EFFECTS OF MUSIC ON VIVIDNESS OF MOVEMENT IMAGERY

THESIS

Presented to the Graduate Council of the
University of North Texas in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Edgar Kok Kuan Tham, B.Eng.

Denton, Texas

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The purpose of the investigation was to determine the effects of music on self-reported vividness of movement imagery. Eighty-four undergraduate kinesiology majors (42 males; 42 females) were subjects. Based on identical perceptions of pre-categorized music (classical and jazz), selected subjects were randomly assigned to one of three music treatment conditions (sedative, stimulative, and control) and administered the Vividness of Movement Imagery Questionnaire. A $3 \times 2 \times 2$ (Treatment x Gender x Perspective) ANOVA with repeated measures on the last factor was employed. The results revealed that the two music conditions significantly enhanced the vividness of internal and external imagery perspectives when compared to the no music condition, and that music facilitated the vividness of males and females equally.
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CHAPTER I

INTRODUCTION

A review of previous research indicates that imagery is important to sport because it is a fundamental mental skill that has numerous uses for enhancing physical performance. During the past decade, the field of applied sport psychology has witnessed tremendous growth (Williams & Straub, 1993). Specifically, athletes and coaches have come to recognize the influence of psychological factors on athletic performance, and thus have turned to psychological skills training (PST) for that extra competitive edge. The acronym PST is defined as "techniques and strategies designed to teach or enhance mental skills that facilitate performance and a positive approach to sport competition" (Vealey, 1988, p. 319). In particular, one of the more popular PST techniques used by many athletes to positively affect performance is imagery (Murphy, 1990). Imagery is defined as the use of "all the senses to create or recreate an experience in the mind" (Vealey & Walter, 1993, p. 201).

There is a growing body of knowledge that supports the use of imagery as an enhancement tool during learning and performance of motor skills. For example, anecdotal (Mahoney, 1979), correlational (Mahoney & Avener, 1977) and empirical studies (Clark, 1960; Corbin, 1967) have shown that mental practice via imagery enhances subsequent performances. Reviews by Corbin (1972), Richardson (1967a, 1967b), Weinberg (1982) and Feltz & Landers (1983) provide us with several decades
of scientific evidence that support the link between mental practice and enhanced performance. In addition, Vealey (1988) reported that imagery was included in all of the 27 published PST books (e.g., Loehr, 1986; Martens, 1987; Orlick, 1986a, 1986b).

The sport psychology research literature (Goss, Hall, Buckolz, & Fishburne, 1986; Ryan & Simons, 1982) also suggest that the more vivid the imagery, the greater the improvement in physical performance. One approach which could be instrumental in enhancing an individual's ability to develop vivid imagery protocols is the use of music as an adjunct during the imagery session. For example, music has been found to facilitate the production, and possibly the vividness, of creative and therapeutic imagery in non-sport and patient populations (Bonny, 1989; Osborne, 1981; Quittner & Glueckauf, 1983).

Despite the popular use of music with imagery in the field of sport psychology, no study has yet been published about the effects of music on the vividness of movement-related imagery. It seems that most of the applications that are used in sports are based on research conducted in mainstream psychology rather than sport psychology (Morgan, 1989). The use of music as an adjunct to imagery or mental preparation is one application that should be evaluated.

Research has also provided evidence of some individual variables that are associated with imagery, namely, imagery perspective (Mahoney & Avener, 1977; Smith, 1987) and gender differences (Campos & Perez, 1988; Sheehan, 1967). The research literature indicates that there are two perspectives involved in imagery, i.e., external and internal. Although athletes tend to utilize imagery from an internal
perspective more so than from an external perspective (Mahoney & Avener, 1977; Orlick & Partington, 1986; Rotella, Gansneder, Ojala, & Billing, 1980), there is limited research that determines how the vividness of these two imagery perspectives are affected by music.

In addition, the findings of gender differences in imagery research are currently equivocal. A few research studies reported that females have more vivid imagery than males (Sheehan, 1967; White, Ashton, & Brown, 1977), while others have failed to replicate this finding (Beech & Leslie, 1978; Guy & McCarter, 1978; Ashton & White, 1980). Interestingly, Campos and Perez (1988) found that females scored higher on vividness of movement imagery than their male counterparts. Thus, research examining the relationship between gender, movement-related imagery abilities, and music is needed.

This study was conducted using college students majoring in kinesiology. This population was used to ensure that the sample would represent individuals who could relate to imagery in a sporting context. A control (no music) group was incorporated for comparison with different music treatment conditions.

**Purposes of the Study**

Previous research suggests that listening to music may facilitate the production of vivid imagery, and subsequently enhance performance. Therefore, the purposes of the present study were to determine:

1. The effects of music on vividness of movement imagery, from both the external and internal perspectives.
2. The different types of music, if any, which enhance the vividness of movement imagery.

3. The gender differences, if any, related to the effects of music on vividness of movement imagery.

**Hypotheses**

The following hypotheses using a movement-oriented population guided the study:

1. The subjects in both the sedative music and the stimulating music treatment groups will score significantly higher on the vividness of movement imagery than the subjects without music.

2. The subjects in the sedative music group will score significantly higher on the vividness of movement imagery than the subjects in the stimulating music group.

3. The subjects receiving both sedative and stimulative music will score significantly higher on vividness of movement imagery under the internal perspective than the external perspective.

4. Females will score significantly higher on the vividness of movement imagery than males under both musical conditions.

**Limitations of the Study**

Only one subjectively scored test (i.e., the VMIQ) was used to measure vividness of movement imagery. This was selected over other available self-report questionnaires based on its comparatively better psychometric properties and its ability to cover the widest variety of common body movements. The validity of the VMIQ
has yet to be fully established. As such, the subsequent findings of this study have to be cautiously and conservatively interpreted.

**Delimitations**

The study was delimited to a sample of 84 male and female kinesiology major students at a large Southwestern university.

**Definition of Terms**

The following definitions were pertinent to the present study:

1. **Imagery**: Using all the senses to create or recreate an experience in the mind (Vealey & Walter, 1993).

2. **Mental practice**: A synonymous term to imagery that may refer to "a mental technique that 'programs' the human mind to respond as programmed" (Vealey & Walter, 1993, p. 200-201).

3. **Vividness**: The clarity, "sharpness" or sensory richness (Richardson, 1988), and "reality" (Murphy & Jowdy, 1992) of an image.

4. **Controllability**: The ease and accuracy with which a mental image can be transformed or manipulated (Kosslyn, 1990).

5. **Sedative music**: Music "of a sustained, melodic nature, with strong rhythmic and percussive elements largely lacking" (Gaston, 1951, p. 42).

6. **Stimulating music**: Music that "enhances bodily energy, induced bodily action,... and is based on such elements as strong rhythms, volume, and detached notes" (Gaston, 1951, p. 42).
7. **External imagery perspective**: A perspective where the person views himself/herself performing a physical skill from the position of an external observer (Mahoney & Avener, 1977). External imagery is also synonymous with the term "visual imagery."

8. **Internal imagery perspective**: A perspective where the person views himself/herself performing a physical skill as if "being inside his/her body and experiencing those sensations which might be expected in the actual situation" (Mahoney & Avener, 1977, p. 137). Internal imagery is also synonymous with the term "kinesthetic imagery."
CHAPTER II

REVIEW OF LITERATURE

Imagery in Sport

Vealey & Walter (1993) have listed numerous uses of imagery for enhancing sport performance: (a) improving physical skills (e.g., learning, practicing and problem solving of sport skills), (b) refining perceptual skills (e.g., learning, practicing and problem solving of performance strategies), and (c) development of other psychological skills (e.g., arousal control, stress management, goal setting, self-confidence, attentional focusing, interpersonal skills, and recovery from injury). Murphy and Jowdy (1992) also noted that imagery interventions are very popular with applied sport psychologists, adding that "it is clear that imagery can be used in many ways that go beyond simple practice of sports skills" (p. 244). Thus, imagery may be the most fundamental and important skill of all in PST because it is the foundation on which almost all other mental skills are built upon.

