, F. J., & Snow, B. S. (1990). Use of mood scores as indices of athletic character and stress reactivity among musicians. *Medical Problems of Performing Artists, 5,* 45-48.

Borkovec, T. D. (1976). Physiological and cognitive processes in the regulation of anxiety. In G. E. Schwartz & D. Shapiro (Eds.), *Consciousness and self-regulation: Advances in research* (Vol. 1, pp. 205-278). New York: Plenum.

Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy, 21,* 9-16.

Brandfonbrener, A. G. (1990). Beta blockers in the treatment of performance anxiety. *Medical Problems of Performing Artists, 5,* 23-26.

Brantigan, C. O., Brantigan, T. A., & Joseph, N. (1982). Effect of beta blockade and beta stimulation on stage fright. *American Journal of Medicine, 72,* 88-94.

Brantigan, T. A., Joseph, N. H., & Brantigan, C. O. (1978). Beta-blockade and musical performance. *The Lancet, 2,* 896.

Brantigan, T. A., Joseph, N. H., & Brantigan, C. O. (1979). Stage fright revisited. *The American Organist, 13,* 20-21.

Bruner, J. P., Matter, J., & Papanek, M. L. (1955). Breadth of learning as a function of drive level and mechanization. *Psychological Review, 62,* 1-10.

Bruning, J. L., Capage, J. E., Kozuh, G. F., Young, P. F., & Young, W. E. (1968). Socially induced drive and range of cue utilization. *Journal of Personality and Social Psychology, 9,* 242-244.

Buck, R., Miller, R. E., & Caul, W. F. (1974). Sex, personality and physiological variables in the communication of affect via facial expression. *Journal of Personality and Social Psychology, 30,* 587-596.

Callaway, E., & Dembo, E. (1958). Narrowed attention: A psychological phenomenon that accompanies a certain physiological change. *Archives of Neurology and Psychiatry, 79,* 74-90.

Callaway, E., & Thompson, S. V. (1953). Sympathetic activity and perception. *Psychosomatic Medicine, 15,* 443-455.

Carron, A. V. (1971). Reactions to "Anxiety and Motor Behavior." *Journal of Motor Behavior, 3,* 181-188.

Carron, A. V., & Morford, W. R. (1968). Anxiety, stress and motor learning. *Perceptual and Motor Skills, 27,* 507-511.

Cox, R. H. (1985). *Sport psychology: Concepts and applications.* Dubuque, IA: Brown.

Craske, M. G., & Craig, K. D. (1984). Musical performance anxiety: The three-systems model and self-efficacy theory. *Behaviour Research and Therapy, 22,* 267-280.

Cutietta, R. (1986). Biofeedback training in music: From experimental to clinical applications. *Council for Research in Music Education, 87,* 35-42.

Davidson, R. J. (1978). Specificity and patterning in biobehavioral systems: Implications for behavior change. *American Psychologist, 33,* 430-436.

Davidson, R. J., & Schwartz, G. E. (1976). The psychobiology of relaxation and related states: A multiprocess theory. In D. I. Mostofsky (Ed.), *Behavior control and modification of psysiological activity* (pp. 399-442). Englewood Cliffs, NJ: Prentice-Hall.

Deffenbacher, J. L. (1978). Worry, emotionality and task-generated interference in test anxiety: An empirical test of attentional theory. *Journal of Educational Psychology, 70,* 248-254.

Deffenbacher, J. L. (1980). Worry and emotionality in test anxiety. In I. G. Sarason (Ed.), *Test anxiety: Theory, research, and applications* (pp. 111-128). Hillsdale, NJ: Erlbaum.

Deffenbacher, J. L., & Hazaleus, S. L. (1985). Cognitive, emotional and physiological components of test anxiety. *Cognitive Therapy and Research, 9,* 169-180.

Deffenbacher, J. L., Zwemer, W. A., Whisman, M. A., Hill, R. A., & Sloan, R. D. (1986). Irrational beliefs and anxiety. *Cognitive Therapy and Research, 10,* 281-292.

Dews, C. L. B., & Williams, M. S. (1989). Student musicians' personality styles, stresses, and coping patterns. *Psychology of Music, 17,* 37-47.

Doctor, R. M., & Altman, F. (1969). Worry and emotionality as components of test anxiety: Replication and further data. *Psychological Reports, 24,* 563-568.

