THE EFFECTS OF TWO DIFFERENT TYPES
OF BACKGROUND MUSIC ON BOWLING
SCORES AND ATTITUDES

DISSERTATION

Presented to the Graduate Council of the
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Fulfillment of the Requirements

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By

Tom S. Beasley, B.B.A., M.Ed.
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The problem with which this investigation was concerned was that of determining the value of the use of musical accompaniment while bowling. This study analyzed the effects of two different types of background music, played at the same decibel level, on the bowling scores and attitudes of college students enrolled in bowling classes at a state university.

One hundred sixty-six students were given pre-tests for raw score averages. Group I - Disco and Group II - Easy Listening had music while Group III - No Music was the control group. After entering competitive bowling the students were given post-tests.

Hypothesis 1 stated that the adjusted post-test mean in bowling averages attained by Group I would be significantly greater than for Group II and Group III.

Hypothesis 2 stated that the adjusted post-test mean in bowling averages attained by Group II would be significantly greater than for Group III.

Hypothesis 3 stated that male students would achieve a significantly greater adjusted post-test mean in bowling scores than would female students in all three groups.
Hypothesis 4 stated that Group I would achieve a significantly higher mean score on the attitude scale than would Group II and Group III.

Hypothesis 5 stated that Group II would achieve a significantly higher mean score on the attitude scale than would Group III.

Hypothesis 6 stated that female students would achieve a significantly higher mean score on the attitude measure than would male students in all three groups.

A one-way analysis of covariance was computed to test hypotheses 1, 2, and 3. A one-way analysis of variance was computed to test hypotheses 4, 5, and 6. The null hypotheses were retained and the research hypotheses were rejected in all cases except hypothesis 3.

This report concluded that bowling scores were not affected by listening to disco or easy listening music. Male subjects obtain higher adjusted mean scores than do female subjects regardless of experimental condition. Music does not affect attitude toward bowling. Attitude toward bowling is independent of gender.
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CHAPTER I

INTRODUCTION

The use of musical accompaniment in the learning of motor skills is not new; however, little has been done in this respect with bowling skills. Physical education teachers interested in developing new instructional methods have experimented with the use of music in teaching golf, swimming, tennis and basketball skills. The belief that ballroom dancing helps develop a rhythmic skill, which is needed on the playing field, has motivated some basketball and football coaches to include rhythmic dance instruction in their training programs for male athletes (2).

Rhythm has continually played an important part in many physical education activities. It is important in basic movements such as walking, skipping, marching, throwing and hitting. Many gymnasts have used musical accompaniment for vaulting, rope climbing and swinging on rings as well as individual and group exercise. Rhythmic experience and ordered movement add an essential value to an art, enhancing it and lifting it to a level of higher experience (1).

There is an instinctive tendency to group impressions gained through hearing and a capacity to do this with precision in time and stress. We irresistibly group uniform successions of sound into rhythmic measure. Man's imagination
may unconsciously be satisfied as he interprets the click of rails on a train track as rhythm. This tendency toward rhythmic grouping may be applied to all his activities. Rhythm in which groupings are clearly marked, as in music, is also realized through other senses besides hearing (10).

Rhythm is biologically a principle of efficiency, a condition for advancement and achievement, and a perpetual source of satisfaction. Rhythmic measure is taking advantage of nature’s supply of pulsating efforts of attention. We get a restful feeling of satisfaction and ease when the measure fits our attention wave. We acquire a feeling of ease, power and adjustment when we hear rhythmic measures. Rhythm gives a feeling of balance, freedom, luxury, expanse, and power. It makes a person feel as if he has succeeded on his own and gives him the assurance to cope with the future. This results in a motor- or self-in-action attitude. Rhythm stimulates or lulls. It can start organic and rhythmic movements of the body immediately (10).

Many people contend that music expresses something deep and valuable and is the voice of universal harmony. Music, acoustically, is a sound frequency pattern combined with rhythmic patterns which has profound effect upon mankind (6). It aids in establishing and reestablishing desirable interpersonal relationships, and not only has unique sensory appeal but is a means of nonverbal communication (3). In recent years music has been applied specifically in a variety of academic and social settings. Therapists, industrialists, military
officials and educationalists have studied the effect of music upon man's behavior and actions.

Rhythmic activities make working together easier because words are not needed. Rhythm stimulates muscular action. Behavior of certain groups of people can be controlled by the type of music used. Often people are trapped between conflicting goals in direct versus symbolic expression, and music may provide the bridge to cross this conflict. A musical experience allows us to have very strong emotions and to contain these emotions in nondisruptive ways (3).

When a student moves in rhythmic measure, movements may be foreseen and forefelt and accomplished without conscious effort, resulting in lessened expenditure of energy, more effective action, and a feeling of satisfaction. A natural tendency to always move in rhythmic measure will be developed. Perception of rhythm results in response of the entire organism to its pulsations. Rhythm is one of the foundation structures in all motor skills and furnishes the backbone structure of all sports and games of grace and skill (10).

A pilot study using music with instructional bowling was conducted in the summer of 1979 at a multipurpose state university in the Dallas-Fort Worth metroplex.

Statement of the Problem

The problem of this study was to analyze the effects of two different kinds of background music (disco and easy listening) at the same decibel level on the bowling scores
and attitudes of college students enrolled in bowling classes.

Purposes of the Study

The purposes of this study were to

1. determine the effects of two different kinds of background music on the bowling scores of college students enrolled in bowling classes at a state university;

2. determine the effects of music on students' attitudes toward bowling; and

3. make recommendations for coaches, physical educators, and bowling alley proprietors who would be interested in the promotion of bowling.

Hypotheses

To carry out the purposes of the study, the following hypotheses were tested:

1. The adjusted post-test mean in bowling averages attained by the college student bowlers exposed to disco background music will be significantly greater than the adjusted post-test mean in bowling averages for
   a. students exposed to easy listening music, and
   b. students who are not exposed to music.

2. The adjusted post-test mean in bowling averages attained by the college student bowlers who are exposed to easy listening background music will be significantly greater than
the adjusted post-test mean in bowling averages of college
student bowlers who are not exposed to background music.

3. Male students will achieve a significantly greater
post-test mean increase in bowling scores than will female
students.

4. Students exposed to disco background music will
achieve a significantly higher mean score on the attitude
scale than will
   a. students exposed to easy listening music, and
   b. students who are not exposed to music.

5. Students exposed to easy listening background music
will achieve a significantly higher mean score on the attitude
scale than will those not exposed to music.

6. Female students will achieve a significantly higher
mean score on the attitude measure than will male students.
This will hold for
   a. disco music,
   b. easy listening music, and
   c. no music.

Significance of the Study

The present study determined the effects of two kinds of
background music on bowling scores and attitudes. If the
music has a positive effect, then bowling instructors should
utilize background music during bowling activities.

This study was significant in that it

1. determined whether easy listening music or disco
   music has an effect on bowling scores; and
2. established methods to determine if selected types of music produce a positive attitude toward a specific activity.

Background of the Study

Music, which may occur in many different settings, has been shown to be effective in reinforcing and modifying behaviors. Some music has been found to promote silence in a group. Silence can be a contemplative, fearful, sad or angry experience; and music has been found to help a person discuss these frustrations more openly. The silence in a group may represent a shared resistance to commence the session as a group or may be the total of individual reactions. Some music is heard without listening and when this is understood there may be an attempt to become more alert to internal experience and reactions (9).

Sometimes cherished and familiar self-images and relationships are sacrificed when new prerogatives and pleasures are gained. Nostalgia for childhood that can never be recaptured and the intensity, vividness, and sense of discovery of adolescence are expressed in some music. Some music has been found to bring loneliness and leads to reminiscence, causing the past to become more important than the present or the future. The difficulties of feeling and expressing intimacy are explored by some music. Strivings and hopes for the future are expressed by others (9).
Overt behavior masks deeper psychological issues and effects. Emotionally exhausting and depressive feelings result when someone can only reach out to people with self-defeating techniques. Music can be played to introduce and facilitate the termination of disagreeably overt behavior, melancholy, and depression. Various useful and pathological adaptations are gained through the use of music (9).

Rohner and Miller (8) concluded that background music may have less effect than music which claims one's conscious attentiveness. Highly anxious subjects may require long periods of music before they begin to feel less anxious. Anxiety appears not to be increased by music and under certain conditions may be reduced. Sedative music was found to have some facilitating psychological and behavioral effects. Although these effects may be temporary, the potential usefulness of music to modify behavior is not reduced.

An evaluation was made of the effectiveness of contingent music listening (passive reinforcement) versus contingent playing of rhythm instruments (active reinforcement) to increase preacademic and motor skills of severely retarded children and adolescents. Results determined that both passive and active music reinforcement had a positive effect even though no significant differences were discerned between the two reinforcers (4).

Madsen and Wolfe's (5) study investigated the effect on bodily movement of
a. interrupted music during a reading task, 
b. interrupted music during a listening task, 
c. an incompatible response using rhythmic movement, and 
d. negative practice procedures (5, p. 19).

It was found that body movement is reduced when a task requires an individual to attend to music and when this attention occupies a high degree of participant involvement. If music is found to compete with another task, it may be removed from the person's awareness so that the primary task may be completed (5).

Definition of Terms

The following terms had restricted meaning and were thus defined for this study:

1. College bowling students were defined as those college students enrolled in bowling classes offered for credit by the physical education department of a state university.

2. Bowling achievement was defined as the average bowling scores for three games.

3. Disco music was defined as a style of popular music for dancing, usually recorded and with complex electronic instrumentation, in which simple, repetitive lyrics are subordinated to a heavy, pulsating rhythmic beat (7).

4. Easy listening music was defined as music that does not require concentrated listening and may be vocal or instrumental. It is conducive to ease and is free from formality and constraint (7).
5. Ambient noise is the surrounding sound such as the contact of the ball with the floor, ball striking the pins, conversation, etc.