Imagery Ability & Its Assessment

While extensive research has been conducted on the utilization of imagery and mental practice in motor and sport performance, it is important for sport psychologists to understand the various conditions that may facilitate the imagery process. In this way, by incorporating these conditions, better and more effective PST programs that utilize imagery may be developed.
Smith (1987) identified six conditions that are likely to mediate the effectiveness of imagery use: (a) high imagery ability, (b) repeated imagery practice, (c) positive attitude and expectation toward imagery, (d) previous experience with the physical skill/task, (e) relaxation prior to imagery, and (f) imagery perspectives (internal versus external). While Smith suggested that each factor is an important ingredient for developing good PST programs, Murphy (1990) and Murphy and Jowdy (1992) contended that imagery ability is probably the most critical factor influencing performance effects of imagery use.

Imagery ability has two primary characteristics or dimensions: vividness and controllability (Denis, 1989; Kosslyn, 1985). The vividness of an image relates to its clarity, "sharpness" or sensory richness (Richardson, 1988), and its "reality" (Murphy & Jowdy, 1992). Controllability refers to the ease and accuracy with which a mental image can be transformed or manipulated (Kosslyn, 1990). Both vividness and controllability affect a subject's ability to improve performance as a result of using imagery (Corbin, 1972; Hall, 1985; Murphy & Jowdy, 1992).

In studies examining the relationship between imagery ability and motor skill performance, the major approach used for measuring imagery ability has been self-report questionnaires (Hall, 1985; Murphy, 1990; Murphy & Jowdy, 1992). The two characteristics of imagery ability typically assessed by these tests in the sport context are vividness and controllability. A typical vividness questionnaire will ask a subject to imagine certain situations or experiences, and then to rate the clarity of the images on a 5- or 7-point Likert scale. Similarly, a controllability questionnaire will
be concerned with the subject’s ability to manipulate or control mental images, using the Likert scale rating procedure.

Several instruments have been used in sport-related studies to measure vividness and controllability. The **Shortened form of Betts’ Questionnaire upon Mental Imagery (SQMI)** is an abbreviated version of the original 150-item **Questionnaire upon Mental Imagery (QMI)** developed by Betts (1909), and assesses imagery in seven sensory modalities: (a) visual, (b) auditory, (c) tactile (cutaneous), (d) kinesthetic, (e) gustatory, (f) olfactory, and (g) organic (whole body). The instrument uses a 7-point scale that ranges from (7) “no image present at all, only ‘knowing’ that you are thinking of the object” to (1) “perfectly clear and as vivid as the actual experience.” Lower scores refer to greater vividness. Sheehan (1967) revised the original QMI and constructed a shorter and practical version (i.e., the SQMI) consisting of 35-items which was cross-validated with an independent sample of 60 subjects. The SQMI has a high correlation with the original QMI, indicating convergent validity ($r = .92$).

Marks (1973) designed a **Vividness of Visual Imagery Questionnaire (VVIQ)**, which was a 16-item extension of the visual subscale of Betts’ (1909) QMI. The subject rates four items related to four familiar images (viz., that of a relative or friend, a rising sun, a popular shop, and a country scene) using a 5-point Likert scale with the same endpoints as the QMI. It was reported that the instrument had a test-retest reliability coefficient of .74 ($n = 68$) and a split-half reliability coefficient of .85 ($n = 150$). The VVIQ has claimed validation support by successfully predicting
various types of visual memory performance (McKelvie & Demers, 1977), although
Chara and Hamm (1989) have questioned the construct validity of the instrument.
McKelvie (1990) contends that "there is no single criterion ready for the VVIQ to
predict" (p. 552). This is a problem that many other imagery tests also encounter
(Moran, 1993).

The Movement Imagery Questionnaire (MIQ) was developed by Hall and
Pongrac (1983). The MIQ measures the visual and kinesthetic modalities of imagery
that are highly relevant to human movement (Hall, 1985). Subjects are required to
physically perform a variety of arm, leg, and body movements, and subsequently rate
their imaginal ability to see and feel those movements on a 7-point rating scale. This
18-item questionnaire was reported to have a Cronbach's alpha (internal coefficient) of
.87 for the visual scale, and an alpha of .91 for the kinesthetic scale. Test-retest
reliability was $r = .83 \ (n = 32)$. However, according to Ostrow (1990), a major
problem with the MIQ is that its validity was not discussed by its developers, and
further, it "has not yet been validated adequately" (Moran, 1993, p.162).

Another instrument that is similar to the MIQ is the Vividness of Movement
Imagery Questionnaire (VMIQ) which assesses ability in visual and kinesthetic
imagery (Isaac, Marks, & Russell, 1986). The VMIQ is also well-suited for use in
motor performance studies. This test consists of 24 items and uses a 5-point rating
scale. Subjects rate the vividness of imagery for 24 test items using an internal and
external perspective. The items refer to movement situations from basic body
movements to movements demanding precision and control in upright, unbalanced and
aerial situations. The VMIQ has a test-retest reliability (Pearson product) of $r = .76$ ($n = 220$). Using the same method of analysis as the VMIQ, the reliability of the VVIQ was $.75$. Convergent validity between the VMIQ and the VVIQ was $r = .81$ ($n = 220$). The criterion-validity of the VMIQ has been further supported by studies that successfully differentiated between high and low imagers with respect to motor performance improvements (Doheny, 1993; Isaac, 1992).

Unlike all the above-mentioned instruments that assess visual imagery, Gordon’s Test of Visual Imagery Control (TVIC) is concerned with a subject’s ability to manipulate and/or control images (Gordon, 1949; Richardson, 1969). The TVIC is composed of 12 items that instruct the subject to visualize and then rate the transformation of an automobile (e.g., stopping, lying upside down, climbing up a hill, falling off a bridge). Moran (1993) has identified two weaknesses in the instrument. First, the "purity" of the questionnaire is questioned. The TVIC was found to correlate significantly with the QMI ($r = .47$; McKelvie & Gingras, 1974) and the VVIQ ($r = .45$; Kihlstrom, Glisky, Peterson, Harvey, & Rose, 1991), both of which assess vividness of imagery instead of controllability. The reliability of this instrument has yet to be strongly established (Smith, 1987). Secondly, the relative brevity of the TVIC (i.e., 12 items only) decreases "its power to generate variance (which is the purpose of any psychological test)" (Smith, 1987, p. 161).

**Imagery Ability & Performance**

The following section is a discussion of relevant correlational and experimental studies that demonstrate a link between imagery ability and performance.
Correlational Studies. Several correlational studies have provided evidence that imagery ability plays an important role in sport performance. Many of the following studies used the questionnaire or a modified version developed by Mahoney and Avener (1977) to survey athletes about their imagery use. Mahoney and Avener employed this instrument with male gymnasts who were finalists at an Olympic trial in 1976. The questionnaire covered topics such as personality, self-concept, psychological strategies, stress, and cognitive activities. Correlations between grouping (qualifiers vs. nonqualifiers) and "imagery clarity" and "difficulty in controlling imagery" were $r = .17$ and $r = -.34$, respectively. Despite the nonsignificant results of the Mahoney and Avener study, following later studies found some correlation between imagery ability and better performance.

Meyers, Cooke, Cullen and Liles (1979) replicated the Mahoney-Avener study using nationally ranked and collegiate racquetball players. The players were assessed by coach’s rankings, by divisional rankings, and by performance at state championships. Meyers et al. found that better and more successful racquetball players had greater clarity ($r = -.70$ on coaches’ first ranking, $r = -.62$ on divisional ranking), and had less difficulty in controlling imagery ($r = -.51$ on divisional ranking). Highlen and Bennett (1983) compared open- with closed-skilled elite athletes, i.e., wrestlers and divers respectively, on psychological factors associated with training and competition. They found that those divers who qualified for the Pan-American Games reported more vivid and controlled imagery than did
nonqualifiers ($r = .42$). However, no significant difference between qualifiers and nonqualifiers was found for wrestlers.