Dodge, C. L. (1989). School, stress, and the harp. *American String Teacher, 39* (2), 71-73.

Duffy, E. (1934). Emotion: An example of the need for reorientation in psychology. *Psychological Review, 41,* 184-198.

Duffy, E. (1941). The conceptual categories of psychology: A suggestion for revision. *Psychological Review, 48,* 177-203.

Duffy, E. (1957). The psychological significance of the concept of "arousal" or "activation." *Psychological Review, 64,* 265-271.

Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66,* 183-201.

Ellis, A. (1977). Rational-emotive therapy: Research data that supports the clinical and personality hypotheses of RET and other modes of cognitive-behavior therapy. *The Counselling Psychologist, 7,* 2-42.

Epstein, S., & Fenz, W. D. (1962). Theory and experiment on the measurement of approach-avoidance conflict. *Journal of Abnormal and Social Psychology, 64,* 97-112.

Epstein, S., & Fenz, W. D. (1965). Steepness of approach and avoidance gradients in humans as a function of experience: Theory and experiment. *Journal of Experimental Psychology, 70,* 1-12.

Eysenck, H. J., & Eysenck, S. B. G. (1964). *Manual of the Eysenck personality inventory.* London: University of London.

Feltz, D. L., & Mugno, D. A. (1983). A replication of the path analysis of the causal elements in Bandura's theory of self-efficacy and the influence of autonomic perception. *Journal of Sport Psychology, 5,* 263-277.

Feltz, D. L., Landers, D. M., & Raeder, U. (1979). Enhancing self-efficacy in high-avoidance motor tasks: A comparison of modeling techniques. *Journal of Sport Psychology, 1,* 112-124.

Fenz, W. D. (1964). Conflict and stress as related to physiological activation and sensory, perceptual and cognitive functioning. *Psychological Monographs, 78* (8), 1-33.

Fenz, W. D. (1973). Stress and its mastery: Predicting from laboratory to real life. *Canadian Journal of Behavioral Sciences, 5,* 332-346.

Fenz, W. D. (1975). Coping mechanisms and performance under stress. In D. M. Landers (Ed.), *Psychology of sport and motor behavior II* (pp. 2-24). University Park, PA: Penn State HPER Series No. 10.

Fenz, W. D., & Epstein, S. (1962). Measurement of approach-avoidance conflict along a stimulus dimension by a thematic apperception test. *Journal of Personality, 30,* 613-632.

Fenz, W. D., & Epstein, S. (1967). Changes in gradients of skin conductance, heart rate and respiration rate as a function of experience. *Psychosomatic Medicine, 29,* 33-51.

Fenz, W. D., & Jones, G. B. (1972a). Individual differences in physiological arousal and performance in sport parachutists. *Psychosomatic Medicine, 34,* 1-8.

Fenz, W. D., & Jones, G. B. (1972b). The effect of uncertainty on mastery of stress: A case study. *Psychophysiology, 9,* 615-619.

Fenz, W. D., & Jones, G. B. (1974). Cardiac conditioning in a reaction time task and heart rate control during real life stress. *Journal of Psychosomatic Research, 18,* 199-203.

Fenz, W. D., Kluck, B. L., & Bankart, C. P. (1969). The effect of threat and uncertainty on mastery of stress. *Journal of Experimental Psychology, 79,* 473-479.

Fishbein, M., & Middlestadt, S. (1988). Medical problems among ICSOM musicians: Overview of a national survey. *Medical Problems of Performing Artists, 3,* 1-8.

Fogle, D. O. (1979). Preparing students for the worst: The power of negative thinking. *Personnel and Guidance Journal, 57,* 364-367.

Fogle, D. O. (1982). Toward effective treatment for music performance anxiety. *Psychotherapy: Theory, Research and Practice, 19,* 368-375.

Fridlund, A. J., Schwartz, G. F., & Fowler, S. C. (1984). Pattern recognition of self-reported emotional state from multiple-site facial EMG activity during affective imagery. *Psychophysiology, 21,* 622-631.

Gabbard, G. (1979). Stage fright. *International Journal of Psychoanalysis, 60,* 383-392.

Gabbard, G. O. (1983). Further contributions to the understanding of stage fright: Narcissistic issues. *Journal of the American Psychoanalytic Association, 31,* 423-441.

Gates, G. A. (1988). Performance anxiety (stage fright): Causes and control. *National Association of Teachers of Singing Bulletin, 45* (2), 26-27.