6. Decibel (dB) is the usual unit for measuring relative loudness of sounds, being approximately the smallest degree of difference of loudness ordinarily detectable by the human ear (11).

Limitations

A limitation of this study which must be recognized is that there was no control over the amount or type of instruction in bowling which the subjects received outside of the class situation. Students in the selected classes were requested not to "bowl for practice" outside of class.

General Procedures

Permission was obtained from the physical education departmental chairman of a major state university to use six sections of bowling classes to conduct this experiment. The student center management at the university also gave permission to use its facilities to conduct this experiment.

One hundred sixty-six students were utilized in the study. The students were given a pre-test consisting of bowling three games for raw score averages after twelve hours of instruction. They then entered competitive bowling for fourteen hours and were given a post-test. The experimental groups had music during the fourteen hours of competitive
bowling and during the post-test. In both the experimental groups and the control groups, instruction was continued on an individual basis during the fourteen hours of competitive bowling.

A Sony cassette player was set up with five feet amplifiers placed behind the bowlers with the music volume played at a constant setting. When the equipment was placed, it was tested with a sound level meter to insure the same music volume on each approach. This equipment was set up for a pilot study in the summer of 1979. See Appendix A for complete music setup and sound measurements.

Two hours of disco and two hours of easy listening music were used. The students were hearing the same music once a week, as the tapes were repeated. Easy listening music was chosen for the study because it does not require concentrated listening. It is considered soothing and relaxing. Disco music was chosen because it is very popular to the age group being tested.

In a pilot study conducted in the summer of 1979, no negative attitudes were exhibited because of background music.
CHAPTER BIBLIOGRAPHY


CHAPTER II

REVIEW OF THE LITERATURE

Music has been used and has produced positive effects in sports, education, business, and therapy. Background music has been used in the learning and developing of motor skills, and has an effect on the physical performance of most participants in sports events. Music has beneficial psychological and behavioral effects when used in education, business, and therapy, for it appears to improve attitudes, which then tend to improve performance.

An investigation by Bellamy and Sontag (3, p. 134) concludes that music may serve consequentially as an accelerator for work behaviors. The results also seem to support the point that attention shall be directed to the use of music as a behavior determinant as well as to the more typical uses which emphasize discriminative stimulus function.

Bellamy and Sontag (3, p. 135) utilized normal public school resources to demonstrate that music, presented both intermittently and continuously, provides an effective means of accelerating the assembly line production rates of retarded students. More extended inquiries including clearer demonstrations of experimental control are certainly desirable. However, Bellamy and Sontag's investigations do provide
optimistic demonstrative evidence of the ease and economy with which the motor activities of retarded students can be improved.

Podvin (21) attempted to determine whether the rate and correctness of the performance of a work task was modified by presenting or withdrawing of music. A work task was performed using two mentally retarded children. No stable increasing or decreasing trend of correct response was observed. Music presented immediately following a correct response resulted in an increase in rate of correct responding and a decrease in rate of incorrect responding. Music unrelated to the activity resulted in a lower rate of correct responding and a higher rate of incorrect responding. Podvin concluded that music can be helpful in the rehabilitation of the handicapped and can act as an aid in adjusting the individual to his work. She recommended further investigation.

Music has emerged as one of the most pleasant of all curative agents. Modern science with its methods of measuring physiological activities has daily confirmed as fact what many have suspected down through the course of history: that music exerts a profound influence on human health, happiness and efficiency. Toward the end of the eighteenth century the first serious efforts to evaluate the precise effects of music on the human body were made. Podolsky (20) stated that music was found to be of distinct value in the operating room in that it tended to distract the patient and release tensions for the surgeon and staff during the operation.
Patients in mental hospitals found dance a method of expressing those inner feelings which they could not express in rational speech. Chace (4, p. 30) maintained that dance therapy was useful in the hospital setting "not because patients are patients, but because they are people" and people live their lives in rhythm and movement. She further reported that children at the Children's Physical Development Clinic in Maryland were approached through nonverbal direction and instruction. It may be concluded that integration of the personality of the child depends significantly on this physical base, music.

Litchman (12) conducted a study testing the effects of music to establish a learning environment for language instructions for autistic children. The results indicate that music is considered useful in direct language training programs with autistic children.

Swimming to the accompaniment of music or with music as a background is not new. In recent years many college swimming clubs have been using music as an accompaniment for their swimming. Some teachers interested in this type of swimming have used music with instructional swimming classes and have found that students, as a general rule, enjoy this type of instruction. Many coaches, instructors, and aquatics officials believe rhythm is important in both speed swimming and form swimming (6, p. 1).

Intermediate swimmers being taught with music improved more in swimming form and swimming speed than did swimmers
who were taught without music. Mean improvement scores of the music group were better in all instances than were those of the non-music group (6, p. 8).

The mean score on attitudes was found to be significantly higher in the music than in the no music group in a study conducted by Woods (28) on the effects of music on tennis skills.

Roth (25) conducted a study to examine the effects of music on knowledge, comprehension, application, and analysis of types of learning. The results of the analysis of data showed that music had no effect on the cognitive domain. It appeared the effect of music was negligible overall, and, where significant, was attributed to the individual differences of the student.

The effect of Afro-American music on the attitudes of black disadvantaged junior high school students was studied by Woodard (27). She found that music materials can significantly improve musical achievement and attitudes.

Lane (11) conducted a study on the effects of three different types of background music on the behavior of elementary school children. These music types were Stimulus Progressive (SP), Sedative Music (SM), and Popular Music (PM). The classroom received soft background music. The students' mathematics achievement increased relative to their academic aptitude when listening to (SP), (SM), or (PM). A progressive trend in mathematics achievement was noted when the classroom received a background music sequence of (PM),
(SP), and (SM). Mathematics achievement was not greater under (PM) than under (SM) or (SP). Task-relevant behavior will decline slightly when background music (SP), (SM), and (PM) are used, but accompanying achievement will not decline. Students reported feeling rested and pleasant when listening to (SP), (SM), and (PM). Noise level remained below the level at which the music was heard when (SP), (SM), and (PM) were used.

Franklin's (8) study sought to determine if any significant differences occurred in reading comprehension test scores among three groups of students who heard high-intensity rock music, low-intensity rock music, or no music. Tapes were played at low intensity listening levels, high-intensity listening levels, or preferred listening levels. Students were tested individually. They were randomly assigned to a control group or one of the experimental groups (low-intensity or high-intensity). Advanced reading tests were given. There were no significant differences on the reading comprehension test scores. The preferential reading and studying trends with rock music indicated no significant differences among the subjects. The students did not indicate whether they felt listening to music while studying was helpful.

Mandell (14) used three types of music to determine their effects on group test performance. Test anxiety seems to increase through school years and has been found to be counter-productive when it reached high levels. Group administered tests were used to measure students' scholastic aptitudes and
are sometimes misinterpreted to be measures of general intelligence. No allowance has been made for the interference of anxiety in student performance. Three types of music were used to determine which type was most effective in reducing test anxiety to a productive level. Students were told if a score of eighty-five percent was not earned, six weeks of remedial English would be required. This statement was retracted after the test. No significant difference was found among the groups nor between sexes. There was no interaction noted between these factors.

An investigation was conducted by Nelson (17, p. 484) of the effect of selected music, pure tones, and music intensity on endurance and strength performance as measured by a ninety second all-out ride on a bicycle ergometer. It has been assumed that rhythm is an important part of successful performance in certain sports. For example, optimum rhythm may be contrasted with the lack of rhythm of a young child attempting to perform an intricate skill or movement for the first time. Music has been used to facilitate learning with a rhythm characteristic of the motor performance and appears to be related to certain aspects of physical performance. The rhythm of one skill differs from the rhythm of another skill and the effect of sounds on different skills can vary.

The faster sounds and high intensities seemed to make the subjects feel better, but apparently their feelings had no effect on their performance. Evidently highly trained people in
this type of skill reject various stimuli and concentrate on the fatiguing activity being done. In the test used for this study it was concluded that music will have no effect on performance (17, p. 488).

There is much opinion but little experimental evidence as to the effects of different types of music on workers. It has been found that typing output was somewhat reduced by jazz on the one hand and dirge on the other. In Devereux's (5, p. 29) study, eight of thirty-one subjects indicated that they would have preferred modern popular music to that provided.

The argument most often advanced for the use of music on the job is that it makes employees happier and more satisfied and as a consequence, more productive. A study of music in industry suggests that music, as a nonfinancial incentive, is assumed to increase production by bringing about changes in the attitudes and behavior of employees. Such a formulation implies a two step process in which music first improves attitudes, and attitudes then improve production (10, p. 882).

During this study the clerical, analytic, scientific-technical, and administrative-management workers were asked to select from these alternatives: popular, jazz, classical, makes no difference, or no music. One-half of the machine operators selected "makes no difference" (10, p. 884).

Researchers who sought to draw a relationship between music and productivity hypothesized that the less complex the individual's task, the greater would be the effect. If the
data from the machine operators are discounted on the grounds that the nature of their working environment does not permit attentiveness to background music, then a similar relationship appears to exist between music and morale, viz., the less complex the job, the greater the perceived positive effect. On all questions, the clericals were more favorably disposed towards the music than were the individuals in the scientific-technical, analytic, and administrative-management areas. It thus appears that functionally different segments of the work force vary in their appreciation of industrial work music. Furthermore, the preliminary data collected in Jacoby's (10, p. 886) study also indicate that favorable attitudes toward public address music decrease as one goes from the purely subordinate to the supervisory ranks.

An experiment was designed by Newman (18, p. 493) to look at the effects of four types of music, as opposed to no music, on the quantity and quality of production and the attitude of workers engaged in the routine task of assembling and packing skateboards. Subjects were twenty-six assembly-line personnel between the ages of eighteen and twenty-three. Four types of music were played: dance, slow, folk, and popular. These were contrasted with periods during which no music was played. Music conditions were balanced with respect to days of the week over a period of five weeks. Results showed that, while employees had a highly favorable attitude toward music and
thought they did more work with it, there was no change in measured productivity.