**Experimental Studies.** Several experimental studies have found that imagery ability may be a critical variable influencing the effects of mental practice on performance. In a classic study, Start and Richardson (1964) studied the vividness and controllability of gymnasts. Vividness and controllability were measured by Betts' (1909) QMI and Gordon's (1949) TVIC, respectively. They found that those with vivid and controlled imagery had the greatest physical improvements as a result of mental practice than (in descending order) less vivid controlled imagers, followed by less vivid uncontrolled imagers, and vivid uncontrolled imagers.

Ryan and Simons (1982) examined the effects of visual and kinesthetic imagery on the performance of a novel balancing task. Subjects were categorized according to the frequency with which they used imagery in everyday life. Another questionnaire was administered to the subjects regarding the amount and quality of their visual and kinesthetic imagery experienced during mental practice. Ryan and Simons reported that the groups with strong visual imagery and kinesthetic imagery performed better than those without strong imagery of either type. Further, Goss, Hall, Buckolz and Fishburne (1986) classified their subjects from scores on the MIQ into the following three groups: (a) high-visual, high-kinesthetic; (b) high-visual, low-kinesthetic; and (c) low-visual, low-kinesthetic. The results of the study indicated that the high-visual, high-kinesthetic group performed best on the acquisition of a selection of movement patterns, while the low-visual, low-kinesthetic group
performed worst on the same movement tasks, although no significant differences in retention were found between the three groups.

More recently, Isaac (1992) used mental practice with trampolining students who had high and low imagery abilities. Imagery ability, in terms of vividness, was assessed by the total scores on the VMIQ and the VVIQ. Significant differences between high and low imagers mediated performance improvements. The results were that high imagers improved significantly more than low imagers. Doheny (1993) studied the effects of mental practice on the performance of a psychomotor skill (i.e., intramuscular injection) by nursing students. Based on scores obtained on the VMIQ, subjects were randomly assigned to one of four conditions: (a) control, (b) mental practice, (c) relaxation, and (d) combined mental practice and relaxation. Her findings suggested that although there was no significant effects of group assignment on performance, the level of imagery vividness had a significant effect on performance.

In summary, research studies suggest that imagery ability may be correlated with athletic success, and may be a critical factor in the mental practice process. Smith (1987) states that correlational studies make it difficult to conclude whether vivid images make athletes more effective, or whether elite athletes are just better able to use imagery. He suggests that it is a combination of both in that "vivid images may aid in skill execution for the elite athlete, who in turn develops better imagery skills" (p. 238). Also, individual differences in imagery may interact with cognitive manipulations, because if subjects with low imagery ability are asked to use imagery
under an experimental condition, it is likely that no effect or only a small effect for
the condition will be shown (Hall, 1985).

**Imagery Perspective**

Another variable associated with imagery is that of perspective. The two types
of imagery perspectives are external and internal, where "an external perspective is
when the athletes take a third-person perspective and view themselves as though they
were watching a film. An internal perspective is when the athletes see themselves
performing as if they were physically doing the skill at the same time" (Hall, Rodgers,
& Barr, 1990, p. 2).

Several studies have found that internal imagery is favored more than external
imagery. For example, Mahoney and Avener (1977) surveyed elite gymnasts and
found that those who qualified for the Olympic team reported the use of more internal
images than external images when compared with nonqualifiers. In a similar study on
young, elite skiers, Rotella, Gansneder, Ojala, & Billing (1980) found that better-
skilled skiers visualized the skiing course from an internal perspective, while less
successful skiers could see their entire body skiing (an external perspective). In
another survey study of 700 athletes, Mahoney, Gabriel, and Perkins (1987) reported
that elite athletes relied "more on internally focused and kinesthetic imagery than on
third-person visual forms of mental preparation" (p. 197) than their nonelite peers.

In contrast, several studies investigating external and internal perspectives
concluded that success was not dependent on the type of imagery perspective used.
For example, Meyers et al. (1979) surveyed nine racquetball players and found no
differences between less and more skilled players in the use of either imagery perspective. Further, Epstein (1980), using an experimental design approach, failed to find dart-throwing performance differences between subjects who used external imagery and those who used internal imagery. Similarly, Mumford and Hall (1985) compared the use of three different types of imagery (internal kinesthetic, internal visual, and external visual) and found no differences between the groups on figure skating performance.

Caution, however, should be taken in interpreting these equivocal results. While the latter experimental studies (Epstein, 1980; Mumford & Hall, 1985) attempted to correlate external/internal perspective with actual physical performance and used smaller sample sizes, the previous survey-type studies (i.e., Mahoney & Avener, 1977; Mahoney et al., 1987; Rotella et al., 1980) related perspective use with precategorized elite/nonelite or successful/unsuccessful athletes and used much larger sample sizes.

Thus, despite the equivocal findings in the research on imagery perspective, it is clear that both external and internal perspectives are being used during imagery. It should be noted that the purpose of this study was not to compare the relative use and/or effectiveness of external or internal imagery perspectives, but to examine the imagery construct that is composed of both of these perspectives.

Imagery and Gender Differences

Several researchers (Sheehan, 1967; White, Ashton, & Brown, 1977) have reported that females, as a group, exhibited greater vividness than males. White et al.
(1977) provided two possible explanations for such findings. First, they speculated that females may employ a less stringent criteria when evaluating their images than males, and secondly, it is possible that females are better able to generate and process images than males. Conversely, other studies (Beech & Leslie, 1978; Guy & McCarter, 1978) have found no significant differences between genders using self-reported imagery.

Although females reported more vivid imagery than males when the original (blocked) version of the QMI was administered (Hiscock, 1978; White et al., 1977), no differences were reported when a random version of the QMI was employed (Ashton & White, 1980; Sheehan, Ashton, & White, 1983). Some researchers have suggested that the previously reported sex differences may be due in part to an artifact of the test being used (Ashton & White, 1980). Nevertheless, females still reported more vivid imagery than males on visual questions when the items were rearranged. It appears that such contradictory findings clearly signal the need to study the relationship between imagery ability and gender differences.

Further, many of the previous studies dealing with gender and imagery ability have used questionnaires that were developed earlier, such as the QMI. Recent investigations have used newly-developed questionnaires like the VMIQ, an imagery assessment of movement-related activities. It is notable that Campos and Perez (1988), using this instrument, also found females reporting more vivid imagery than males. More evidence is necessary before a definite conclusion may be advanced
about the gender-imagery relationship in sport. Therefore, the need to further examine
gender and movement-related imagery abilities is warranted.

Methodological Concerns

Methodological concerns about the use of self-report measures to classify
individuals in terms of imagery ability need to be addressed. Concerns arise because
subjects have to make judgements about their mental experiences that are not
measured directly when compared with objective and electrophysiological tests.

Objective instruments are typically used to evaluate spatial abilities (Heil,
1984; Straub & Williams, 1984). Although they are well standardized and generally
have good psychometric properties, it is unclear as to what imagery abilities are being
assessed (Morris & Hampson, 1983). Moran (1993) has suggested that spatial tests
measure imagery control rather than vividness of imagery. Therefore, due to these
theoretical problems spatial tests were excluded from the present study.

Electrophysiological instruments measure the physiological responses (e.g.,
EMG, EEG) during or immediately after the imaginal activity (Anderson, 1981;
Murphy & Jowdy, 1992; Paivio, 1973; Qualls, 1982; Zikmund, 1972). Data from such
instruments do not describe how vivid an image is, but rather the data only suggest
that physiological relationships exist during imagery (Zikmund, 1972). Thus, while
objective and electrophysiological data can provide valuable information regarding the
different aspects associated with imaginal activity, the more appropriate and widely
used approach to assess imagery vividness is probably still through self-report
measures.
There are inherent weaknesses that have to be considered when using the self-report technique (Moran, 1993). Specifically, these problems are: (a) social desirability, (b) acquiescence, and (c) inconsistent subject ratings. Several researchers (Anderson, 1981; Morris & Hampson, 1983; Mueller, 1986) have offered the following suggestions to maximize the accuracy of subjective reports:

1. The problem of social desirability may be reduced by "carefully instructing subjects about the importance of unbiased, honest report on their part" (Anderson, 1981, p. 157). "The subjects should clearly understand that they are being asked to report their experiences, and not to speculate on how they undertook the given task" (Morris & Hampson, 1983, p. 35).