Geen, R. G. (1976). Test anxiety, observation, and range of cue utilization. *British Journal of Social and Clinical Psychology, 15,* 253-259.

Geen, R. G. (1977). The effects of anticipation of positive and negative outcomes on audience anxiety. *Journal of Consulting and Clinical Psychology, 45,* 715-716.

Geen, R. G. (1980). Test anxiety and cue utilization. In I. G. Sarason (Ed.), *Test anxiety: Theory, research, and applications* (pp. 43-61). Hillsdale, NJ: Earlbaum.

Gentile, A. M. (1972). A working model of skill acquisition with application to teaching. *Quest, 17,* 3-23.

Gould, D., Horn, T., & Spreemann, J. (1983). Competitive anxiety in junior elite wrestlers. *Journal of Sport Psychology, 5,* 58-71.

Gould, D., Petlichkoff, L., & Weinberg, R. S. (1984). Antecedents of, temporal changes in, and relationships between CSAI-2 components. *Journal of Sport Psychology, 6,* 289-304.

Gould, D., Weiss, M., & Weinberg, R. (1981). Psychological characteristics of successful and nonsuccessful Big Ten wrestlers. *Journal of Sport Psychology, 3,* 69-81.

Griffin, M. R. (1972, Spring). An analysis of state and trait anxiety experienced in sports competition at different age levels. *Foil,* pp. 58-64.

Gur, R. C., Gur, R. E., Skolnick, B. E., Resnick, S. M., Silver, F. L., Chawluk, J., Muenz, L., Obrist, W. D., & Reivich, M. (1988). Effects of task difficulty on regional cerebral blood flow: Relationships with anxiety and performance. *Psychophysiology, 25,* 392-399.

Guyton, A. C. (1981). *Textbook of medical physiology* (6th ed.). Philadelphia: Saunders.

Hamann, D. L. (1982). An assessment of anxiety in instrumental and vocal performances. *Journal of Research in Music Education, 30,* 77-90.

Hamann, D. L., & Sobaje, M. (1983). Anxiety and the college musician: A study of performance conditions and subject variables. *Psychology of Music, 11,* 37-50.

Hanson, D. G. (1967). Cardiac response to participation in Little League baseball competition as determined by telemetry. *Research Quarterly, 38,* 384-388.

Harris, S. R. (1988). A study of musical performance anxiety: A brief report on the results of an important survey. *American Music Teacher, 37* (4), 15-16.

Highlen, P. S., & Bennett, B. B. (1979). Psychological characteristics of successful and nonsuccessful elite wrestlers: An exploratory study. *Journal of Sport Psychology, 1,* 123-137.

Hockey, R. (1970). Signal probability and spatial location as possible bases for increased selectivity in noise. *Quarterly Journal of Experimental Psychology, 22,* 37-42.

Hockey, R. (1973). Changes in information-selection patterns in multi-source monitoring as a function of induced arousal shifts. *Journal of Experimental Psychology, 101,* 35-42.

Hockey, R., & Hamilton, P. (1983). The cognitive patterning of stress states. In R. Hockey (Ed.), *Stress and fatigue in human performance* (pp. 331-362). Chichester: Wiley.

Holroyd, K. A., & Appel, M. A. (1980). Test anxiety and physiological responding. In I. G. Sarason (Ed.), *Test anxiety: Theory, research, and applications* (pp. 129-151). Hillsdale, NJ: Erlbaum.

Hull, C. L. (1943). *Principles of behavior.* New York: Appleton-Century.

Ingram, R. E., & Kendall, P. C. (1987). The cognitive side of anxiety. *Cognitive Therapy and Research, 11,* 523-536.

James, I. M., Griffith, D. N. W., Pearson, R. M., & Newbury, P. (1977). Effect of oxprenolol on stage-fright in musicians. *The Lancet, 2,* 952-954.

James, I., & Savage, I. (1984). Beneficial effect of nadolol on anxiety-induced disturbances of performance in musicians: A comparison with diazepam and placebo. *American Heart Journal, 108,* 1150-1155.

Johnson, W. R. (1949). A study of emotion revealed in two types of athletic sports contests. *Research Quarterly, 20,* 72-79.

Jones, J. G., & Cale, A. (1989). Precompetition temporal patterning of anxiety and self-confidence in males and females. *Journal of Sport Behavior, 12,* 183-195.