In Great Britain, eighty-eight female assemblers in a radio tube factory produced less scrappage when furnished with a musical background. This was in complete accord with studies in American plants. Duck (7) conducted a survey and found that popular music was most in demand. Waltzes and semiclassical music ran a close second and third.

Antrim (1) reported that in 1945 more than three thousand industrial plants in this country were using music to some extent. This approximated some five million workers benefitting from music. He further predicted that it would not be long before industrial audiences would far exceed any other audience for music, even radio. The use of music has resulted in increased production. It was pointed out that speed or tempo affects the relative efficiency of the workers. The results of the experiments conducted by Antrim indicated that fast music tended to speed up the worker in his movements and that slow music had the opposite effect.

Studies usually have used only one kind of music which, in the judgment of the experimenters, is the most likely to produce favorable results. Poock and Wiener (22, p. 318) presented to their subjects undesirable music as compared to desirable music. They also used background music to enhance the performance of a monotonous task. Rather than use "music" versus "no music," an attempt was made to evaluate both popular
and unpopular music. Music is desirable and sought after to fill in empty background or to override a noisy one. People using transistor radios and earpieces confirm this.

To determine the "preferred" and "non-preferred" music, subjects were asked to rank-order their choices for background music while performing a task. The highest ranking was popular piano music and the lowest was "rock and roll." The music used was popular, appealing, and current. The background music was found, however, to have no beneficial effect, even in monotonous visual tasks (22).

McCormbridge (15) conducted a study to determine the effects of most preferred and least preferred music on performance of a simple and a complex inhibitory task. The results of this study indicated that the presence of music did not have a significant effect on the performance of an inhibitory task when performance was measured in terms of speed and accuracy.

Perrillo (19) experimented with the effects of music on each sex in relation to reaction to failure and perceived loss of ability for self-control. Males were assumed to have stronger expectations of self-efficacy than females, and were more likely to look to an external reason for their failures. Women were more likely to become helpless and indifferent when reacting to failures.

Emotionally disturbed children riding three school buses were the focus of a study on the influence of background music
on their fighting and out-of-seat behavior. Teachers, administrators and bus drivers had agreed that inappropriate behavior on the bus was a major problem and bus problems were carried over to the classroom. Hostilities carried into the classroom and subsequent increased activity levels resulted from the inappropriate bus behavior (16).

Following introduction of background music on each bus, the mean percentages of time for each phase and the daily percentages of time of inappropriate behavior indicated a decrease in inappropriate behavior. Group cohesiveness developed on buses. Older students helped each other and the younger children to remember the rules (16).

McCarty's (16) study found background music to be an effective tool for encouraging appropriate bus riding behavior. School-aged children, other than the emotionally disturbed, being transported by bus were likely to have similar behavior problems. McCarty's study, therefore, would have ramifications for them also.

Holloway (9) conducted a study in which eight severely retarded subjects were each taught two behavioral modes with music listening (passive reinforcement) contingent with rhythm instrument playing (active reinforcement) to determine which type of reinforcement was most effective. The most effective reinforcement must be used to increase the functional skills of the severely retarded in the least amount of time. It was found that a powerful means of acquiring and maintaining useful skills is by music reinforcement, both passive and active.
Passive reinforcement includes music listening and televised music lessons and demands little or no physical response. Active reinforcement involves playing instruments, moving the body to music, and singing. Both passive and active reinforcement increased desired behaviors in the retarded.

The eight subjects involved in this experiment resided in a state institution. Their ages ranged from eight to eighteen and the average length of institutionalization was eight years. Five subjects were nonambulatory and all were nonverbal and had handicaps such as cerebral palsy, spasticity, and hyperactivity. The subjects had normal hearing and were responsive to musical stimuli (9, p. 60).

Holloway’s (9) study contains the following implications for therapists and educators:

1. Both music listening and instrument playing can effectively increase preacademic and motor skills in the severely retarded.
2. A change in music reinforcement from passive (listening) to active (playing) or vice versa may be indicated if the client is experiencing difficulty acquiring a skill.
3. Should satiation occur with one type of music reinforcement, the other type may supply the necessary revitalization.
4. Due to physical or mental limitations, some clients may not respond to one type of music reinforcement yet may respond well to the other (9, pp. 67-68).

Further research was recommended to examine passive and active music reinforcement with the severely retarded (9, p. 68).

The success of the therapeutic use of music in institutions and research settings has pointed to the possibilities
of using music to reduce anxiety in high-anxiety subjects. The behavioral effects of music have been investigated from a number of research standpoints, including effects on physiological and psychological measurements of mood states as well as on task performance. The relaxation or anxiety-reducing effects of music upon human behavior have also been examined (24, pp. 2-3).

That music has immediate and soothing effects upon the behavior of high-anxiety subjects was the hypothesis of Rohner and Miller's (24, p. 4) study. Familiar music would reduce state anxiety more than unfamiliar music. Sedative music would reduce state anxiety in high state anxiety subjects more than stimulating music. The type of music would account for more variance than either sex or degree of familiarity. Music in general would have a greater anxiety-reducing effect than would a no music environment in high state anxiety subjects.

Rohner and Miller (24, pp. 10-11) concluded that sedative music has some facilitating psychological and behavioral effects. These effects may be manifested as more subtle and temporary than long term, but a qualitative difference does not reduce the potential usefulness of music for therapeutic purposes.

Very little research has been done with the use of music therapy with the elderly. Some of the effects of music on the elderly include improvement in appropriate behavior and
personal appearance as well as increased environmental awareness. Geriatric patients express themselves more freely, which may make them less defensive and aggressive in their attitudes toward their environment. The use of music therapy with regressed geriatric patients was an effective tool in reinvolving patients in their environment (23).

Music therapy with its potential to motivate and reactivate the geriatric patient would be a valuable addition to a reality orientation program. Reality orientation (RO) is a technique used with patients exhibiting confused or disoriented behavior. The purpose of RO is to reverse or halt confusion, social withdrawal and apathy characteristic of elderly institutionalized patients (23).

Riegler (23) conducted a study on comparison of a reality orientation program for geriatric patients with and without music. This study compared the effects of a traditional versus music-based RO program. Eight residents of the Chateau de Notre Dame Nursing Home were randomly assigned to experimental and control groups. A pre-test was given to identify any significant differences in RO and behavior functioning between the two groups. The goals and objectives were then formulated from information obtained from the pre-test. The experimental group received two thirty minute music-based RO sessions a week for eight weeks, while the control group received the same number of traditional RO sessions without music. Upon completion of the treatment,
the post-test was administered to each subject. A significant interaction was found between the groups and the treatment condition, with the control group remaining at the same level across trials and the group receiving the music-based RO showing marked improvement.

Madsen and Wolfe (13) conducted a study to investigate the effect of certain variables on the bodily movement and attentiveness of normal subjects. This study examined the effect on bodily movement of

a. interrupted music during a reading task,
b. interrupted music during a listening task,
c. an incompatible response using rhythmic movement, and
d. negative practice procedures (13, p. 17).

This study indicated that when a task requires an individual to attend to music in some manner, active or passive, the attention occupies a high degree of participant involvement, which creates a reduction in other behavior. When music becomes a competing factor in relationship to another task, the music may be phased out of awareness and the person can attend to the primary task (13, pp. 17-28).

A music therapist may need to establish a contingent relationship between the music itself and the behavior to be reduced, as well as to inform the client of the therapeutic intent of the music activity. The aftereffect or increased motor movement may be produced without this therapeutic awareness. Implications from this study indicated that the use of
background music during group discussion or to enhance relaxation may be counterproductive (13, p. 28).

A great deal has been written about the use of music in therapy, but little has been written about its use in teaching. Psychiatrists are more involved in training paraprofessionals and professionals for other disciplines. They are using popular records as training aids and "clinical material." With the growth of community mental health centers and consultation to community agencies, the psychiatrist needs to present his knowledge and approach to people in very different kinds of work and with widely varying backgrounds, orientation, training, and temperament (26).

Some of the advantages of the techniques used are as follows:

a. Records used as an adjunct result in rapport between the psychiatrist and the group, and among members of the group. Several functions are served by the music. It evokes memory and emotion and permits cognitive discussion and understanding of memories and effects aroused. A sense of empathy is conveyed by the music. The group can then better understand that conflicts and sufferings are universal and can be shared.

b. Popular music shows life's difficulties and intrapsychic conflicts in a direct, but relatively nonthreatening manner.
c. Most people are comfortable commenting upon music. Some of the conference participants remain patiently silent.

d. Music can be used to demonstrate the importance and power of nonverbal communication.

e. Different people react in varying ways to the same musical stimulus, which means a given event can be viewed from many perspectives. The staff can study different typical responses of people with different personalities and the relationship of these responses to their character structures.

f. A psychiatrist-teacher is seen as less distant as his reactions to the music are shared in a setting that seems informal. In exploring behavior, the combination of affective exchange with cognitive exploration is particularly useful (26).

Schiff (26) describes the use of popular music as an adjunct that may assist the psychiatrist in the teaching of social workers, nurses, aides, and paraprofessionals. The playing of records induces effects, memories, and ideas which are then explored.

Studies have been made to demonstrate that music has been used and has produced positive effects in sports, education, business, and therapy. Background music seemed to create an environment for heightening physical performance. Participants who move in rhythmic measure while listening to music may be expected to improve in motor skills. Rhythm stimulates muscular action and is important in performing most athletic
activities; therefore, music has an effect on physical performance of most persons involved in sports. Students, who listened to background music, did not find it helpful in studying or while taking tests. However, they did feel rested and relaxed while listening to some types of music. No particular increase in productivity was realized in most workers, but music brought about changed attitudes and behaviors of employees, which in turn brought about happiness and satisfaction. Finally, some of the greatest advances have been in the treatment of autistic children, the mentally retarded, the handicapped, and the elderly.
CHAPTER BIBLIOGRAPHY


CHAPTER III

PROCEDURES FOR THE STUDY

In the fall semester of 1980, the departmental chairman of a major state university gave his permission to use six sections of bowling classes to conduct a study on the effects of two different types of music on bowling scores and attitudes toward bowling. This experiment was conducted in the student center bowling alley at the university. The bowling alley consists of eight regulation lanes and has been approved by the American Bowling Congress.