2. To alleviate acquiescence, many self-report measures (e.g., VVIQ, VMIQ) currently use "counter-intuitive" reverse scoring procedures (Mueller, 1986), where lower scores are assigned to greater vividness.

3. To reduce inconsistent ratings, Anderson (1981) proposes that subjects be taught how to use the scales. Also, "the subjects should clearly understand that they may not have any relevant experiences to report, and that this is not a failing on their part" (Morris & Hampson, 1983, p. 35).

These recommendations were incorporated in the procedures employed in the present study and are discussed in the method section. Morris and Hampson (1983) have suggested that

What is important is that one should attempt to obtain the most reliable information possible, and that the information is sufficiently trustworthy
for it to be used to develop and then test hypotheses without too great a fear of inherent weaknesses invalidating the whole activity. (p. 36)

Meanwhile, most self-rating scales, when used appropriately, have been able to differentiate the individual differences in imagery abilities that influence cognitive manipulations in previous studies (e.g., Doheny, 1993; Goss et al., 1986; Isaac, 1992). More importantly the self-report technique's usefulness and value far outweigh its failings for imaginal assessment.

From the previous review of the imagery-ability literature, it would seem that vividness and controllability are considered separate dimensions. However, Moran (1993) argues that "the theoretical basis of a conceptual distinction between them remains obscure," and questions "how an imaginary experience can be controllable if it is not vivid" (p. 159). Moran suggests that future imagery research be conceptually more rigorous. Interestingly, the TVIC was found to correlate significantly with the QMI, which supposedly assesses vividness (McKelvie & Gingras, 1974). Based on these conceptual and theoretical uncertainties, the construct of controllability was excluded from the present study.

Facilitating Vividness of Imagery

The research literature indicates that high imagery ability when combined with imagery interventions can significantly improve sporting performance. In particular, the more vivid the imagery, the greater the improvement in performance. Smith (1987) explains that

Because realistic, vivid images can use previous experience for comparison, they may lead to more accurate future execution of the
tasks involved in those images. Imagined tasks may facilitate future bridging of the synapses for the time when those tasks are actually performed (Eccles, 1958; Hebb, 1968; McKay, 1981). The more realistic the image, the more that actual task movement synapses will experience the facilitory effect. (p. 238)

There are, however, individuals categorized as less vivid or low imagers who might have difficulty simulating actual practice (Kohl, Roenker, & Turner, 1985) who are in need of methods to improve or increase their vividness.

Richardson (1969) contends that the vividness of imagery in low imagers may be increased. A common and effective approach to increasing vividness, and imagery ability in general, is through systematic imagery training (Rodgers, Hall, & Buckolz, 1991; Smith, 1987; Vealey & Walter, 1993). For example, Vealey and Walter (1993) provide a basic training program that includes imagery exercises to strengthen the athlete's "imagery muscles," while Smith (1987) suggests the use of "mind games" for imagery development. In addition to imagery training, there are other alternative approaches that may also help facilitate vividness of imagery.

One alternative approach is the use of relaxation prior to and in combination with imagery. A popular cognitive strategy in sport psychology that utilizes this relaxation-imagery combination is the visuomotor behavioral rehearsal (VMBR) technique (Suinn, 1976, 1983, 1993). However, in a review of the imagery and mental practice literature, Murphy and Jowdy (1992) reported that several studies found no significant benefits from combining relaxation with imagery (e.g., Gray, Haring & Banks, 1984; Weinberg, Seabourne, & Jackson, 1981, 1987). Several other studies
Music in Sport

Uses of Music in Sport and Physical Performance

The use of music in sports and exercise settings is not new. In general, the facilitative effects of music are currently used during and prior to sports and physical performance. Music represents a second alternative approach for adjuntly facilitating imagery vividness.

Music During Physical Performance. Music is one of the most popular motivational techniques used in exercise and fitness programs (Willis & Campbell, 1992). For example, music is an integral component of aerobics and fitness walking programs. Further, music has been shown to enhance the learning of physical tasks (Beisman, 1967; Dillon, 1952) and facilitate muscular endurance (Anshel & Marisi, 1978; Bushey, 1966; Widdop, 1968). Exercise participants also perceive an exercise bout to be easier despite the slight increase in energy expenditure with music (Franklin, 1978).

Subjects in the Gfeller (1988) study reported that music improved their mental attitudes toward exercise. Ninety-seven percent of the subjects said that music made a difference in their aerobic performance, and 79 percent indicated that music helped
them in pacing, strength, and endurance. Thus, Gfeller concluded that her study supported past research in that music facilitates strength and endurance during exercise, as well as mental attitude, by providing motivation while serving to distract from the discomforts of physical exertion.

Recently, Beckett (1990) reported that subjects had higher recovery heart rates and walked significantly further during music conditions than during no music conditions. Similarly, Boutcher and Trenske (1990) found perceived exertion to be lower when music was played as compared to a no music condition at both low and moderate cycling workloads. Significantly higher levels of affect were observed during the music condition when compared to the deprived (no music) condition. Thus, from past research, there is evidence that listening to music during physical performance can offer the individual exerciser or athlete many positive benefits. The research, however, has neither shown nor investigated whether imagery accompanies the listening of music during physical performance.

Music Prior to Physical Performance. There are several ways that music is currently being used as an adjunct to imagery or mental preparation prior to sports performance. These are emerging approaches for facilitating imagery or mental preparation (Vealey & Walter, 1993). For example, musical packages may be purchased commercially, or they can be "self-made" and individualized.

In applied sport psychology, there is a relatively new approach that uses music videos in conjunction with visualization techniques (Halliwell, 1990; Loehr, 1991). Halliwell (1990) had athletes identify the times when they performed their very best.
Next, the athletes would specify their favorite songs. And the final product is a combination of the video footage of the athletes' best performances with their preferred songs. These highly individualized music videos have been reported to be effective for building and maintaining confidence and recreating the ideal performance state (Loehr, 1986).

Even more popular are the commercially produced imagery tapes designed to help athletes enhance their psychological skills and subsequently their performances (Vealey & Walter, 1993). Many of these tapes also include selections of music to accompany the imagery scripts. For example, there is a series of recently developed mental training audiotapes available for as many as 15 different sports (Bowman, 1993). In these tapes, slow, calm music is introduced in the background when the athlete is guided through relaxation exercises. More up-beat music is played when the athlete is guided through the mental rehearsal of competitive performances. The effectiveness of these techniques are unknown, therefore, there is a need to assess their influence on imagery (Sachs, 1991; Vealey, 1988).

Gluch (1993) has noticed that it is common to see athletes listening to Walkman stereos prior to performance. He interviewed six NCAA Division I athletes from different sports to investigate the various uses of music in preparing for sport performance. Using an inductive content analysis method, he identified five major purposes for using music, namely: (a) self-regulation, (b) feelings of well-being, (c) mental preparation, (d) memories, and (e) confidence. Several comments regarding the use of music for mental preparation are highlighted here. Interestingly, four of the
six athletes revealed that they "use [music] with pre-competition imagery." Other comments like, music "gets me ready to do what I see in my imagery," "makes imagery more effective," and "music and visualization help me to make game plan" were also noted. Gluch concluded that the interviewed athletes used music to "manipulate arousal levels and assist in altering or controlling thoughts and emotions" (p. 33), but he offered no explanation for a systematic use of music.

**Effects of Music**

Music affects humans both physiologically and psychologically. In this section, a review of the literature on the psychophysiological responses to music will be discussed, with particular attention on the facilitation of imagery with music.