Kanefield, E. L. (1990). Psychological services at The Juilliard School. *Medical Problems of Performing Artists, 5,* 41-44.

Kaplan, D. (1969). On stage fright. *Drama Review, 14,* 60-83.

Karasek, R. A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24,* 285-307.

Karteroliotis, C., & Gill, D. L. (1987). Temporal changes in psychological and physiological components of state anxiety. *Journal of Sport Psychology, 9* , 261-274.

Keene, J. A. (1982). *A history of music education in the United States.* Hanover, NH: University Press of New England.

Kelly, D. H. W., & Walter, C. J. S. (1968). The relationship between clinical diagnosis and anxiety, assessed by forearm blood flow and other measurements. *British Journal of Psychiatry, 114,* 611-626.

Kendrick, M. J., Craig, K. D., Lawson, D. M., & Davidson, P. O. (1982). Cognitive and behavioural therapy for musical performance anxiety. *Journal of Consulting and Clinical Psychology, 50* , 353-362.

Klavora, P. (1978). An attempt to derive inverted-U curves based on the relationship between anxiety and athletic performance. In D. M. Landers & R. W. Christina (Eds.), *Psychology of motor behavior and sport, 1977* (pp. 367-377). Champaign, IL: Human Kinetics.

Kohut, H. (1971). *The analysis of the self: A systematic approach to the psychoanalytic treatment of narcissistic personality disorders.* New York: International Universities.

Kohut, H. (1977). *The restoration of the self.* New York: International Universities.

Koksal, F. (1990). Four systems anxiety questionnaire (FSAQ): A self-report measure of somatic, cognitive, behavioral, and feeling components. *Journal of Personality Assessment, 54,* 534-545.

Korchin, S. J. (1964). Anxiety and cognition. In C. Scheerer (Ed.), *Cognition: Theory, research, promise* (pp. 58-78). New York: Harper & Row.

Krane, V., & Williams, J. (1987). Performance and somatic anxiety, cognitive anxiety, and confidence changes prior to competition. *Journal of Sport Behavior, 10,* 47-56.

Landers, D. M. (1980). The arousal-performance relationship revisited. *Research Quarterly for Exercise and Sport, 51,* 77-90.

Lang, P. J. (1978). The application of psychophysiological methods to the study of psychotherapy and behaviour modification. In A. Bergin & S. Garfield (Eds.), *Handbook of psychotherapy and behavior change* (2nd ed., pp. 75-125). New York: Wiley.

Lang, P. J., Miller, G. A., & Levin, D. (1988). Anxiety and fear. In R. J. Davidson, G. E. Schwartz, & D. Shapiro (Eds.), *Consciousness and self-regulation* (pp. 123-151). New York: Plenum.

Leary, M. R. (1990). Anxiety, cognition, and behavior: In search of a broader perspective. In M. Booth-Butterfield (Ed.), *Communication, cognition & anxiety* [Special issue]. *Journal of Social Behavior and Personality, 5* (2), 39-44.

LeBlanc, A., Shehan-Campbell, P., & Codding, P. (1992, April). *Suitability of a personal heart rate monitor for use in music research.* Paper presented at the Music Educators National Conference National Biennial In-Service Conference, New Orleans, LA.

Levitt, E. E. (1980). *The psychology of anxiety.* Hillsdale, NJ: Erlbaum.

Lidén, S., & Gottfries, C. G. (1974). Beta-blocking agents in the treatment of catecholamine-induced symptoms in musicians. *The Lancet, 2,* 529.

Liebert, R. M., & Morris, L. W. (1967). Cognitive and emotional components of test anxiety: A distinction and some initial data. *Psychological Reports, 20,* 975-978.

Lund, D. R. (1972). A comparative study of three therapeutic techniques in the modification of anxiety behavior in instrumental music performance. *Dissertation Abstracts International, 33,* 1189A. (University Microfilms No. 72-23,026).

Mahoney, M. J., & Avener, M. (1977). Psychology of the elite athlete: An exploratory study. *Cognitive Therapy and Research, 1,* 135-141.

Malmo, R. B. (1959). Activation: A neurophysiological dimension. *Psychological Review, 66,* 367-386.

Martens, R. (1971). Anxiety and motor behavior: A review. *Journal of Motor Behavior, 3,* 151-179.