During the study, students in the experimental group were the only students on the lanes. Six bowling sections consisting of thirty students each in two sections (Group I), twenty-six and twenty-five students in two sections (Group II), and twenty-eight and twenty-seven students in two sections (Group III) were used. The students were separated into eight teams, providing a maximum of four students on each bowling lane. Students were given

a. a pre-test consisting of bowling three games for raw score averages after twelve hours of instruction,

b. a post-test after entering competitive bowling for fourteen hours, and

c. a post-test only attitude survey.
Background music was played during the fourteen hours of competitive bowling and during the post-test. The experimental groups and the control groups received instruction on an individual basis during the fourteen hours of competitive bowling.

A Sony TC-95 Cassette Player, Pioneer Model SA-8500 Amplifier, Peavy 412H Coloumn Speakers, was set up with five feet amplifiers placed behind the bowlers with the music volume played at a constant setting. When the equipment was placed, it was tested with a sound level meter to insure the same music volume on each approach. This equipment was set up for a pilot study in the summer of 1979. The same equipment was set up and used for the study conducted in the fall of 1980. See Appendix A for complete music setup and sound measurements.

Two hours of disco music and two hours of easy listening music were used. The students were hearing the same music once a week, as the tapes were repeated.

Easy listening music was chosen for this study because it does not require concentrated listening, being soothing and relaxing. Disco music was chosen because it is very popular with the age group being tested.

Class Procedure

The classes used in the experiment were morning and afternoon classes and met twice a week. Two classes met on
Monday and Wednesday and the other four classes met on Tuesday and Thursday. Students were exposed to disco music (two classes), easy listening music (two classes), and no music (two classes). The experimental treatment started five minutes after the hour and ended five minutes before the hour. A work period of fifty minutes duration existed for each group. The treatment was randomly assigned by placing the section numbers in a container and drawing for music type or no music.

Mackey's (4) techniques were used for class procedure for the disco music, easy listening music, and no music sessions. These techniques were demonstrated:

1. Technique for selecting a ball to fit the hand:
   a. The thumb should slip in and out of the thumb hole easily.
   b. With the thumb in the thumb hole, the hand is laid across the ball with the fingers extended. The knuckles of the two middle fingers should be directly over the inside edge of the holes.
   c. When the thumb and two middle fingers are put into the holes of the ball there should be no more daylight between the hand and the ball than the width of a pencil. See Figure 1 (4, p. 20).

2. There are three acceptable bowling approaches:
   a. The three-step approach,
   b. The four-step approach, and
   c. The five-step approach.
Your thumb should slip in and out of the thumbhole rather easily.

There ought to be just enough space under your palm for a pencil to fit snugly.

For proper span, the knuckles of your middle fingers should be over the edges of the finger holes with your thumb in the thumbhole.

Only by actually using the ball can you determine whether the fit is correct.

Fig. 1—Selecting your ball
The four-step approach, recommended for beginners, was taught to the beginners for the experiment. See Figure 2 (4, pp. 34-35).

3. There are basically four types of balls a bowler can roll:
   a. Hook ball,
   b. Straight ball,
   c. Curve ball, and
d. Backup ball.

The beginning subjects received instructions on the technique of rolling a straight ball. See Figure 3 (4, p. 22).

4. Cues are used to accomplish a good bowling technique. Auditory cues present a concept with key words or catch phrases. Visual cues use checkpoints to promote learning and remembering key movements or positions.

Auditory cues and visual cues emphasized in class were as follows:

**Starting Position**

Auditory cues.—
   a. Hold your body erect.
   b. Shift your weight to your left foot.
   c. Maintain a relaxed position.
   d. To find your starting position, walk four and one-half steps back from the foul line.
Your first step should be a short one taken with your right foot. As you step, push the ball away and fully extend both arms.

As you complete the pushaway, drop your left hand off the ball. Allow the ball to swing down in a pendulum motion while you take the second step.

Continue the pendulum motion as you start to take the third step.

Let the ball swing back past your body to a waist-high position.

The final part of the four-step delivery should be done without specific concern for the position of the ball.

Swing the ball forward without tightness or tension.

Your final step is a slide. At the moment of release, keep your wrist straight and your thumb in position.

As you release the ball, pull your hand up to ear height to obtain more spin on your ball.

Fig. 2—Bowling through audio-visual cues
Fig. 3—Types of delivery
e. Flex your knees slightly and shift your weight onto the balls of your feet.

Visual cues or checkpoints.--

a. Keep your feet far enough apart to maintain good balance and point your toes straight ahead.

b. Keep your right foot back of the left foot so that your right toe is opposite the mid-point of your left foot.

c. Hold the ball in a waist-high position in line with your right hip.

d. The palm of your right hand should face your chest with your thumb in the twelve-o'clock position to roll a straight ball. If you roll a hook, your palm should face to the left of your thumb in the ten-o'clock position.

e. Place your left hand beneath the ball on the left side for support. Your little fingers should be touching each other.

f. With your right hand and wrist, form a straight line with your forearm.

g. Keep your right elbow snugly against your body.

Approach

Auditory cues.--

a. Perfect balance is essential to good bowling.

b. Walk straight toward the target.

c. Don't rush your delivery.
d. Try to develop a smooth approach and release.
e. Use shuffle steps as in ballroom dancing.
f. A medium-fast ball is more effective than one "thrown through the back of the building."

**Visual cues or checkpoints.--**

a. Your first step should be a short one taken with your right foot.

b. As you take your first step, the ball should be pushed away and both arms fully extended.

c. Your left arm should assist your right in the pushaway.

d. As you complete the pushaway, drop your left hand off the ball and move your arm to the side to counterbalance the weight of the ball. Allow the ball to swing downward in a pendulum motion.

e. The pendulum swing should continue until the ball has swung back past your body to a waist-high position.

f. The remainder of the steps --four in all-- should be done without specific concern for the position of the ball. The pendulum movement should be done without tightness or tension.

g. Your final step with your left foot, a sliding motion forward, should take place as you complete the forward swing of the ball.

h. Keep a firm wrist throughout the swing.
Release of the Ball

**Auditory cues.**—

a. Deliver the ball with smoothness and accuracy.

b. Correct follow-through is a key to consistent good bowling.

c. Good balance, important throughout the approach, is the essence of an accurate delivery.

**Visual cues or checkpoints.**—

a. On your final or fourth step, place your left foot next to your right and slide it straight forward.

b. Flex your left knee at a ninety-degree angle as you complete the slide forward.

c. Point both feet straight down the alley.

d. Keep your body erect from the waist up.

e. Keep your shoulders square to the foul line.

f. Release the ball at a point in front of your left foot and in line with your right shoulder.

g. At the moment of release, keep your wrist straight with your thumb in the correct position.

h. In the follow-through, point your hand straight down the alley.

i. As you release the ball, pull your hand up to shoulder height to obtain more spin on your ball.

j. To ensure proper balance, maintain the follow-through position for several seconds.
k. Watch your ball to see if it rolls over the proper spot or diamond.

Some cues must be reversed to apply to left handers (4, pp. 29-36).

Picking Up Spares

3 - 6 - 9 Spare adjustment system. --

a. Always move to the right in three board increments.

b. Second and third arrows are always the pivot points.

1. Second arrow is used for left hand spares.
   (a) 2, 4 and 7 are key pins for left hand spares.
   (b) Moving 3 boards to right - 2 pin.
   (c) Moving 6 boards to right - 4 pin.
   (d) Moving 9 boards to right - 7 pin.

2. Third arrow is used for right hand spares.
   (a) 3, 6 and 10 are the key pins.
   (b) Key on 10 pin to start.
      (1) Move to edge of left channel, shoot over third arrow. Adjust in 3 board increments until you have a 10 pin shot.
   (c) Move 3 boards right of this spot for 6 pin.

c. In any combination of 3 or more pins, key on the center pin. See Figure 4 (2, p. 9).
**Fig. 4--Spare adjustment system**

- **10 PIN:** Starting position
- **3rd ARROW:** Right side spares pivot point (does not move)
- **2nd ARROW:** Left & center spares pivot point (does not move)
- **KEY PINS:** No.'s 2-4-7 (for left side spares)
- **KEY PINS:** No.'s 3-6-10 (for right side spares)
- **STRIKE:** Starting position (adjusting point)
- Always move to the right! (3 board increments)
5. The last two hours of the twelve hours of instruction were dedicated to covering the "picking up" of spares and score keeping. Picking up spares is one of the most important phases of the game and the student needs a good understanding of the technique. A good knowledge of score keeping is essential if the student is going to receive the maximum enjoyment of the game. Score keeping was thoroughly covered during class and students were referred to their textbooks for further review. For rules of scoring, see Figure 5 (4, pp. 53-56).

A game or line of bowling for an individual consists of ten frames. The bowler attempts to knock down all ten pins in each frame. Should the first ball fail to knock down all pins, a second ball is rolled at the remaining pins. The game score is the total number of pins knocked down in the ten frames.

The symbols for scoring are marked in each frame as follows:

Strike: All pins knocked down on first ball.

Spare: 7 pins knocked down on first ball and the remaining 3 on the second ball.

Miss: Failure to strike on the first ball or on the second.

Fig. 5--Rules of scoring
Fig. 5--Continued

**Split:** After first ball, two or more pins remain standing with no intermediate pins in front or between. Pins are knocked down by the second ball.

