

ABSTRACT

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Techniques were employed to induce an external and internal attentional focus (AF) upon 13 male and 14 female collegiate swimmers. Ss answered an attentional focus questionnaire (AFQ) and completed a flexed-arm hang to exhaustion under 2 external focus conditions, listening to stimulative music (ST) and sedative music (SE), and 1 internal focus condition, watching their reflection in a mirror (SR). Hang time (HT) in sec and rating of perceived exertion (RPE) on a scale of 1 to 10 were measured. The order of the conditions was counterbalanced among Ss. Analysis of postexperimental responses by Ss from oral questioning indicated that the procedures used to induce the specific AF were partially successful. A MANOVA with repeated measures on HT and RPE revealed that HT was significantly longer for males than females ($p < .05$), but RPE was not significantly different ($p > .05$). There was a significant interaction of gender by condition on RPE ($p < .05$), but not HT ($p > .05$). Newman Kuels post-hoc tests indicated that RPE was significantly higher ($p < .05$) for females than males during SE and SR relative to ST. Female's SE RPE was significantly higher ($p < .05$) relative to ST and SR. RPEs for males were not significantly different between conditions ($p > .05$). AFQ results indicated Ss did not utilize a specific AF while swimming.

THE EFFECTS OF AN INDUCED INTERNAL
AND EXTERNAL ATTENTIONAL FOCUS
UPON UPPER BODY STRENGTH

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CHAPTER I

INTRODUCTION

Background

Elite athletes to recreational exercisers are concerned with enhancing their performance in order to obtain an edge over their opponents or attain personal goals. Often times the methods used to enhance performance are physiological rather than psychological. For instance, blood doping, caffeine intake, carbohydrate loading, and weight training have been known to positively affect performance (McArdle, Katch, & Katch, 1986). However, meditating, imagery, preparatory arousal, and attentional focus (AF) are psychological means that are also used to enhance performance (Gould, Weinberg, & Jackson, 1980; Murphy, Woolfolk, & Budney, 1988; Wrisberg, Franks, Birdwell, & High, 1988).

In considering psychological cognitive strategies to enhance performance, AF is of particular interest. Past research has suggested that inducing subject's AF toward external stimuli decreases the perceived discomfort of physical exertion and prolongs endurance running time (Pennebaker & Lightner, 1980; Wrisberg et al., 1988; Wrisberg & Pein, 1990). Morgan (1978) coined the term "dissociation" to mean a cognitive strategy that directs

one's attention away from bodily cues and focuses attention upon cues or thoughts unrelated to the activity.

Experienced runners utilize dissociation to take their mind off of factors that may prohibit performance (Wrisberg & Pein, 1990). Conversely, the "associative" cognitive strategy directs one's attention toward internal stimuli or bodily cues. Novice runners often focus on internal cues such as breathing sounds or muscle soreness which causes a decrement in performance and feelings of great fatigue. In contrast, many elite marathoners focus their attention toward internal body cues to monitor their running performance (Morgan, 1978). The cues an exerciser attends to may be dependent upon gender (Wrisberg et al., 1988) and experience level with the particular activity (Wrisberg & Pein, 1990).

Music can function as an external stimulus to make exercise more pleasurable (Makowicki, 1982; Nelson, 1963; Van Laarhoven, 1985). Subjects in studies that listened to music during a cardiovascular endurance test commented that fast, upbeat, or stimulative music made them feel better. They rated their perceived exertion as being lower when compared to listening to slow tempo or no music. Furthermore, research has attempted to link improved performance with musical stimuli (Anshel & Marisi, 1978; Dillon, 1952; Mikol & Denny, 1955). With the increased popularity of exercising to music, many studies have been

conducted to examine the affects upon physiological parameters such as heart rate, blood pressure, and oxygen consumption (Kozinski, 1970; Makowicki, 1982; Schwartz, Fernhall, & Plowman, 1990; Smith, 1987; Van Laarhoven, 1985). Research has further investigated the effects of different genres of music on physical performance and exercise (Nelson, 1963; Papa, 1988; Pearce, 1981; Smith & Morris, 1976; Wales, 1985). Although several of these studies found inconclusive results, it was generally reported that listening to stimulative music improved physical performance as opposed to listening to sedative or no music (Blanchard, 1979; Papa, 1988; Pearce, 1981).

Purpose of the Study

This study examined how attending to an induced internal AF (subjects concentrating on their arm muscles and watching themselves in a mirror) and an induced external AF (subjects concentrating on stimulative and sedative music) affected hang time and rating of perceived exertion (RPE) of a flexed-arm hang in male and female collegiate swimmers. This study further investigated the AF strategy that collegiate swimmers utilize when they swim.