Martens, R. (1974). Arousal and motor performance. In J. H. Wilmore (Ed.), *Exercise and sport science reviews* (Vol. 2, pp. 155-188). New York: Academic Press.

Martens, R. (1977). *Sport competition anxiety test.* Champaign, IL: Human Kinetics.

Martens, R., Burton, D., Rivkin, F., & Simon, J. (1980). Reliability and validity of the Competitive State Anxiety Inventory (CSAI). In C. H. Nadeau, W. C. Halliwell, K. M. Newell, & G. C. Roberts (Eds), *Psychology of motor behavior and sport, 1979* (pp. 91-99). Champaign, IL: Human Kinetics.

Martens, R., Burton, D., Vealey, R. S., Bump, L. A., & Smith, D. E. (1990). Development and validation of the Competitive State Anxiety Inventory-2. In R. Martens, R. S. Vealey, & D. Burton, *Competitive anxiety in sport* (pp. 117-190). Champaign, IL: Human Kinetics.

Martens, R., & Gill, D. L. (1976). State anxiety among successful and unsuccessful competitors who differ in competitive trait anxiety. *Research Quarterly, 47,* 698-708.

Martens, R., & Landers, D. M. (1970). Motor performance under stress: A test of the inverted-U hypothesis. *Journal of Personality and Social Psychology, 16,* 29-37.

Martin, A. Y. (1964, January). The physiological and the psychological concomitants of stage fright. *Music Educators Journal,* pp. 100-108.

McCroskey, J. C., & Richmond, V. P. (1990). Willingness to communicate: A cognitive view. In M. Booth-Butterfield (Ed.), *Communication, cognition & anxiety* [Special issue]. *Journal of Social Behavior and Personality, 5* (2), 19-37.

McLeod, D. R., Hoehn-Saric, R., & Stefan, R. L. (1986). Somatic symptoms of anxiety: Comparison of self-report and physiological measures. *Biological Psychiatry, 21,* 301-310.

McNamara, H. J., & Fisch, R. I. (1964). Effect of high and low motivation on two aspects of attention. *Perceptual and Motor Skills, 19,* 571-578.

Meichenbaum, D. H. (1977). *Cognitive behavior modification.* New York: Plenum.

Meichenbaum, D., & Butler, L. (1980). Toward a conceptual model for the treatment of test anxiety: Implications for research and treatment. In I. G. Sarason (Ed.) *Test anxiety: Theory, research, and applications* (pp. 187-208). Hillsdale, NJ: Erlbaum.

Mendelsohn, G. A., & Griswold, B. B. (1967). Anxiety and repression as predictors of the use of incidental cues in problem solving. *Journal of Personality and Social Psychology, 6,* 353-359.

Meyers, A. W., Cooke, C. J., Cullen, J., & Liles, L. (1979). Psychological aspects of athletic competitors: A replication across sports. *Cognitive Therapy and Research, 3,* 361-366.

Montello, L., Coons, E. E., & Kantor, J. (1990). The use of group music therapy as a treatment for musical performance stress. *Medical Problems of Performing Artists, 5,* 49-57.

Morris, L. W., & Fulmer, R. S. (1976). Test anxiety (worry and emotionality) changes during academic testing as a function of feedback and test importance. *Journal of Educational Psychology, 68,* 817-824.

Morris, L. W., & Liebert, R. M. (1970). Relationship of cognitive and emotional components of test anxiety to physiological arousal and academic performance. *Journal of Consulting and Clinical Psychology, 35,* 332-337.

Motley, M. T. (1990). Public speaking anxiety qua performance anxiety: A revised model and an alternative therapy. In M. Booth-Butterfield (Ed.), *Communication, cognition, and anxiety* [Special issue]. *Journal of Social Behavior and Personality, 5* (2), 85-104.

Mueller, J. H. (1976). Anxiety and cue utilization in human learning and memory. In M. Zuckerman & C. D. Spielberger (Eds.), *Emotions and anxiety: New concepts, methods, and applications* (pp. 197-229). Hillsdale, NJ: Erlbaum.

Nagel, J., Himle, D., & Papsdorf, J. (1981). Coping with performance anxiety. *National Association of Teachers of Singing Bulletin, 37* (4), 26-33.

Neftel, K. A., Adler, R. H., Käppeli, L., Rossi, M., Dolder, M., Käser, H. E., Bruggesser H. H., & Vorkauf, H. (1982). Stage fright in musicians: A model illustrating the effect of beta blockers. *Psychosomatic Medicine, 44,* 461-469.