**Foul:** When a part of the bowler's person goes beyond the foul line. When a player fouls, no score is allowed on that ball.

Fill in the score in each frame for the line of bowling shown in the diagram.

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<tr>
<td>6</td>
<td>72</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>19-</td>
<td>F</td>
<td>X</td>
<td>61</td>
<td>9</td>
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<td>17</td>
<td>26</td>
<td>56</td>
<td>85</td>
<td>104</td>
<td>113</td>
<td>133</td>
<td>152</td>
<td>161</td>
<td>181</td>
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Actually, scoring a game of bowling is quite simple if you follow four basic procedures:

1. **No strike or spare:** Merely add the total pins knocked down on first and second ball and score as follows: Scoring is accumulative.

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2. **Strike:** Ten plus a bonus consisting of the number of pins knocked down on the next two balls rolled.

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<td>X</td>
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<td>28</td>
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Fig. 5--Continued

3. Spare: Ten plus a bonus of the pins knocked down on the first ball of the next frame.

\[
\begin{array}{ll}
1 & 2 \\
15 & 20 \\
\end{array}
\]

4. Tenth Frame. If a spare occurs in the tenth frame, the bowler is entitled to roll one more ball. If a strike occurs in the tenth frame, the bowler is entitled to two additional balls to finish the game.

\[
\begin{array}{ccc}
9 & 10 & \text{Total} \\
9 & \times 7 & 1 \\
134 & 152 & 152 \\
\end{array}
\]

HELPFUL HINTS

A combination of strike-spare or spare-strike in successive frames is always 20. Strike = 10 + next two balls. Spare = 10 + first ball in next frame.

\[
\begin{array}{ccc}
1 & 2 & 3 \\
20 & 40 & \\
\end{array}
\]

A "double" or two strikes in a row is always twenty something (20-?) depending on the number of pins knocked down on the first ball rolled after the double, i.e., 10 + 10 + 8.

\[
\begin{array}{ccc}
1 & 2 & 3 \\
\checkmark & \checkmark & 8 \\
28 & 48 & \\
\end{array}
\]
Fig. 5--Continued

A triple or "turkey" scores 30 and is the highest figure which can be recorded or added on in any one frame, i.e., $10 + 10 + 10$.

NOTE: This is how a perfect game of 300 can be scored (10 frames of 30 each or 12 strikes).

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<tr>
<td>30</td>
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The Population

The population was physical education classes in bowling at a large multipurpose university in the Dallas-Fort Worth metroplex. The students were basically freshmen and sophomores. The classes were elective but credit may be counted in the required activity courses for physical education.

Selection of the Sample

All students in the six selected sections were included in this experiment. These six sections were part of the class teaching assignment of a single instructor. The section numbers were placed in a container and were drawn to determine the music type or no music in the section. Arbitrarily disco music was drawn first, easy listening music second, and no music third. The draw was then repeated. This technique
assured restricted random assignment of the treatment. Group I (disco background music) included thirty students in each of two sections which provided sixty subjects for this treatment. Group II (easy listening background music) included twenty-six students in one section and twenty-five students in another section which provided fifty-one subjects for this treatment. Group III (control, no background music) included twenty-eight students in one section and twenty-seven in another section which provided fifty-five subjects for this treatment. The experimental subjects were exposed to music. The control subjects did not have music. The selection procedure resulted in the classes on Tuesdays and Thursdays at 11:00 am and 2:00 pm being assigned as disco music ($E_1$), those on Tuesdays and Thursdays at 12:30 pm and 3:00 pm as easy listening music ($E_2$), and the ones on Mondays and Wednesdays at 5:00 pm and 6:00 pm as no music ($C$).

It was planned to omit students over thirty years of age from the study because disco music could have a negative effect on their bowling scores. No students were over thirty years of age. Students with hearing impairments were to be omitted from the study because their inclusion would not produce the same results as students with normal hearing ability. A question was included on the data collection sheet asking the student to define his or her hearing as excellent, good, average or poor (see Appendix C). No student admitted to a hearing problem. If a student had a negative attitude toward
bowling with background music, he or she was to be permitted to transfer to another class. There were no requests for transfer because of objections to the music.

Research Design

The study was designed to determine the effects of two different types of music on bowling scores and attitude toward bowling. A pre-test and a post-test were given. The subjects bowled three games at the beginning of the semester after twelve hours of instruction and three games at the end of the semester and the average on each series was the pre-test and post-test scores.

The research design was Campbell and Stanley's (3, p. 13): Pre-test - Post-test Control Group Design No. 4. This design controls for internal validity. Maturation and testing are controlled in that they should be manifested equally in experimental and controlled groups. Instrumentation was not a problem because the computed mean was based on pins bowled. The selection of the section was random. The external invalidity would exist only if one tried to generalize situations which were not similar.

The subjects were given a post-test only attitude survey. The instrument was an adaptation of twenty questions taken from a validated list of forty questions designed by Adams (1) for measuring attitude toward physical education. Similar and duplicate questions were rejected. The most appropriate questions for this study were selected after consultation with
the chairman and one professor in the Physical Education Department at the institution utilized in the study. The Likert method of scoring was used.

Scoring for the test is rather different. The marks, which range from 7 to 1 for each statement, are weighted so that a favorable response toward physical education has the higher mark. Thus, when the statement is a positive one (numbers 6, 7, 9, 11, 12, 13, 15, 16, 18, 19, and 20), scoring is as follows:

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<tr>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td>+3</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
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</table>

When the statement is a negative one (numbers 1, 2, 3, 4, 5, 8, 10, 14, and 17), the whole scoring procedure is reversed:

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3</td>
<td>+2</td>
<td>+1</td>
<td>0</td>
<td>-1</td>
<td>-2</td>
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See Appendix B for a detailed list of questions. The research design for the attitude measurement was a post-test only.

Procedures for Analysis of Data

An analysis of covariance was utilized to hold constant the beginning bowling scores of the participants. The analysis of covariance is used by researchers to compare group means on a dependent variable after these group means have been adjusted for differences on some relevant covariate. The
dependent variable was the average of the last three games, the covariate was the average of the three games bowled for the pre-test, and the analysis of covariance (1) adjusted the post-test means on the basis of the covariate (pre-test) means and then (2) compared these adjusted post-test means to see if they were significantly different from one another. It is important to note that the adjustment was on the dependent variable means (5).

To analyze attitudes, the analysis of variance was utilized. The simple analysis of variance was used for testing the hypothesis that two or more independent samples were drawn from populations having the same mean. The samples were constituted by drawing independent random samples from a single population, subjecting them to experimentation, then comparing them on a single criterion variable (5, p. 230).

The sums of squares between groups, within groups, and for total were calculated, along with their respective degrees of freedom. If the calculated statistic equaled or exceeded the tabled value, the null hypothesis was rejected, and a significant difference in the means of the various samples was determined to exist (5, p. 232).

Testing of the Hypotheses

Hypotheses one through six were tested by computing an \( F \) ratio and comparing it to the Table \( F \) with the appropriate number of degrees of freedom. When the calculated statistic equaled or exceeded the tabled value, the null hypothesis was
rejected, and a significant difference in the adjusted means of the various samples was determined to exist. If F had been significant, the Scheffe would have been used for subsequent tests (5). When the calculated statistic was smaller than the tabled value, the null hypothesis was retained, and no significant difference in the adjusted means was found. The level of significance was reported.
CHAPTER BIBLIOGRAPHY


The purpose of this study was to determine the effects of two types of music on bowling scores and attitudes toward the activity. Data were collected from six bowling classes in the required physical education program at a large multi-purpose university in the Dallas-Fort Worth metroplex.

The subjects were given twelve hours of instruction in bowling techniques, score keeping, and "picking-up" of spares. They were then pre-tested by bowling three games for average. The subjects then entered competitive bowling for fourteen hours. The two experimental groups listened to music during the competitive bowling and the control group was not exposed to music. After the fourteen hours of competitive bowling, the subjects were post-tested by bowling three games for average.

The subjects were given a post-test only attitude survey (see Appendix B). Adams (1) designed 150 statements for measuring attitude toward physical education. Using second-year university psychology and education students as judges, forty most appropriate statements were selected. Each judge arranged the statements from one extreme to the other, placing them in different piles. The responses to the statements ranged from one to eleven with pile one representing a favorable
attitude, pile six representing a neutral attitude and pile eleven representing an unfavorable attitude. This process is called the Thurstone-Chave (Method of Equal-Appearing Intervals). The object was to have the statements so spaced by the judges that a continuum exists from pile one through pile six to pile eleven. In situations where judges disagreed, that is, when a statement occurred in nearly all piles, that statement was discarded as being ambiguous.

The final selection of the forty questions was arranged in two sets (Set I: $r = .61$; Set II: $r = .69$). Set I and Set II had a split-half reliability coefficient of .71. When the two sets were combined the reliability increased to .84.

The twenty questions utilized for the present study were selected from Adams' (1) forty questions. The questions were modified by changing the words physical education to bowling. The twenty most appropriate questions were selected after consultation with the chairman and one professor in the Physical Education Department at the institution utilized in the study.

The reliability of the attitude test administered in the present study was determined by obtaining the coefficient of internal consistency (split-half) as suggested by Isaac and Michael (5). For this purpose, the test questions were randomly divided into two equivalent halves (ten questions each). Since each question can be considered as a factor which may constitute "the attitude toward bowling," the sum of each individual score for both equivalent halves was correlated by using the SPSS
computer subroutine (Pearson Corr command). The obtained correlation \( r = 0.606, p = 0.001 \) was then used to solve the Spearman-Brown formula to estimate the reliability of the complete test.

\[
\text{Reliability} = \frac{nr}{1 + (n-1)r} = \frac{2 \times 0.606}{1 + (2-1)0.606} = 0.756
\]

Borg's (2) interpretation of correlations indicated:

Correlations ranging from .65 to .85 make possible group predictions that are accurate enough for most purposes. As we move toward the top of this range, group predictions can be made very accurately, usually predicting the proportion of successful candidates in selection problems within a very small margin of error. Near the top of this correlation range individual predictions can be made that are considerably more accurate than would occur if no such selection procedure was used (2, p. 283).