**Psychophysiological Responses.** Many studies support the notion that music influences physiological processes like heart rate, blood pressure, galvanic skin response and respiration. Several early studies attempted to relate physiological measures with psychological responses but found little correlation between the variables (Misbach, 1934; Nelson & Finch, 1962; Newman, Hunt, & Rhodes, 1966; Taylor, 1973; Wagner, 1973). In a review of 21 studies, Hodges (1980) reported that (a) heart rate increased with stimulative music and decreased with sedative music in seven studies, (b) subjects in five studies had increased heart rate irrespective of music, (i.e., stimulative or sedative), (c) seven studies concluded that music had no effect on heart rate, and (d) two other studies indicated unpredictable changes in heart rate by both stimulative and sedative music.
Research by Jacobson (1938) and Wolpe (1969) have demonstrated that the general indicators of reduced anxiety and stress levels is the reduction in the physiological measures of pulse rate, blood pressure, respiration rate, and muscular tension. But studies using music to reduce anxiety and/or increase relaxation have yielded inconsistent correlations between subjective psychological and objective physiological measures (Davis & Thaut, 1989). Overall, the research literature provides disparate findings for the effects of musical stimuli on physiological and psychological responses. Perhaps these discrepancies occur because both physiological and psychological response patterns are highly individualized and unique (Davis & Thaut, 1989; Lacey, 1956). And while physiological covariables with imagery are interesting, it has been argued that they apparently are not of central importance to the imagery process itself (Morris & Hampson, 1983).

The Music-imagery Link. Despite the lack of success by researchers in finding consistent physiological patterns in response to music, there are a limited number of recent studies supporting the linkage of music to imagery facilitation. The major objective of many of these studies was to determine the effects of music on the production of imagery rather than effects on the vividness construct. For example, Osborne (1981) had 43 undergraduates listen to synthesized music under relaxed conditions and report their responses to the music in written form. The data were subjected to content analysis and assigned to one of four categories: thoughts, emotions, sensations, and images. The number of image responses was significantly higher than the other response categories. Osborne concluded that imagery may be a
predominant mode of response to music. However, generalizations may be limited due to the absence of a control group.

Quittner and Glueckauf (1983) compared the effects of music and relaxation on the production of visual imagery. Ninety undergraduates were placed into four categories based on their imagery ability scores obtained on the Creative Imagination Scale. All subjects received three counterbalanced experimental conditions: control, relaxation, and music. Electroencephalograms, event recorder measures, and rating scales were used to assess the effects of the treatments on the production of visual imagery. Subjects reported the use of imagery more when listening to music than when in either the relaxation or control condition. Subjects with high imaginal ability produced more vivid images and spent more time imagining than subjects with low imaginal ability. The investigators also suggested that both high and low imagers could significantly increase imagery production if presented with evocative treatments like music. Finally, no clear-cut relationship between visual imagery and alpha rhythms was found, confirming the inconsistent results of prior psychophysiological research.

There is a technique in the field of music therapy called guided imagery and music (GIM) that utilizes music to elicit imagery for therapy (Bonny & Savary, 1973). Bonny (1989) has suggested that GIM may be applied in the treatment of neuroses and depression, in relationship therapy, in the integration of music and art therapies, and with various populations (e.g., psychiatric inpatients, hospice patients). Jarvis (1988) also concluded that GIM combined with conventional psychotherapy may accelerate
the psychological healing of clients and even shorten the duration of therapeutic
treatment as currently practiced.

In conclusion, music may enhance the imagery process and that it may be "a
reliable vehicle for image production" (Peach, 1984, p. 28). However, because much
of what is known about music-facilitated imagery involves non-sport and patient
populations, caution should be exercised in generalizing to sport populations.

Summary

A review of the literature on the uses of imagery and music in sport was
conducted. Previous research studies (e.g., Goss et al., 1986; Meyers et al., 1979;
Ryan & Simons, 1982) indicated that imagery ability may be correlated with athletic
success and is a critical factor in the mental practice process. Vividness and
controllability are popularly considered as two distinct characteristics of imagery
ability (Denis, 1989; Kosslyn, 1985), and research supports the notion that the more
vivid the imagery, the greater the improvement in subsequent physical performance
(Doheny, 1993; Goss et al., 1986; Isaac, 1992; Smith, 1987).

One major instrument to measure imagery ability is the self-report
questionnaire (Hall, 1985; Murphy, 1990; Murphy & Jowdy, 1992). The VMIQ was
selected over the other previously-mentioned questionnaires for the present study based
on the following conditions: (a) inclusion of a broad variety of common body
movements, (b) assessment of both external and internal imagery perspectives, (c)
inclusion of a sufficiently large number of test items, (d) acceptable reliability scores
with the largest number of subjects used for test-retest purposes, (e) evidence of convergent and concurrent validity, and (f) demonstrated criterion-related validity.

There is evidence to support the existence of external and internal perspectives in imagery (Hall et al., 1990; Mahoney & Avener, 1977), but there is limited research which indicates how the vividness of both these imagery perspectives are specifically affected by music. Further, there are currently inconsistent findings in the imagery literature regarding gender effects. Although Campos and Perez (1988) found that females scored higher on vividness of movement imagery than males, gender differences in movement imagery and the nature of music-mediated changes on vividness is not yet understood.

There is a limited number of non-sport studies supporting the linkage of music to imagery facilitation (Bonny & Savary, 1973; Osborne, 1981; Quittner & Glueckauf, 1983). Due to the paucity of sport psychology research using this approach, this study seeks to evaluate the adjunctive use of music on vividness of external and internal perspectives of movement imagery in both males and females.
CHAPTER III

METHOD

Subjects

Eighty-four undergraduate kinesiology majors enrolled during spring and summer semesters of 1994 at a large Southwestern university were randomly assigned to one of three treatment conditions: (a) a sedative music group (n = 28), (b) a stimulating music group (n = 28), or (c) a control (no music) group (n = 28), with each group composed of an equal number of males and females. Criteria used for selection of subjects were (a) a declared major in kinesiology, and (b) an identical subject perception of pre-categorized music, and (c) an age-range of 20 to 27.

Kinesiology majors were selected based on the desire to have individuals who could relate to imagery in a movement or sporting context. These subjects who had selected to major in a movement-oriented discipline were assumed to be able use their previous movement experiences when responding to the VMIQ. Further, all subjects may not respond identically to a musical selection. Therefore, to ensure that the music was perceived as "sedative" or "stimulative," the listener classified the selected music as sedative or stimulative after listening to it, rather than relying on the assumption that all subjects will react uniformly to a given type of music. For instance, if a precategorized stimulative music was perceived as "sedative" by any subject, that subject was not considered for the study. Thus, to eliminate dissimilar perceptions of
the musical stimuli, only subjects who had identical perceptions of precategorized music were considered as potential subjects. A specified age-range was devised for this sample to help ensure group homogeneity and to prevent possible age-related variables that might influence music perception and/or imagery vividness.

**Instruments**

Two instruments were used in the study. A Demographics Questionnaire (Appendix B) was developed by the investigator so that subjects could provide information related to age, gender, major field of academic study, and specific musical perceptions of potential. This questionnaire was used to obtain general information about the subjects and for assignment of subjects to treatment conditions.

The VMIQ (Appendix C) was used to measure self-reported vividness of movement-related imagery. The VMIQ assesses six groups of movements with four items each: (a) basic body movements (e.g., running, jumping), (b) basic movements requiring precision (e.g., reaching for something on tiptoe, bending to pick up a coin), (c) movements requiring control with unplanned risks (e.g., running up stairs, slipping over backwards), (d) movements requiring the control of objects (e.g., catching a ball, kicking a ball), (e) movements causing imbalance and recovery (e.g., running downhill, climbing over a high wall), and (f) movements requiring control in aerial situations (e.g., jumping into water, swinging on a rope).

Using a 5-point scale, subjects were asked to rate 24 items twice, imaging from the perspectives of watching somebody else (i.e., external perspective) and then that of self (i.e., internal perspective). An individual's vividness score is the sum total of
scores from both the other and self perspectives. Scores on the VMIQ can range from a minimum of 48 (high vividness) to a maximum of 240 (low vividness), where the lower scores represent greater vividness ability.

The study consisted of two phases. In Phase One, the Demographics Questionnaire (Appendix B) was administered to students in kinesiology classes and served the purpose of obtaining the musical perceptions of potential subjects. The administration of the VMIQ, during Phase Two of the study, measured the effects of the respective experimental conditions on imagery vividness.

Procedure

The study was conducted during the academic spring and summer terms of 1994. Experimental data were collected from subjects situated in academic classroom settings and the psychomotor learning laboratory.