Neiss, R. (1988). Reconceptualizing arousal: Psychobiological states in motor performance. *Psychological Bulletin, 103,* 345-366.

Neubert, D. (1990). How to cope with performance anxiety and use it to your advantage. *American String Teacher, 40* (1), 63-65.

Nideffer, R. M., & Hessler, N. D. (1978). Controlling performance anxiety. *College Music Symposium, 18,* 146-153.

Nies, A. S. (1990). Clinical pharmacology of beta-adrenergic blockers. *Medical Problems of Performing Artists, 5,* 27-32.

O'Malley, J. J., & Poplawsky, A. (1971). Noise-induced arousal and breadth of attention. *Perceptual and Motor Skills, 33,* 887-890.

Oxendine, J. B. (1970). Emotional arousal and motor performance. *Quest, 13,* 23-32.

Pennebaker, J. W. (1982). *The psychology of physical symptoms.* New York: Springer-Verlag.

Polar Vantage XL Heart Rate Monitor user's instruction manual. (1989). Stamford, CT: Polar USA.

Polar Vantage XL Heart Rate Analysis Software. (1990). Kempele, Finland: Polar Electro OY.

Purdy, D. A., Haufler, S. E., & Eitzen, D. S. (1981). Stress among child athletes: Perceptions by parents, coaches, and athletes. *Journal of Sport Behavior, 4,* 32-44.

Rachman, S., & Hodgson, R. (1974). Synchrony and desynchrony in fear and avoidance. *Behaviour Research and Therapy, 12,* 311-318.

Ray, W. J., Cole, H. W., & Raczynski, J. M. (1983). Psychophysiological assessment. In J. Hersen, A. E. Kazdin, & A. S. Bellack (Eds.), *The clinical psychology handbook* (pp. 427-453). New York: Pergamon.

Reiman, E. M., Fusselman, M. J., Fox, P. T., & Raichle, M. E. (1989). Neuroanatomical correlates of anticipatory anxiety. *Science, 243,* 1071-1074.

Salmon, P. G. (1990). A psychological perspective on musical performance anxiety: A review of the literature. *Medical Problems of Performing Artists, 5,* 2-11.

Sandin, B., & Chorot, P. (1985). Changes in skin, salivary, and urinary pH as indicators of anxiety level in humans. *Psychophysiology, 22,* 226-334.

Sarason, I. G. (1960). Empirical findings and theoretical problems in the use of anxiety scales. *Psychological Bulletin, 57,* 403-415.

Sarason, I. G. (1961). The effects of anxiety and threat on the solution of a difficult task. *Journal of Abnormal and Social Psychology, 62,* 165-168.

Sarason, I. G. (1972). Experimental approaches to test anxiety: Attention and the uses of information. In C. D. Spielberger (Ed.), *Anxiety: Current trends in theory and research* (Vol. 2, pp. 382-403). New York: Academic Press.

Sarason, I. G. (1973). Test anxiety and cognitive modeling. *Journal of Personality and Social Psychology, 28,* 58-61.

Sarason, I. G. (1978). The test anxiety scale: Concept and research. In C. D. Spielberger & I. G. Sarason (Eds.), *Stress and anxiety* (Vol. 5, pp. 193-216). Washington, DC: Hemisphere.

Sarason, I. G. (1981). Test anxiety, stress, and social support. *Journal of Personality, 49,* 101-114.

Sarason, I. G. (1984). Stress, anxiety, and cognitive interference: Reactions to tests. *Journal of Personality and Social Psychology, 46,* 929-938.

Sarason, I. G., Sarason, B. R., & Pierce, G. R. (1990). Anxiety, cognitive interference, and performance. In M. Booth-Butterfield (Ed.), *Communication, cognition & anxiety* [Special issue]. *Journal of Social Behavior and Personality, 5* (2), 1-18.

Scanlan, T. K. (1984). Competitive stress and the child athlete. In J. M. Silva, & R. S. Weinberg (Eds.), *Psychological foundations of sport* (pp.118-129). Champaign, IL: Human Kinetics.

Scanlan, T. K., & Lewthwaite, R. (1984). Social psychological aspects of competition for male youth sport participants: I. Predictors of competitive stress. *Journal of Sport Psychology, 6,* 208-226.