All data were processed through the IBM computer at the University of Texas at Arlington. The mean, standard deviation, maximum and minimum of the average bowling scores and those of attitude tests were obtained by the use of the SPSS subprogram (Condescriptive), respectively. To test the null hypotheses for Hypotheses 1, 2, and 3, One-way Analysis of Covariance was employed. One-way ANOVA (Analysis of Variance) was employed to test Hypotheses 4, 5, and 6.

In all statistical analyses used in the present study, the 0.05 level of significance was used to reject the null hypothesis.
Findings Related to the Hypotheses

Bowling Scores

Table I contains the mean, standard deviation, maximum and minimum of the pre-test and post-test bowling scores for three different groups which received different experimental treatments. See Appendix E for individual pre-test and post-test average scores. Group I (disco music) had an increase in mean score of 5.03 pins. Group II (easy listening music) had an increase in mean score of 8.81 pins. Group III (control, no music) had an increase in mean score of 8.2 pins.

Hypothesis 1 stated that the adjusted post-test mean in bowling averages attained by the college student bowlers exposed to disco background music will be significantly greater than the adjusted post-test mean in bowling averages for

a. students exposed to easy listening background music.

b. students who are not exposed to background music.

Hypothesis 2 stated that the adjusted post-test mean in bowling averages attained by the college student bowlers who are exposed to easy listening background music will be significantly greater than the adjusted post-test mean in bowling averages of college student bowlers who are not exposed to background music.

In order to test the above hypotheses, analysis of co-variance was performed. This was justified on the basis that even though the groups were randomly assigned, considerable differences existed in the pre-test bowling scores among the
<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Group I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 60)</td>
<td>112.12</td>
<td>18.74</td>
</tr>
<tr>
<td>D.M.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 51)</td>
<td>116.64</td>
<td>25.09</td>
</tr>
<tr>
<td>E.L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 55)</td>
<td>121.00</td>
<td>28.32</td>
</tr>
<tr>
<td>N.M.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
groups and it was necessary to perform the analysis of covariance so that the effect of pre-test bowling scores could be kept constant, thus minimizing the effect of pre-test scores difference upon the adjusted post-test bowling scores.

Table II contains the result of analysis of covariance on the adjusted post-test bowling scores.

**TABLE II**

THE RESULT OF ANALYSIS OF COVARIANCE ON THE ADJUSTED POST-TEST BOWLING SCORES

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>510.30</td>
<td>2</td>
<td>255.15</td>
<td>1.91</td>
</tr>
<tr>
<td>Within</td>
<td>21627.97</td>
<td>162</td>
<td>133.50</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>20157.56</td>
<td>165</td>
<td>516.10</td>
<td>...</td>
</tr>
</tbody>
</table>

$F_{.95}(2,162) = 3.02$

The results of the adjusted post-test bowling score means for each of the three groups were analyzed to determine any significant differences. A one-way analysis of covariance, which provided an adjustment for any possible pre-test mean group difference, yielded $F = 1.91$. This $F$ ratio was not significant as the critical value of $F_{.95}(2,162) = 3.02$. The null hypothesis as tested by one-way analysis of covariance which states there are no significant differences between groups is retained. Thus, under the existing experimental
conditions, the hypothesis that college student bowlers exposed to disco background music will have significantly greater adjusted post-test bowling score means than student bowlers exposed to easy listening background music or student bowlers who were not exposed to any background music during a competitive bowling experience is rejected. Also, under the existing experimental conditions, the hypothesis that college student bowlers exposed to easy listening background music will have significantly greater adjusted post-test bowling score means is rejected.

Hypothesis 3 stated that male students will achieve a significantly greater adjusted post-test mean in bowling scores than will female students in each group.

An attempt was made to test whether or not there was any gender difference affecting the adjusted post-test bowling scores among the three groups. Analysis of covariance was employed in an effort to hold the difference in the pre-test bowling scores constant between male and female subjects.

Table III contains the result of analysis of covariance on the adjusted post-test scores for male and female subjects.
TABLE III
THE RESULT OF ANALYSIS OF COVARIANCE ON THE
ADJUSTED POST-TEST SCORES FOR MALE (n = 101)
AND FEMALE (n = 65) SUBJECTS

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>732.03</td>
<td>1</td>
<td>732.02</td>
<td>5.57</td>
</tr>
<tr>
<td>Within</td>
<td>21406.25</td>
<td>163</td>
<td>131.33</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>85157.56</td>
<td>165</td>
<td>516.11</td>
<td></td>
</tr>
</tbody>
</table>

\[ F_{.95}(1,163) = 3.86 \]

Inspection of Table III revealed an \( F = 5.57 \). This \( F \) ratio is significant since it exceeds \( F_{.95}(1,163) = 3.86 \). Therefore, the null hypothesis was rejected and the research hypothesis was accepted.

Table IV contains the mean and standard deviation of female subjects in all three groups combined and male subjects in all three groups combined.

TABLE IV
THE MEAN AND STANDARD DEVIATION OF
POST-TEST BOWLING SCORES

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>132.00</td>
<td>20.33</td>
</tr>
<tr>
<td>Female</td>
<td>111.08</td>
<td>20.39</td>
</tr>
</tbody>
</table>
An examination of Table IV showed that male subjects' post-test mean scores were higher than the female subjects in combined groups.

Table V contains the post-test mean bowling scores and standard deviation of the male and female subjects (separate) in all three groups.

**TABLE V**

**THE MEAN AND STANDARD DEVIATION OF POST-TEST BOWLING SCORES FOR MALE AND FEMALE SUBJECTS IN GROUP I, GROUP II, AND GROUP III**

<table>
<thead>
<tr>
<th></th>
<th>Disco Group I</th>
<th>Easy Listening Group II</th>
<th>No Music Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
<td><strong>Mean</strong></td>
<td><strong>SD</strong></td>
</tr>
<tr>
<td>Male</td>
<td>124.80</td>
<td>13.92</td>
<td>135.00</td>
</tr>
<tr>
<td>Female</td>
<td>109.93</td>
<td>17.92</td>
<td>111.81</td>
</tr>
</tbody>
</table>

An examination of Table V showed that male subjects' post-test mean scores were higher than the post-test mean scores for the female subjects in all three groups.

**Attitude Test Results**

Appendix D contains results of the attitude tests in which the mean and standard deviation are presented for each attitude question asked for each group. The attitude measures were taken on a one to seven scale with the higher number indicating the more favorable attitude toward bowling. The
three questions that received the highest numbers on the scale were numbers five, two, and ten, respectively.

Question five stated that bowling is "the most hateful subject" of all. The average of the three groups was 6.71. This indicated that bowling students surveyed did not feel that bowling was "the most hateful subject" of all. Question two stated that bowling should be disposed of. The average of the three groups was 6.46. This indicated that bowling students surveyed thought that bowling should be retained. Question ten stated that college would be better without bowling. The average of the three groups was 6.26. This indicated that bowling students surveyed thought that bowling should remain in the college curriculum.

The three questions that received the lowest numbers on the scale were numbers nine, seven, and eleven, respectively. On the scale of one to seven, number four was the mean and indicated that bowling students did not agree or disagree with the question.

Question nine stated that bowling is THE ideal subject. The average of the three groups was 3.71. This indicated that bowling students surveyed were slightly toward the negative of the scale that bowling was THE ideal subject. Bowling students responding to this question may have felt that the emphases on the words THE and ideal made a comparison with subjects in their major academic fields unrealistic. Question seven stated that people who like bowling are nearly always "good to know."
The average of the three groups was 4.19. This indicated that bowling students surveyed did not agree or disagree that people who like bowling are nearly always "good to know." Question eleven stated that bowling is "my favorite subject." The average of the three groups was 4.41. This indicated that bowling students surveyed were neutral toward bowling as their favorite subject. Bowling students responding to this question may have felt that bowling, compared to the general curriculum core or their fields of study, was not necessarily their favorite subject.

Hypothesis 4 stated that students exposed to disco background music will achieve a significantly higher mean score on the attitude scale than will

a. students exposed to easy listening background music, and

b. students who are not exposed to background music.

Hypothesis 5 stated that students exposed to easy listening background music will achieve a significantly higher mean score on the attitude scale than will those not exposed to background music.

The computed F ratio for the difference in mean scores on the attitude scale while listening to disco music, easy listening music, and no music is presented in Table VI.
An examination of Table VI showed that there was no significant difference and the null hypotheses were retained and the research hypotheses were rejected.

The means and standard deviations on the attitude survey are presented in Table VII.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>323.77</td>
<td>2</td>
<td>161.89</td>
<td>1.01</td>
</tr>
<tr>
<td>Within</td>
<td>26088.98</td>
<td>163</td>
<td>160.06</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26412.75</td>
<td>165</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$F_{.05}(2,163) = 3.02$

### Table VII

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I - D.M. (n = 60)</td>
<td>107.52</td>
<td>12.16</td>
</tr>
<tr>
<td>Group II - E.L. (n = 51)</td>
<td>105.33</td>
<td>11.92</td>
</tr>
<tr>
<td>Group III - N.M. (n = 55)</td>
<td>108.80</td>
<td>13.80</td>
</tr>
</tbody>
</table>
Inspection of Table VII revealed a very small difference in the means and standard deviations for the three groups. Hypothesis 6 stated that female students will achieve a significantly higher mean score on the attitude measure than will male students. This will hold for
  a. disco music,
  b. easy listening music, and
  c. no music.

The computed F ratio for the significance of difference in mean scores on the attitude scale of male and female students while listening to disco background music is presented in Table VIII.