Phase One: Baseline Scores for Assigning Subjects. Doors and windows of the classrooms were closed to reduce distractions. Subjects were given a short introduction to the study and were informed that they were participating in a two-phase study related to vividness of movement imagery.

All subjects provided informed consent prior to participation in the study. Further, subjects were assured that results would remain confidential and would be reported only in aggregate form (Appendix A). To facilitate data collection and to ensure anonymity, subjects were asked to use the last four digits of their social security number and the first three digits of their home telephone number as their subject identification number. The investigator instructed the subjects to complete the
Demographics Questionnaire by providing information about their age, gender, major field of study, perception of music, and involvement in intercollegiate athletics, if any. To control for individual differences in music perception (Taylor, 1973), subjects were asked to classify two short excerpts of sedative and stimulating music. A stereo cassette player was used to present the stimuli. Two different tapes were used, one for each selection. The subjects were asked to classify the music as: (a) "sedative/slow," (b) "stimulating/upbeat," or (c) "neither." If subjects' responses matched the precategorized music, they were included in the study.

**Phase Two: Experimental Treatment.** The Phase Two session was conducted in the psychomotor learning laboratory, approximately two weeks after the administration of Phase One. With the help of an audiotape, instructions for using the VMIQ were given. Subjects were asked to image and rate the vividness of each item in the questionnaire using both external and internal perspectives. External perspective was one where the subjects imaged doing the movement skills with respect to someone else (i.e., "watching somebody else"), while internal perspective was with respect to themselves (i.e., "doing it yourself"). Subjects were instructed to honestly report their experiences. The audiotape also explained that the VMIQ was not designed to assess the positive or negative aspects about the way mental tasks were to be performed, that there were no "right" or "wrong" ratings or that some ratings were better than others. Subjects were shown how to use the instrument's rating scales, and were given the opportunity to ask questions before completion of the VMIQ, which had no time limitation.
Eighty-four subjects were randomly assigned, stratified by gender and perception of music classification in Phase One, to one of the three experimental conditions: (a) sedative music (n = 28), (b) stimulating music (n = 28), or (c) no music or control (n = 28). Subjects in the two musical conditions were instructed that during the first two minutes of listening to the music they should allow themselves to follow the "flow" of the music and become one with it (Bonny, 1975). The cassette player was then turned on with the appropriate music and the subjects would listen to the music for two minutes. After two minutes had elapsed, they were requested to complete the VMIQ with the music still playing. The music was turned off after subjects had completed the VMIQ. Although there was no time restriction for completion of the VMIQ, the average time per administration was approximately 15 minutes. The volume of the two music selections remained at the same audio level throughout the study. The control group engaged in conversation with the experimenter for two minutes prior to completing the VMIQ without music.

Design

A 3 x 2 x 2 (Treatment x Gender x Perspective) ANOVA design was employed. Scores on each of the perspectives included in the VMIQ served as the dependent measures.

For musical treatments, the two most common types of music used as an adjunct to imagery in sport psychology (e.g., Bowman, 1993) and in other music-mediated therapies (e.g., Bonny & Savary, 1973) are "sedative" and "stimulating" music (Taylor, 1973). The sedative/slow music selection used was Erik
Satie's "Gymnopedies 1&2" (classical). It was chosen for its slow tempo and gentle timbres. In contrast, the stimulating/upbeat music selection used was Kenny G's "Against Doctor's Orders" (jazz). It was selected for its fast tempo and lively rhythms.

From the review of literature (e.g., Ashton & White, 1980; Sheehan, 1967; White et al., 1977; Campos & Perez, 1988), gender differences in vividness of imagery have been noted, but the nature of the music-mediated changes is not yet understood. Therefore, the use of "gender" as an independent variable was to determine if gender differences were related to the effects of music on vividness of movement imagery.
CHAPTER IV

RESULTS AND DISCUSSION

Results

This chapter presents the data analysis results and discussion. To determine the effectiveness of the three treatment conditions, VMIQ scores (on external and internal perspectives) were examined. The means and standard deviations of the groups' vividness scores are presented in Table 1.

Table 1

Means and Standard Deviations of Vividness Scores for Different Treatment Conditions

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Stimulative Music</th>
<th>Sedative Music</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>External</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58.86</td>
<td>15.53</td>
<td>51.07</td>
</tr>
<tr>
<td>Female</td>
<td>53.50</td>
<td>16.18</td>
<td>55.79</td>
</tr>
<tr>
<td>Internal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51.93</td>
<td>12.94</td>
<td>46.79</td>
</tr>
<tr>
<td>Female</td>
<td>44.64</td>
<td>14.15</td>
<td>45.00</td>
</tr>
</tbody>
</table>

Note. The lower the score, the greater the perceived vividness.
A 3 x 2 x 2 (Treatment x Gender x Perspective) ANOVA with repeated measures on the last factor was performed on the VMIQ scores using the SPSS MANOVA program (Norusis, 1988). A summary of the results of the ANOVA may be found in Tables 2 and 3 of Appendix D. The probability for statistical significance for all analyses was $p < .05$.

Results indicated a significant main effect for treatment groups, $F(2,78) = 3.34$, $p < .05$. Using the two degrees of freedom available, follow-up contrasts revealed that a combination of both music treatment groups reported greater vividness than the control group, $F(1,78) = 6.14$, $p < .02$. However, no significant differences were found between the stimulative and sedative music groups.

The main effect for imagery perspective was significant, $F(1,78) = 27.66$, $p < .001$. Results indicated that imagery was more vivid when subjects used an internal perspective than an external perspective, irrespective of treatment group and gender.

The main effect for gender was not significant, thus no gender differences in vividness were found. As a result of this finding, average group scores, collapsed across gender, were used and are presented in Figure 1. Finally, all interaction effects were non-significant.

**Discussion of Results**

Four hypotheses were tested in this experimental protocol. Possible explanations for the present findings, relevant to the proposed hypotheses, integrated with past literature, are discussed.
Hypothesis 1: Music vs. No Music. The two music treatment groups (viz., sedative and stimulative) were hypothesized to have significantly higher vividness of movement imagery than the control or no music group. The findings for main effect of treatment groups were used to test this hypothesis. This hypothesis was supported, based on the data analysis that revealed a significant main effect for treatment group. Both music treatment groups reported significantly higher movement imagery vividness than the control group. Thus, music was shown to enhance the vividness of movement imagery. However, due to the paucity of similar research on this topic in
sport psychology, caution against overgeneralizing this statement to include all types of music is advised. Only instrumental/nonvocal, sedative and stimulative music were used in the present study.

This finding converges with earlier research that used non-sport populations (Osborne, 1981; Quittner & Glueckauf, 1983; Summer, 1985). The present investigation provided additional support for the linkage of music to imagery facilitation in a movement-oriented population. While earlier studies used case study and counterbalanced designs, this study utilized a randomized groups experimental-design that further replicates and extends the previous findings.

The facilitative effect of music on movement imagery may be explained by brain hemisphere lateralization research in the field of neuropsychology. Specifically, independent empirical studies have shown that there is increased right hemispheric activation when listening to music (Osborne & Gale, 1976; Marin, 1982), and when engaged in imagery activities (Gabel, 1988; Goldstein, 1983). In contrast, the left hemisphere controls motor, analytic and logical processes like language skills (Kolb & Whishaw, 1990). Both hemispheres are suggested to have the capacity to perform a given task, but that only one does so at a time (Allen, 1983). Moscovitch (1979), borrowing from general attention theory (Kahneman, 1973; Posner, 1975), theorized that attention to any stimulus has two functions. One is to arouse or activate the hemisphere, and the other is to direct the hemisphere’s processing. Activating or priming a hemisphere
leads to the processing of incoming stimulus material in a 'mode that is consistent with the cognitive capacities of the primed hemisphere' (Moscovitch, 1979, p. 425); that is, if the left hemisphere is primed, incoming stimulus material will be processed verbally. (Allen, 1983, p. 89).

Thus, as music activates or primes the right hemisphere, concurrent imagery experiences can be processed. In other words, music may be an important input stimulus to activate the right hemisphere's capacity to optimally engage in visualization, when compared to hemispheric activity without musical activation.