Scanlan, T. K., & Passer, M. W. (1978). Factors related to competitive stress among male youth sports participants. *Medicine and Science in Sports, 10,* 103-108.

Scanlan, T. K., & Passer, M. W. (1979). Sources of competitive stress in young female athletes. *Journal of Sport Psychology, 1,* 151-159.

Schwartz, G. E., Davidson, R. J., & Goleman, D. (1978). Patterning of cognitive and somatic processes in the self-regulation of anxiety: Effects of meditation versus exercise. *Psychosomatic Medicine, 40,* 321-328.

Schwarzer, R., & Quast, H. (1985). Multidimensionality of the anxiety experience: Evidence for additional components. In H. M. van der Ploeg, R. Schwarzer, & C. D. Spielberger (Eds.), *Advances in test anxiety research* (Vol. 4, pp. 3-14). Lisse, Netherlands: Swetz & Zeitlinger.

Shapiro, A. H., & Fenz, W. D. (1969). Changes in heart rate as a function of an unconditional stimulus presented under varying conditions of certainty. *Psychonomic Science, 16,* 177-179.

Simon, J. A., & Martens, R. (1979). Children's anxiety in sport and nonsport evaluative activities. *Journal of Sport Psychology, 1,* 160-169.

Sjöberg, H., Frankenhaeuser, M., & Bjurstedt, H. (1979). Interactions between heart rate, psychomotor performance and perceived effort during physical work as influenced by beta-andenergic blockade. *Biological Psychology, 8,* 31-43.

Smith, C. A., & Morris, L. W. (1976). Effects of stimulative and sedative music on two components of test anxiety. *Psychological Reports, 38,* 1187-1193.

Smith, N. C., Burwitz, L., & Jakeman, P. (1988). Precompetitive anxiety and motor performance: A psychophysiological examination. *Journal of Sports Sciences, 6,* 115-130.

Solso, R. L. (1968). The effect of anxiety on cue selection in the A-Br paradigm. *Psychonomic Science, 13,* 105-106.

Solso, R. L., Johnson, J. E., & Schatz, G. C. (1968). Perceptual perimeters and generalized drive. *Psychonomic Science, 13,* 71-72.

Sonstroem, R. J., & Bernardo, P. (1982). Intraindividual pregame state-anxiety and basketball performance: A reexamination of the inverted-U curve. *Journal of Sport Psychology, 4,* 235-245.

Spence, J. T., & Spence, K. W. (1966). The motivational components of manifest anxiety: Drive and drive stimuli. In C. D. Spielberger (Ed.), *Anxiety and Behavior* (pp. 291-326). New York: Academic Press.

Spence, K. W. (1951). Theoretical interpretations of learning. In S. S. Stevens (Ed.), *Handbook of experimental psychology* (pp. 690-729). New York: Wiley.

Spielberger, C. D. (1966). Theory and research on anxiety. In C. D. Spielberger (Ed.), *Anxiety and Behavior* (pp. 3-20). New York: Academic Press.

Spielberger, C. D. (1971). Trait-state anxiety and motor behavior. *Journal of Motor Behavior, 3,* 256-279.

Spielberger, C. D. (1972). Anxiety as an emotional state. In C. D. Spielberger (Ed.), *Anxiety: Current trends in theory and research* (Vol. 1, pp. 23-49). New York: Academic Press.

Spielberger, C. D., Gorusch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory (Self-evaluation questionnaire).* Palo Alto, CA: Consulting Psychologists.

Spielberger, C. D., Gorusch, R. L., Lushene, R. E., Vagg, P. R., Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory (Form Y): Self-evaluation questionnaire.* Palo Alto, CA: Consulting Psychologists.

Starkman, M. N., Cameron, O. G., Nesse, R. M., & Zelnik, T. (1990). Peripheral catecholamine levels and the symptoms of anxiety: Studies in patients with and without pheochromocytoma. *Psychosomatic Medicine, 52,* 129-142.

Steptoe, A. (1989). Stress, coping and stage fright in professional musicians. *Psychology of Music, 17,* 3-11.

Steptoe, A., & Fidler, H. (1987). Stage fright in orchestral musicians: A study of cognitive and behavioural strategies in performance anxiety. *British Journal of Psychology, 78,* 241-249.

Stollak, G. E., & Stollak, M. A. (1988). Psychological contributions to understanding and alleviating stage fright. *National Association of Teachers of Singing Bulletin, 44* (5), 10-34.