**TABLE VIII**

**SUMMARY FOR ANALYSIS OF VARIANCE FOR ATTITUDE TEST - MALE AND FEMALE DIFFERENCE - EXPOSED TO DISCO BACKGROUND MUSIC**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>167.96</td>
<td>1</td>
<td>167.96</td>
<td>1.14</td>
</tr>
<tr>
<td>Within</td>
<td>8550.96</td>
<td>58</td>
<td>147.43</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8718.92</td>
<td>59</td>
<td>..</td>
<td>..</td>
</tr>
</tbody>
</table>

$F_{.95(1,58)} = 4.02$
An examination of Table VIII revealed no within-group differences between male and female student bowlers on attitude toward bowling. The null hypothesis was retained. Therefore, the hypothesis that female students will achieve a significantly higher mean score on the attitude survey than will male students was rejected.

Table IX contains the mean and standard deviation of male subjects and female subjects on the attitude survey in Group I - disco background music.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (n = 33)</td>
<td>109.03</td>
<td>10.77</td>
</tr>
<tr>
<td>Female (n = 27)</td>
<td>105.67</td>
<td>13.64</td>
</tr>
</tbody>
</table>

Inspection of the means and standard deviations in Table IX indicated males scored slightly higher than females in attitude toward bowling.

The computed F ratio for the significance of difference in mean scores on the attitude scale of male and female students while listening to easy listening background music is presented in Table X.
TABLE X

SUMMARY FOR ANALYSIS OF VARIANCE FOR
ATTITUDE TEST - MALE AND FEMALE
DIFFERENCE - EXPOSED TO EASY
LISTENING BACKGROUND MUSIC

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Within</td>
<td>7099.33</td>
<td>49</td>
<td>144.88</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7099.33</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Γ.95(1,49) = 4.04

An examination of Table X revealed no within-group differences between male and female student bowlers on attitudes toward bowling. The null hypothesis was retained. Therefore, the hypothesis that female students will achieve a significantly higher mean score on the attitude survey than will male students was rejected.

Table XI contains the mean and standard deviation of male student bowlers and female student bowlers on the attitude survey for Group II - easy listening background music.
TABLE XI
THE MEAN AND STANDARD DEVIATION OF THE ATTITUDE SURVEY FOR GROUP II - EASY LISTENING BACKGROUND MUSIC

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>105.33</td>
<td>12.12</td>
</tr>
<tr>
<td>(n = 30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>105.33</td>
<td>11.91</td>
</tr>
<tr>
<td>(n = 21)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inspection of the means in Table XI indicated males scored similar to females in attitude toward bowling.

The computed F ratio for the significance of difference in mean scores on the attitude scale of male and female students exposed to no background music is presented in Table XII.

TABLE XII
SUMMARY FOR ANALYSIS OF VARIANCE FOR ATTITUDE TEST - MALE AND FEMALE DIFFERENCE - EXPOSED TO NO BACKGROUND MUSIC

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>29.45</td>
<td>1</td>
<td>29.45</td>
<td>0.152</td>
</tr>
<tr>
<td>Within</td>
<td>10241.31</td>
<td>53</td>
<td>193.23</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>10270.76</td>
<td>54</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

F.95(1,53) = 4.03
An examination of Table XII revealed no within-group differences between male and female student bowlers on attitudes toward bowling. The null hypothesis was retained. The hypothesis that female students will achieve a significantly higher mean score on the attitude survey than will male students was rejected.

Table XIII contains the mean and standard deviation of male subjects and female subjects on the attitude survey for Group III - no background music.

**TABLE XIII**

THE MEAN AND STANDARD DEVIATION OF THE ATTITUDE SURVEY FOR GROUP III - NO BACKGROUND MUSIC

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (n = 38)</td>
<td>109.29</td>
<td>14.13</td>
</tr>
<tr>
<td>Female (n = 17)</td>
<td>107.71</td>
<td>13.37</td>
</tr>
</tbody>
</table>

Inspection of the means and standard deviations in Table XIII indicated males scored slightly higher than females in attitude toward bowling.

It is interesting to note that the mean scores in all groups ranged between 105.33 and 109.29 with the standard deviations ranging from 10.77 to 13.64. Thus, a very favorable attitude toward bowling is held by the college students.
since the attitude measure would range between 2.0 and 14.0 with the higher number expressing the more favorable attitude. The small amount of variance as indicated by the small standard deviations indicated a very consistent attitude by the students.

Discussion

The analysis of covariance was computed on post-test bowling scores to determine the significance of difference within and between groups. By determining the F ratio, it was concluded that there were no significant differences between the experimental groups although they received different treatments (disco background music and easy listening background music).

The results of this study supported previous findings by Devereux (3), Newman (7), McCambridge (6), and Woods (10) that music does not improve performance. Woods (10) contended that music did delay fatigue and cultivate positive attitudes toward practice. He further stated that the subjects sought physical proximity to the tape player in every experimental group. When questioned about this action, the response typically was simply: "I just like to be near the music" (10, p. 60).

In the current study it was observed that students in bowling sections not included in the experiment wanted to use the equipment to play background music in their classes. When the study was completed, student bowlers indicated a desire
for the continuation of the background music. Some of these students requested permission to bring their personal tapes to bowling class in order to enjoy background music for the remainder of the semester. The overall response to the music was positive.

The analysis of covariance was computed on the adjusted post-test mean scores to determine if male students achieved a significantly greater adjusted post-test mean in bowling scores than female students. The F ratio was computed and it was determined that there was a significant difference in the adjusted post-test mean bowling scores. The adjusted post-test mean for male students was greater than the adjusted post-test mean for female students. This is probably a result of males, as a group, being larger and stronger than females. Males, as a general rule, will use heavier balls than females.

Each body in motion; track sprinter, long-distance swimmer, or bowling ball rolling down a lane, has a certain mass and a certain velocity, and the product of these two is known as the momentum, or quantity of motion, that the body possesses.

The momentum of a body (as distinct from its speed or velocity) is generally of little importance in sports unless that body becomes involved in a collision with another body. Then, the result of the collision hinges very largely on how much momentum each of the bodies had just before the collision took place. The greater the momentum of a body, the more
pronounced the effect that it produces on other bodies in its path. If, for example, two bowlers use identical techniques and each releases the ball at precisely the same velocity, the bowler who is using the ball that has the greater mass (and therefore the greater momentum) is more likely to score well than his counterpart with the less massive ball. This comes about because the ball with the greater momentum has the tendency to cause the pins to fly about more dramatically, knocking the other pins down and contributing to a better score than does the ball with less momentum (4). This contention is largely borne out by the results of research in which it was reported that women who used a sixteen-pound ball averaged about five pins higher than women who used a fifteen-pound ball, about twelve pins higher than those who used a fourteen-pound ball, and about twenty-six pins higher than those who used a thirteen-pound or lighter ball (9).

Another reason for males attaining better adjusted post-test mean bowling scores than females could be the pressure put on males to perform in sports by our society. Males are expected to perform better than females in sports. Many women have a negative attitude toward high performance in sports because they feel society does not expect or want them to perform well (10).

An analysis of variance was computed on post-test attitude scores to determine the significance of difference within and between groups. The F ratio was computed and it was
determined that there were no significant differences between the experimental groups even though they received different treatments (disco music and easy listening music).

Even though there were no significant differences on the attitude survey, students indicated a preference for music. The two experimental groups were asked whether they approved or disapproved of the music. The subjects listening to disco music were in favor of the music. Fifty-six students gave positive responses and five gave negative responses. The students exposed to easy listening music were in favor of the music. Thirty-eight gave positive responses and thirteen gave negative responses. The subjects in the control group were asked if they would have preferred music. Fifty-one gave positive responses and four gave negative responses. The total response in favor of music in all groups was one hundred forty-five. The total negative response in all groups was twenty-two.

The student bowlers in the experimental groups giving the negative responses to the background music may have responded negatively toward the type of music played instead of toward the music in general. Easy listening background music received more negative responses than disco background music. This was probably because of the age group utilized in the experiment. In the control group the student bowlers were asked if they would prefer background music while bowling, without stating the type of music to be played. Fewer than eight percent gave negative responses. Thus, it appears that the enjoyment of
bowling could be enhanced if the student bowlers were permitted to select the type of background music to be played.

An analysis of variance was conducted to determine if female students would achieve a significantly higher mean score on the attitude measure than the male students. The F ratio was computed and indicated there were no significant differences between the experimental groups although they received different treatments (disco music and easy listening music).
CHAPTER BIBLIOGRAPHY


SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Music has been determined to have some influence on physical performance in most sports. When played in the background, it has been useful as an aid in the learning and developing of motor skills. Music has been included and has produced positive effects in sports, education, business, and therapy. Beneficial psychological and behavioral effects have been obtained when background music has been included in education, business and therapy.

Rhythmic dance instruction has been used by basketball and football coaches in training male athletes. Motor skills can be improved by the use of musical accompaniment while performing a task.

Man irresistibly groups uniform successions of sound into rhythmic measure. All of his activities may be affected by these rhythmic groupings. Rhythm gives a feeling of balance, freedom, luxury, expanse, and power and gives a person the assurance to cope with the future (1).

Acoustically, music is a sound frequency pattern combined with rhythmic pattern which have profound effects upon us.
The purposes of the study were to

1. determine the effects of two different kinds of background music on the bowling scores of college students enrolled in bowling classes at a state university;

2. determine the effects of music on students' attitudes toward bowling; and

3. make recommendations for coaches, physical educators, and bowling alley proprietors who would be interested in the promotion of bowling.

To carry out the purposes of the study, the following hypotheses were tested:

1. The adjusted post-test mean in bowling averages attained by the college student bowlers exposed to disco background music will be significantly greater than the adjusted post-test mean in bowling averages for
   a. students exposed to easy listening music, and
   b. students who are not exposed to music.

2. The adjusted post-test mean in bowling averages attained by the college student bowlers who are exposed to easy listening background music will be significantly greater than the adjusted post-test mean in bowling averages of college student bowlers who are not exposed to background music.