Another alternative explanation is suggested, using an information-processing approach. There are two influential theories that are currently used to explain mental effects in sport psychology (Murphy & Jowdy, 1992), although none have been used to explain vividness of imagery phenomena with background music in particular. First, the bioinformational theory (Lang, 1977, 1979) suggests that images can be more vivid when the imagery experience includes as many visual, auditory, kinesthetic, tactile, and emotional cues as possible. Music may serve as an auditory cue that is incorporated with other sensory cues, making the imagery experience more realistic and thus enhance vividness. Secondly, Ahsen's triple-code (image-somatic response-meaning) ISM model of imagery theory (Ahsen, 1984) specifies that imagery has three essential parts, (a) the image itself, (b) the somatic or psychophysiological responses due to the act of imaging, and (c) the meaning of the image. According to Ahsen, every image has different meanings to different people. Thus, listening to music while imaging may change the meaning of the cognitive experience, and as a result, change
the vividness of the imagery. Finally, integrating the results from the present study with the past literature, it was concluded that music can enhance the vividness of movement imagery.

**Hypothesis 2: Sedative Music vs. Stimulative Music.** The sedative music treatment group was hypothesized to score significantly higher on vividness of movement imagery than the stimulative music treatment group. The follow-up contrast analysis of vividness scores of the sedative and stimulative music treatment groups was used to test this hypothesis. This hypothesis was not supported. The results revealed no statistically significant differences in vividness scores between sedative and stimulative music groups, although subjects consistently reported higher vividness under the influence of sedative music than stimulative music. It was concluded that both sedative and stimulating music can equally enhance the vividness of movement imagery.

One possible explanation could be that despite the considerable differences in rhythm and energy between sedative and stimulative music, both types of music possess patterns of tension-resolution and tension-inhibition-resolution that could stimulate images and other cognitive states (Meyer, 1956; Summer, 1985). Other than the activation and informational-processing theories discussed previously, it may also be these inherent patterns in music that help contribute to imagery facilitation.

Similar to the previously discussed notion of combining relaxation with imagery (Murphy & Jowdy, 1992), music appears to enhance imagery vividness but the type or category of music may not be a critical factor in producing imagery.
effects. As such, in the field of sport psychology, music could function as a useful tool for enhancing the vividness of images during mental rehearsal or visualization. Finally, integrating the results from the present study with the past literature, it was concluded that some forms of sedative and stimulative music can enhance the self-reported vividness of movement imagery.

**Hypothesis 3: Effects of Music on Internal vs. External Perspective.** Both music treatment groups were hypothesized to score significantly higher on vividness of movement imagery under the internal perspective than the external perspective. The findings for Treatment x Perspective interaction was used to test this hypothesis. The data analysis revealed no significant interactions, thereby failing to support this hypothesis. Therefore, subjects in both sedative and stimulative music groups were able to enhance imagery vividness equally well from internal and external perspectives.

A possible explanation for this finding could be that music has the ability to effect similar changes in the vividness responses of subjects regardless of imagery perspective. Although the exact mechanism by which it influences these responses is unclear, music does seem to be able to enhance overall movement imagery vividness, as both perspectives make up all imagery experiences. This result has important implications for the use of music as an adjunct to imagery in applied sport psychology, since both perspectives are employed by different athletes and often for different purposes. For example, Vealey and Walter (1993) have suggested that the internal perspective may be useful for bodily awareness during performance, while an
external perspective may be important for recalling a successful, past performance to help improve confidence.

Although no hypothesis was proposed for the main effects of perspective, the results of this study revealed that internal imagery was more vivid than external imagery across all three groups and across gender (see Figure 1). Focusing only on the control group in the following discussion, subjects were found to report more vivid imagery under internal perspectives than external ones. These data converge with those of Campos and Perez (1988) in that movement imagery in the internal perspective was more vivid than the external perspective. One explanation may be that internal imagery is both easier to use and more often used than external imagery (Gordon, Weinberg, & Jackson, 1994). This, perhaps, partially explains why "even subjects who were taught to use external imagery favored using kinesthetic images" (Gordon et al., 1994, p. 72). Interestingly, no study has yet demonstrated that external imagery is more effective than internal imagery on subsequent performance.

It should be noted that while the present investigation did not examine the effectiveness of internal versus external imagery perspective on performance, any research attempting to do so may be futile because perspective use has been found to fluctuate during imagery (Gordon et al, 1994; Murphy & Jowdy, 1992). Finally, integrating the results from the present study with the past literature, it was concluded that music enhances the overall vividness of movement imagery in a movement-oriented population.
Hypothesis 4: Effects of Music on Females vs. Males. Females were hypothesized to report significantly greater movement imagery vividness than males under both musical conditions. The findings for Treatment x Gender interaction was used to test this hypothesis. Treatment x Gender interaction was insignificant, thus the hypothesis was not supported. Females and males did not differ in vividness of movement imagery under either of the two musical treatment conditions.

The results suggest that music had similar vividness effects for women and men. This contradicts the findings of Miller and Schyb (1989), where performance on nonverbal tasks (i.e., spatial rotation and numerical computation) was facilitated for females when background music was used. These disparate findings may be explained by the fact that different types of cognitive tasks (movement-related vs. movement-unrelated) and sample populations (kinesiology vs. psychology) were used.

Further, the comparable facilitation of imagery for females and males could indicate that there is similar activation of the right hemisphere by music (Moscovitch, 1979), or that music was equally effective as an auditory cue (Lang, 1977) or as a meaningful stimulus (Ahsen, 1984). Nevertheless, implications of this experiment is that both genders can equally benefit from the use of music to enhance imagery vividness.

Although no hypothesis was proposed for the main effects of gender, the results of this study revealed no gender differences in vividness scores across the three groups and the two perspectives. Therefore, without the influence of music, control females in the present study were found similar to males in self-reported vividness in
imagery measures. Considering only subjects in the control group for the rest of this discussion, the failure to find gender differences is in direct contrast to that of Campos and Perez's (1988) study in which females reported greater imagery vividness than did males upon administration of the VMIQ.

One reason for the contradictory results obtained in the Campos and Perez study versus the present may be that the subjects used in the former were students enrolled in a psychology class. There may be different abilities related to movement imagery between the two population groups. A second possible reason could be that there really is no clear-cut relationship between movement imagery (or perhaps imagery in general) and gender. In fact, the general psychology literature also suffers from a lack of consistent findings regarding this somewhat elusive relationship (e.g., Beech & Leslie, 1978; White et al., 1977). A third possible explanation is that the VMIQ may not be psychometrically sensitive enough to differentiate gender differences. Several studies may have used the VMIQ to successfully differentiate individual differences in imagery abilities that influence cognitive manipulations (Doheny, 1993; Isaac, 1992), it is still undergoing the validity process. The results of the present study strongly suggest that the questionnaire needs to be more rigorously evaluated, in order to better ascertain the influence of gender on imagery vividness. Finally, integrating the results from the present study with the past literature, it was concluded that music enhances the vividness of movement imagery in both genders.
CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of the present study was to determine the effects of music on vividness of movement imagery. This chapter presents a summary of the study’s procedures and findings, conclusions, and recommendations for future research.

Summary of Procedures

The subjects were 84 undergraduate kinesiology majors whose age ranged from 20 to 27. The study consisted of two phases. In Phase One, a Demographics Questionnaire (Appendix B) was administered to students in an academic classroom setting, and was used to obtain information about age, gender, major field of study, and perception of music. To control for differences in music perception, two short excerpts of pre-categorized music (viz, sedative and stimulative) were played and subjects were asked to classify the music. Subsequently, selected subjects were then randomly assigned to one of three treatment conditions: (a) sedative music (n = 28), (b) stimulative music (n = 28), or (c) control or no music (n = 28), with each group composed of an equal number of males and females.

Phase Two was conducted in the psychomotor learning laboratory approximately two weeks after Phase One. The instrument used to assess self-reported imagery was the Vividness of Movement Imagery (VMIQ; Appendix C). With the help of an audiotape, instructions for using the VMIQ were given and subjects were
instructed to honestly report their experiences. Subjects were shown how to use the rating scales included in the instrument, and were given the opportunity to ask questions.