Sweeney, G. A., & Horan, J. J. (1982). Separate and combined effects of cue-controlled relaxation and cognitive restructuring in the treatment of musical performance anxiety. *Journal of Counseling Psychology, 29,* 486-497.

Taber, C. W. (1985). *Taber's cyclopedic medical dictionary* (16th ed.) (C. L. Thomas, Ed.). Philadelphia: F. A. Davis.

Terwilliger, R. D. (1972). The effect of group counseling on the vocal recital performance of undergraduate education vocal music majors. *Dissertation Abstracts International, 33,* 577A. (University Microfilms No. 72-22,715).

Tyrer, P. J., & Lader, M. (1974). Response to propranolol and diazepam in somatic and psychic anxiety. *British Medical Journal, 2,* 14-16.

Ussher, M. H., & Hardy, L. (1985). The effect of competitive anxiety on a number of cognitive and motor subsystems. *Journal of Sports Sciences, 3,* 232-233.

Waal-Manning, H. J., Knight, R. G., Spears, G. F., & Paulin, J. M. (1986). The relationship between blood pressure and personality in a large unselected adult sample. *Journal of Psychosomatic Research, 30,* 361-368.

Wachtel, P. L. (1968). Anxiety, attention, and coping with threat. *Journal of Abnormal Psychology, 73,* 137-143.

Wardle, A. (1974). Behavior modification by reciprocal inhibition of instrumental music performance anxiety. *Journal of Band Research, 11,* 18-26.

Weinberg, R. S., & Genuchi, M. (1980). Relationship between competitive trait anxiety, state anxiety, and golf performance: A field study. *Journal of Sport Psychology, 2,* 148-154.

Weinberg, R. S., Gould, D., & Jackson, A. (1979). Expectations and performance: An empirical test of Bandura's self-efficacy theory. *Journal of Sport Psychology, 1,* 320-331.

Weinberg, R. S., Gould, D., & Jackson, A. (1980). Cognition and motor performance effect of psyching-up strategies on three motor tasks. *Cognitive Therapy and Research, 4,* 239-245.

Weinberg, R. S., & Hunt, V. V. (1976). The interrelationships between anxiety, motor behavior, motor performance and electromyography. *Journal of Motor Behavior, 8,* 219-224.

Wesner, R. B., Noyes, R. Jr., & Davis, T. L. (1990). The occurrence of performance anxiety among musicians. *Journal of Affective Disorders, 18,* 177-185.

West, C. K., Lee, J. F., & Anderson, T. H. (1969). The influence of test anxiety on the selection of relevant from irrelevant information. *Journal of Educational Research, 63,* 51-52.

Wilkinson, L. (1989a). *SYGRAPH: The system for graphics.* Evanston, IL: SYSTAT.

Wilkinson, L. (1989b). *SYSTAT: The system for statistics.* Evanston, IL: SYSTAT.

Wine, J. D. (1971). Test anxiety and direction of attention. *Psychological Bulletin, 76,* 92-104.

Wine, J. D. (1980). Cognitive-attentional theory of test anxiety. In I. G. Sarason (Ed.), *Test anxiety: Theory, research, and applications* (pp. 349-385). Hillsdale, NJ: Erlbaum.

Wolfe, M. L. (1990). Coping with musical performance anxiety: Problem-focused and emotion-focused strategies. *Medical Problems of Performing Artists, 5,* 33-36.

Wolfe, R. L. (1977). A comparison of self- versus therapist-administered biofeedback relaxation training and desensitization. *Dissertation Abstracts International, 38B,* 923B-924B. (University Microfilms No. 77-16,258).

Wolpe, J. (1973). *The practice of behavior therapy* (2nd ed.). New York: Pergamon.

Wright, M. R., Wright, J., & Frankenhaeuser, M. (1981). Relationships between sex-related psychological characteristics during adolescence and catecholamine excretion during achievement stress. *Psychophysiology, 18,* 459-482.

Yan Lan, L., & Gill, D. L. (1984). The relationships among self-efficacy, stress responses, and a cognitive feedback manipulation. *Journal of Sport Psychology, 6,* 227-238.

Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology, 18,* 459-482.

Zaffy, D. J., & Bruning, J. L. (1966). Drive and the range of cue utilization. *Journal of Experimental Psychology, 71,* 382-384.