3. Male students will achieve a significantly greater post-test mean increase in bowling scores than will female students in each group.
4. Students exposed to disco background music will achieve a significantly higher mean score on the attitude scale than will
   a. students exposed to easy listening music, and
   b. students who are not exposed to music.

5. Students exposed to easy listening background music will achieve a significantly higher mean score on the attitude scale than will those not exposed to music.

6. Female students will achieve a significantly higher mean score on the attitude measure than will male students. This will hold for
   a. disco music,
   b. easy listening music, and
   c. no music.

This study utilized six bowling sections with a total of one hundred sixty-six students. The students were given a pre-test consisting of bowling three games for raw score averages after twelve hours of instruction. They then entered competitive bowling for fourteen hours and were given a post-test. The experimental groups had music during the fourteen hours of competitive bowling and during the post-test. In the experimental groups and the control groups, instruction was continued on an individual basis during the fourteen hours of competitive bowling.

A Sony cassette player was set up with five feet amplifiers placed behind the bowlers with the music volume played
at a constant setting. When the equipment was placed, it was tested with a sound level meter to insure the same music volume on each approach. This equipment was set up for a pilot study in the summer of 1978. See Appendix A for complete music setup and sound measurements.

Two hours of disco and two hours of easy listening music were used. The students were hearing the same music once a week. The tapes were repeated.

Easy listening music was chosen for the study because it does not require concentrated listening. It is considered soothing and relaxing. Disco music was chosen because it is very popular to the age group being tested.

The subjects for this study were enrolled in bowling classes offered for credit by the physical education department of a state university in the fall of 1980. The subjects were basically freshmen and sophomores and were the only students on the bowling lanes.

The classes used were morning and afternoon classes which met twice a week. Two classes met on Monday and Wednesday and the other four classes met on Tuesday and Thursday. Students were exposed to disco music (two classes), easy listening music (two classes), and no music (two classes). The experimental treatment started five minutes after the hour and ended five minutes before the hour. A work period of fifty minutes duration existed for each group. The treatment was randomly assigned.
Techniques demonstrated during the twelve hours of instruction for the disco music, easy listening music, and no music groups were (1) ball selection, (2) recommended bowling approaches, (3) types of balls that a bowler can roll, (4) visual and auditory cues, (5) "picking-up" spares and (6) score keeping. Visual cues and auditory cues covering the starting position, approach, and release of the ball were emphasized in class.

Findings

The findings did not support the first hypothesis that the adjusted post-test mean in bowling averages with disco background music will be significantly greater than the adjusted post-test mean in bowling averages with easy listening background music or no background music.

The findings did not support the second hypothesis that the adjusted post-test mean in bowling averages with easy listening background music will be significantly greater than the adjusted post-test mean in bowling averages with no background music.

The findings did support the third hypothesis that male students will achieve a significantly greater post-test mean in bowling scores than will female students with disco background music, easy listening background music, and no background music.

The findings did not support the fourth hypothesis that a significantly higher mean score on the attitude scale will be
achieved with disco background music than with easy listening background music and no background music.

The findings did not support the fifth hypothesis that a significantly higher mean score on the attitude scale will be achieved with easy listening background music than with no background music.

The findings did not support the sixth hypothesis that female students will achieve a significantly higher mean score on the attitude measure than will male students who are exposed to disco background music, easy listening background music, and no background music.

Conclusions

As a result of the findings of this study, the following conclusions are drawn:

1. Bowling scores were not affected by listening to disco music or easy listening music.

2. Male subjects obtained higher mean scores than female subjects regardless of experimental condition.

3. Music did not affect attitude toward bowling.

4. Attitude toward bowling was independent of gender.

Recommendation for the Physical Educator

Music may be played for its unique sensory appeal and aesthetic value even though it has no effect on student attitudes or bowling scores. Student bowlers expressed interest in the background music. They requested permission to continue
the music when the study was completed. Students in classes that were not included in the experiment asked if they could use the sound equipment during their classes.

Recommendations for Further Study

1. Further study should be conducted utilizing running averages rather than three games for average at the end.

2. Further research should be directed toward permitting subjects to select the type of music that will be played during bowling classes. If students could select the background music type to be played while bowling, it could have a more positive effect.

3. Further study should be directed toward placing beginning, intermediate, and advanced bowling students in separate groups. Students at different levels possibly could require different levels of concentration while bowling.

4. A similar study should be conducted over a longer time period. This would enable the researcher to use more games during the pre-testing and post-testing.

5. A similar study should be conducted using headphones. The student bowler could select the type of music preferred. The use of headphones should eliminate all distractions and promote complete individualization.
CHAPTER BIBLIOGRAPHY

APPENDIX A

MUSIC SETUP AND SOUND MEASUREMENTS

Test Equipment: General Radio Model 1565C Sound Level Meter
General Radio Model 1562 Sound Level Calibrator

Sound Equipment: Sony TC-95 Cassette Player
Pioneer Model SA-8500 Amplifier
Peavy 412H Columnn Speakers

Conditions of Test:

All measurements were made according to instruction manual supplied with equipment. The meter was set to "A" weighting and slow response to comply with standard industrial practices. The meter was held about four feet above the floor, perpendicular to the lanes. Measurements were made at the ball return between each pair of lanes. Reflective sound from the walls or reverberation did not seem to affect any of the readings.

Ambient:

Measurements were made as outlined under test conditions, with games in progress at all eight lanes. An average sound level of 80 dB(A) was recorded at each test point. This included such things as people talking, balls rolling, pin sorting machine, and balls hitting the pins. A peak reading
of 90 dB(A) was recorded at all test points and seemed to be caused by the ball hitting the lane when released by some students.

Music:

Measurements were made as outlined under test conditions, with games in progress at all eight lanes. The speakers were placed against the rear wall and angled in to give the best distributive sound. An average sound level of 90 dB(A) with a peak of 95 dB(A) was measured at each test point. The peak reading seemed to be caused by variations in the music.
APPENDIX A —Continued

TAPE DECK AND SPEAKER LOCATIONS

- Speakers
- Amplifier and Cassette Deck
APPENDIX A --Continued

DECIBEL MEASUREMENT CHART

<table>
<thead>
<tr>
<th>Decibels</th>
<th>Ambient Noise</th>
<th>Peak</th>
<th>Easy Music</th>
<th>Disco Music</th>
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<td>Control</td>
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<td>E_1</td>
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APPENDIX B

ATTITUDE SURVEY

This is a questionnaire to measure your attitude toward bowling as a college subject. There are a number of statements about bowling below, each one followed by a set of "boxes" numbered as follows:

| +3 | +2 | +1 | 0 | -1 | -2 | -3 |

You are asked to put a mark in ONE of the boxes to show how strongly you agree or disagree with the statement. The numbers in the boxes are there to guide you. This is what they stand for:

+3 = Very strongly agree
+2 = Strongly agree
+1 = Agree
0 = Neither agree or disagree
-1 = Disagree
-2 = Strongly disagree
-3 = Very strongly disagree

Please consider each statement carefully and in your answer indicate your present feelings about bowling as you know it.

1. Bowling gets very monontous.
APPENDIX B --Continued

2. Bowling should be disposed of.
   
   1  2  3  4  5  6  7
   +3  +2  +1  0  -1  -2  -3
   1  2  3  4  5  6  7

3. Bowling is particularly limited in its value.
   
   1  2  3  4  5  6  7
   +3  +2  +1  0  -1  -2  -3
   1  2  3  4  5  6  7

4. I suppose bowling is all right but I don't care much for it.
   
   1  2  3  4  5  6  7
   +3  +2  +1  0  -1  -2  -3
   1  2  3  4  5  6  7

5. Bowling is the most hateful subject of all.
   
   7  6  5  4  3  2  1
   +3  +2  +1  0  -1  -2  -3
   7  6  5  4  3  2  1

6. I do not want to give up bowling.
   
   7  6  5  4  3  2  1
   +3  +2  +1  0  -1  -2  -3
   7  6  5  4  3  2  1

7. People who like bowling are nearly always good to know.
   
   1  2  3  4  5  6  7
   +3  +2  +1  0  -1  -2  -3
   1  2  3  4  5  6  7

8. Anyone who likes bowling is silly.
   
   7  6  5  4  3  2  1
   +3  +2  +1  0  -1  -2  -3
   7  6  5  4  3  2  1

   
   1  2  3  4  5  6  7
   +3  +2  +1  0  -1  -2  -3
   1  2  3  4  5  6  7

10. (School) College would be better without bowling.
    
    1  2  3  4  5  6  7
    +3  +2  +1  0  -1  -2  -3
    1  2  3  4  5  6  7
APPENDIX B --Continued

11. Bowling is my favorite subject.


13. Bowling is a pleasant break.

14. Bowling seems useless to me.

15. Bowling encourages moral improvement.

16. Bowling is quite good.

17. Bowling is fundamentally unsound.

18. Bowling is one of the best subjects I have ever taken.

19. I think bowling is good.

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Scoring Explanation

Scoring for this test is rather different. The marks, which range from 7 to 1 for each statement, are weighted so that a favorable response toward physical education has the higher mark. Thus, when the statement is a positive one (numbers 6, 7, 9, 11, 12, 13, 15, 16, 18, 19, and 20), scoring is as follows:

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When the statement is a negative one (numbers 1, 2, 3, 4, 5, 8, 10, 14, and 17), the whole scoring procedure is reversed:

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<td></td>
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<td>(1) M</td>
<td>(2) L</td>
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APPENDIX D

THE MEAN AND SD OF THE ATTITUDE TESTS FOR EACH GROUP

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*Negative questions—scoring was reversed.*
### APPENDIX E

**PRE-TEST AND POST-TEST AVERAGES**

**FOR GROUP I (DISCO MUSIC)**

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APPENDIX E —Continued

PRE-TEST AND POST-TEST AVERAGES FOR GROUP II (EASY LISTENING MUSIC)

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