Need for the Study

There is a scarcity of interdisciplinary research combining exercise physiology and exercise psychology. However, Morgan (1981) has attempted to bring the two disciplines together by studying the psychophysiology of

self-awareness during vigorous physical activity. The effects of stimulative and sedative music on physiological parameters (Smith, 1987; Van Laarhoven, 1985) and physical performance (Mikol & Denny, 1955) have been researched repeatedly, but the effects of these types of music as an external attentional focus have not been reviewed. Some studies have used movies, breathing sounds, or scenery as the induced external focus (Pennebaker & Lightner, 1980; Wrisberg et al., 1988). The effects of noise on a cognitive task or physical performance (Singer, Cauraugh, Murphy, Chen, & Lidor, 1991) can be found in the literature, but music has never been found to be an induced external AF. The effects of music on cardiovascular endurance, motor tasks, and sport performance were widely found (Dillon, 1952; Mikol & Denny, 1955; Smith, 1987); however, few studies measured muscular strength under a musical condition (Papa, 1988; Pearce, 1981). Many studies typically included male subjects (Coutts, 1965; Kozinski, 1970; Makowicki, 1982; Mikol & Denny, 1955; Murphy et al., 1988), while only a few included both males and females (Pennebaker & Lightner, 1980; Schwartz et al., 1990; Wrisberg et al., 1988; Wrisberg & Pein, 1990). It was the intent of this investigator to add to the existing body of knowledge concerning AF and to cover areas of the literature that are lacking (i.e., identifying gender differences and studying music as an external attentional focus).

Hypotheses

1. Males will have a significantly longer hang time than females.
2. Females will have a significantly higher RPE than males.
3. There will be significant differences in hang time between the experimental conditions for males and females.
4. There will be significant differences in RPE between the experimental conditions for males and females.
5. Collegiate swimmers will utilize a dissociative cognitive strategy while swimming.

Assumptions

1. During testing subjects performed to the best of their ability.
2. Subjects answered the attentional focus questionnaire (AFQ) truthfully.

Delimitations

1. The subjects were male and female collegiate swimmers from the University of Wisconsin-La Crosse (UW-L).
2. The subjects had no hearing or physical impairments.
3. The order in which the attentional focus was given was counter-balanced and randomly assigned to subjects.
4. The volume of the music was held constant between 90 and 98 decibels (dBAs).
5. The subjects were not told the true purpose of the study until testing was completed.

6. The subjects were not told their scores until testing was completed.

Limitations

1. The AFQ was adapted from a study investigating recreational runners (Wrisberg & Pein, 1990).
2. The subject's like or dislike of the selected music could not be controlled.
3. Diet, rest, activity level, health, and daily habits were not monitored.

Definition of Terms

Association - cognitive strategy that directs one's attention toward internal stimuli or bodily cues (Morgan, 1978).

Dissociation - cognitive strategy that directs one's attention away from bodily cues and focuses it on cues or thoughts unrelated to the present activity (Morgan, 1978).

External Attentional Focus - attention is directed toward objects and events outside one's body.

Internal Attentional Focus - attention is directed toward one's own thoughts and feelings.

Sedative Music - music which has the qualities of being sustained and smooth and is generally labeled legato (Gaston, 1951).

Stimulative Music - music which has the qualities of being short, detached, and percussive and is generally labeled staccato (Gaston, 1951).

Upper Body Strength - the length of time subjects hold their chin above a bar while in a flexed-arm position.

CHAPTER II
REVIEW OF RELATED LITERATURE

Introduction

In recent years the application of psychological principles to sport performance has become a training technique. Such training often incorporates cognitive-behavioral techniques such as imagery, preparatory arousal, and AF. Of the existing literature examining cognitive-behavioral strategies (Gould et al., 1980; Morgan, 1981; Singer et al., 1991), few studies have examined the effectiveness of manipulating AF. Those that did, often used a collage (Gill & Strom, 1985), movie (Wrisberg et al., 1988), or scenery (Pennebaker & Lightner, 1980) as the external focus. Music was never an induced AF. The following is a review of literature examining the effects of AF on physical performance and the physical performance, rating of perceived exertion (RPE), physiological, and psychological responses to musical stimuli.