Subjects in the two musical treatment conditions were instructed that during the first two minutes of listening to the music, they were to allow themselves to "follow the flow of the music" and "become one with it." A stereo cassette player was then turned on with the appropriate music and the subjects listened to the music for two minutes. After two minutes had elapsed, they were requested to complete the VMIQ with the music still playing in the background. The volume of the two music selections remained at the same audio level throughout the study. The control group engaged in conversation with the experimenter for two minutes prior to completing the VMIQ without music.

Summary of Findings

The study utilized a 3 x 2 x 2 (Treatment x Gender x Perspective) factorial design. VMIQ scores were analyzed by conducting an ANOVA with repeated measures on the last factor. Alpha was established at the .05 level. The data analysis yielded the following findings:

1. The hypothesis that vividness of movement imagery for both music treatment groups is greater than the control group was supported. Music enhances the vividness of movement imagery.

2. The hypothesis that vividness of movement imagery of the sedative music group is greater than the stimulative music group was not supported. Both sedative
and stimulative music equally enhance vividness of movement imagery.

3. The hypothesis that for both music treatment groups the vividness of movement imagery under the internal perspective is greater than the external perspective was not supported. Music enhances the vividness of both internal and external movement imagery equally.

4. The hypothesis that for both music treatment groups, the vividness of movement imagery of females is greater than that of males was not supported. Music enhances the vividness of movement imagery of both males and females equally.

Conclusions

Based on the findings and limitations of the present study, integrated with that of past research, the following conclusions were made:

1. Sedative (classical) and stimulative (jazz) music facilitate the self-reported vividness involved in movement imagery.

2. Music enhances the overall vividness of movement imagery for a movement-oriented population, with similar increases in vividness whether internal and external imagery perspectives were used.

3. Music increases the vividness of movement imagery for males and females equally.

These conclusions, however, should be interpreted with an awareness that external validity might have been compromised based on these factors: (a) only two types of music were examined, (b) just one subjectively scored questionnaire was used
to measure vividness of imagery, and (c) few collegiate athletes from the sample of kinesiology students were tested.

Recommendations for Further Research

The following recommendations for future research are provided in an attempt to establish an empirical basis for the facilitative effects of music:

1. Explore the effects of several types of music (e.g., classical, country, jazz, pop, rock) on vividness of movement imagery.

2. Conduct replication studies using athletes at different performance levels (e.g., collegiate, elite) and possibly compare them with non-sport populations.

3. Classify subjects' abilities to use external and internal imagery into different levels (e.g., low/low, low/high, high/low, high/high) and examine the effect of music on those abilities.

4. Continue to examine gender factors involved in imagery abilities associated with responses to music, because current research yields equivocal findings.

5. Assess the effects of music on vividness of imagery and its subsequent influence on sport or motor performance.
APPENDIX A

INFORMED CONSENT FORM
Vividness of Movement Imagery Research Study

University of North Texas
Department of Kinesiology, Health Promotion & Recreation

Consent to Participate in a Research Study

You have been asked to participate in a research study which will examine the vividness of movement-related imagery. This is a two-phase study where you will rate your imagery experiences on the Vividness of Movement Imagery Questionnaire (VMIQ).

I hereby consent to participate in Mr. Edgar Tham's study of "Vividness of Movement Imagery." I fully understand that the VMIQ will determine the vividness of my imagery of movements, and that it was not designed to assess the positive or negative aspects about the way mental tasks are performed. In addition, I have been assured that there are no "right" or "wrong" ratings, or that some ratings are better than others. I have been informed that the information provided by me to the experimenter is confidential and that I will in no way be referred to by name in any subsequent publications or presentations of the research. And while there are no risks involved during the vividness rating procedure, I understand that I am free to withdraw from this consent at any stage of the study and that my grades or academic status will in no way be affected.

If I have any question or problem that arises in connection with my participation in this study, I should contact Mr. Edgar Tham, the principal investigator, at 565-2651/3436 (Office) or 566-3066 (Home).

I, __________________________, have read the above and have decided to participate in this study as described above. My signature also indicates that I understand the contents of this consent form. A copy of this form will be provided to me.

____________________________  __________________________
Signature                               Date

Edgar K. Tham  Peggy A. Richardson, Ph.D.
Principal Investigator  Regents Professor of Kinesiology
& Assistant Chair  Department of KHPR

THIS RESEARCH STUDY HAS BEEN REVIEWED BY THE UNIVERSITY OF NORTH TEXAS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (Phone: 565-3940).
APPENDIX B

DEMOGRAPHICS QUESTIONNAIRE
DEMOGRAPHICS QUESTIONNAIRE: ______________________

Please answer the following questions by circling or writing the correct responses.

1. My age is __________.

2. I am (circle one): male  female

3. My major field of study is __________________________.

4. In a moment, you will listen to 2 musical selections. Please rate how the music sounds to you. There are no "right" or "wrong" answers.

   a. First Musical Selection:  
      How does the music sound to you? (circle only ONE)

         (i) "Sedative" or slow

         (ii) "Stimulating" or upbeat

         (iii) neither "Sedative" nor "Stimulating"

   b. Second Musical Selection:  
      How does the music sound to you? (circle only ONE)

         (i) "Sedative" or slow

         (ii) "Stimulating" or upbeat

         (iii) neither "Sedative" nor "Stimulating"
APPENDIX C

VIVIDNESS OF MOVEMENT IMAGERY QUESTIONNAIRE
VIVIDNESS OF MOVEMENT IMAGERY QUESTIONNAIRE:  

Movement imagery refers to the ability to imagine a movement. The aim of this test is to determine the vividness of your movement imagery. The items of the test are designed to bring certain images to your mind. You are asked to rate the vividness of each item by reference to a 5-point scale. After each item, write the appropriate number on the line provided. The first column is for an image obtained watching somebody else and the second column is for an image obtained doing it yourself. Try to do each item separately, independently of how you may have done other items. Complete all items obtained watching somebody else and then return to the beginning of the questionnaire and rate the image obtained doing it yourself. The two ratings for a given item may not in all cases be the same. For all items, please have your eyes CLOSED.

RATING SCALE:

<table>
<thead>
<tr>
<th></th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>No image at all, you only &quot;know&quot; that you are thinking of the skill</td>
<td>Watching somebody else</td>
<td>Doing it yourself</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Standing</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Walking</td>
<td></td>
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<td></td>
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<td>3. Running</td>
<td></td>
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</tr>
<tr>
<td>4. Jumping</td>
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<tr>
<td>5. Reaching for something on tiptoe</td>
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<tr>
<td>6. Drawing a circle on paper</td>
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<tr>
<td>7. Kicking a stone</td>
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<tr>
<td>8. Bending to pick up a coin</td>
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<td></td>
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<tr>
<td>9. Falling forwards</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>10. Running up stairs</td>
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<td>11. Jumping sideways</td>
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<td>12. Slipping over backwards</td>
<td></td>
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<tr>
<td>13. Catching a ball with two hands</td>
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<tr>
<td>14. Throwing a stone into water</td>
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<tr>
<td>15. Kicking a ball in the air</td>
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<td>16. Hitting a ball along the ground</td>
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<td>17. Running downhill</td>
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<td>18. Climbing over a high wall</td>
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<tr>
<td>19. Sliding on ice</td>
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<tr>
<td>20. Riding a bike</td>
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<tr>
<td>21. Jumping into water</td>
<td></td>
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<tr>
<td>22. Swinging on a rope</td>
<td></td>
<td></td>
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<td>23. Balancing on one leg</td>
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<td>24. Jumping off a high wall</td>
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APPENDIX D

ANALYSIS OF VARIANCE TABLES
Table 2

Analysis of Variance of Mean Vividness Scores for Three Treatment Conditions

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<td><strong>Within Subjects</strong></td>
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* p < .05
** p < .001
Table 3

Analysis of Variance of Mean Vividness Scores for Music Treatment Groups vs. Control

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<tr>
<td><strong>Error</strong></td>
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<td><strong>Within Subjects</strong></td>
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*p < .02

**p < .001
REFERENCES