Internal and External Attentional Focus

In recent years much interest has developed around the factors athletes attend to while engaging in their sport. Two attentional strategies, associative and dissociative, have described the focus of marathoners. As a result of interviewing athletes, Morgan (1978) describes dissociation

as a self-hypnotic strategy that focuses attention away from bodily cues (fatigue) and diverts attention to external cues (noise or scenery). Conversely, the associative strategy directs one's attention toward internal stimuli or bodily cues. Morgan (1981) found that novice runners typically applied an associative cognitive strategy when they ran; however, when they were directed to employ a dissociative cognitive strategy, like fixating their gaze upon a point on the wall while walking on a treadmill, they were able to withstand the discomfort of exercising for a greater period of time. Furthermore, Morgan (1978) was surprised to find that the top 5% of elite marathoners engaged in associative rather than dissociative strategies. These highly trained runners focused on internal cues such as breathing and hydration level to monitor their performance. However, experienced, though nonelite, runners utilized dissociative strategies. Morgan (1978) reasoned these runners attempted to take their mind off factors which may inhibit performance: fatigue, pain, and heavy breathing.

Not only did distance-event athletes benefit from Morgan's cognitive strategies, but also the recreational exerciser benefitted. One of the first experiments to induce AF had untrained, adult subjects walk on a treadmill (Pennebaker & Lightner, 1980). They listened to their own breathing (internal focus) and then to street noise (external focus). The street noise diverted attention away

from physiological cues and consequently decreased perceptions of fatigue and physiological symptoms. As predicted, an internal focus (listening to breathing sounds) heightened RPE.

Wrisberg et al. (1988) conducted a similar investigation after Pennebaker and Lightner's (1980), but with some modifications. Two groups of 10 untrained males and females exercised on a treadmill. Both genders perceived the exercise to be more difficult when subjected to watching themselves in a mirror and listening to their breathing (internal focus). Watching a movie (external focus) during treadmill exercise elicited a lower perception of exertion from both groups. Females particularly perceived exertion to be lower under the external focus condition. This result may reflect differences in the self-monitoring styles of males and females (Frazier & Fatis, 1980).

While the previously mentioned studies (Pennebaker & Lightner, 1980; Wrisberg et al., 1988) examined AF during an endurance running condition, Gill and Strom (1985) studied AF during the performance of a muscular endurance task. Female members of various intercollegiate athletic teams performed a leg extension task in two separate testing sessions. During one session the subjects performed the task while fixating their vision on a collage. During the other session, subjects were instructed to focus all their attention toward the feelings in their legs as the task was

performed. Significantly more repetitions were performed when using the external focus (collage) than the internal focus (leg feeling). On a questionnaire, subjects indicated the external focus strategy was easier to use.

Another study measured leg strength under various mental preparation strategies (Gould et al., 1980). Subjects performed the task immediately after each of the following five instructional sets: 1) internal AF (focusing upon the internal feelings of the leg muscles), 2) imagery (visualizing performing the task to the best of one's ability), 3) preparatory arousal (psyching oneself up for maximum performance), 4) rest (resting prior to the trial), and 5) counting backwards (counting backwards aloud by sevens starting with a four digit number). Males were found to be significantly stronger than females. An internal AF (leg muscle feeling) did not significantly improve strength performance. Although the preparatory arousal condition produced the greatest state anxiety, the internal AF condition produced significantly higher levels of anxiety than the rest condition. Furthermore, internal AF, preparatory arousal, and imagery made the subjects feel more confident about their performances. Finally, internal AF and imagery produced a higher effort rating than the resting condition.

Experienced individuals of a particular activity may have developed coping strategies like dissociation to lessen

perceived exertion associated with exercise (Wrisberg & Pein, 1990). Experienced recreational runners dissociated more than inexperienced runners. Dissociation allowed the experienced runners to block out psychophysiological alterations associated with exercise and focus on cues unrelated to running. Inexperienced runners were unable to turn their attention away from uncomfortable bodily cues, thereby, utilizing an associative cognitive strategy. Comparing Morgan's (1978) interviews with marathon runners to the latter results, both inexperienced runners and the top 5% of elite marathoners applied the associative strategy, but for different reasons. The elite marathoners focused attention toward bodily cues to adjust their performance accordingly. However, the inexperienced runners probably had not learned effective dissociative strategies.

Other studies have been reported in which the effects of various cognitive strategies on performance have been examined. The effects of emotive imagery on strength performance was investigated (Murphy et al., 1988). Subjects were instructed to imagine themselves within each of the following conditions: anger, fear, and relaxation. While under each condition, arm strength was measured by a hand-grip dynamometer. Relaxation significantly decreased strength performance. Fear and anger situations did not increase strength, but did augment subjects' arousal. Another cognitive strategy, AF training, improved accuracy

and consistency early and late in learning of a target shooting task (Singer et al., 1991).

Physical Performance Responses to Music

Athletes and coaches have attempted to use music to enhance performance within a sport or other physical task. Music as an ergogenic aid was reported to improve swimming form (Dillon, 1952), develop more efficient ball handling techniques in basketball players (Yanisch, 1946), stimulate young athletes (Troopman, 1955), and heighten morale and enthusiasm (Hyatt, 1961).

Rhythm is the dynamic, driving force in music that stimulates muscular contraction and induces bodily movement (Gaston, 1951). Mikol and Denny (1955) indicated that a regularly occurring rhythm synchronous with a rotary motion tended to facilitate a rotary pursuit performance task. Pedalling in synchrony with music prolonged endurance time as opposed to pedalling with asynchronous music or no music (Anshel & Marisi, 1978).

Vallerga (1962) discovered that varied sound intensities influenced speed of arm movement and force of muscular contraction. Loud sounds produced a faster speed of movement than medium sounds. No significant reaction time or strength of contraction differences occurred between loud and soft intensities, but softer sounds produced a faster reaction time than medium sounds. Medium sounds produced

the most muscular force, and loud sounds produced more force than soft sounds.

Stimulative music positively affects muscular strength and endurance. In a test of grip strength as measured by a hand dynamometer, grip strength increased as a result of stimulative music relative to sedative music. However, stimulative music did not increase grip strength relative to silence (Pearce, 1981). In a similar study, Papa (1988) found grip strength to increase under a stimulative musical condition relative to both sedative music and silence.

Three studies to determine music's impact upon endurance on a bicycle ergometer revealed inconclusive results. Nelson and Finch (1962) reported no effect of fast, slow, or white music (cascading water sounds) on an all-out endurance test. Nelson (1963) and Coutts (1965) varied the sound intensity and tempo of music and also found no significant differences in pulse rate, work output, and endurance time.

Rating of Perceived Exertion Responses to Music

Music in an exercise setting can act as an external focus to lessen perceived exertion and make exercise more enjoyable (Makowicki, 1982; Nelson, 1963; Wales, 1985). Of the three studies that measured RPE, two concluded that the music lessened perceived exertion (Makowicki, 1982; Nelson, 1963). In Makowicki's study the subjects ran on the treadmill while listening to music they personally selected. Although perceived exertion increased as the subjects ran,

it was always less under the music condition as compared to no music. Makowicki attributed the subjects' familiarity with the self-selected music to feelings of less exertion. Another study found upbeat music to significantly lower RPE, anxiety, and endorphin production during prolonged treadmill exercise (Wales, 1985). Contrary to these results, stimulative and sedative music did not affect RPE during a submaximal treadmill test (Van Laarhoven, 1985). In a study that did not specifically measure RPE, subjects stated that they seemed to feel better with faster sounds and high intensities during a bicycle ergometer endurance test (Nelson, 1963). It can be generalized that fast tempo or upbeat music tended to diminish feelings of fatigue for treadmill and bicycle ergometer users more than no music or slow tempo music.

Physiological Responses to Music

Physiological responses such as heart rate, blood pressure, and oxygen consumption during physical activity have been of interest to researchers (Blanchard, 1979; Coutts, 1965; Kozinski, 1970; Schwartz et al., 1990; Smith, 1987; Van Laarhoven, 1985). The results are equivocal. Van Laarhoven completed a study which determined if fast tempo music (120 beats or more per minute) or slow tempo music (60 beats or less per minute) had an effect on physiological parameters. Male and female subjects listened to the two music conditions as they exercised to a submaximal level on

a treadmill. Van Laarhoven stated that there was no change in blood pressure response throughout the three conditions. Duration time was significantly influenced by the slow tempo music. Subjects exercised longer and consumed less oxygen listening to slow music as opposed to fast music. In a similar study testing all females, the results were identical. The main finding, again, was that slow music prolonged endurance and reduced oxygen consumption (Smith, 1987). However, Schwartz et al. did not support Smith. Subjects exercised at 75% of their maximum heart rate on a bicycle ergometer. The investigators concluded that there were no significant differences between oxygen consumption, heart rate, blood lactate, and respiratory exchange ratio in the presence of music.

The effect of rock and roll, classical, or no-music on postexam anxiety in Blanchard's (1979) study revealed that all groups displayed faster heart rate recovery than the no-music group's heart rate recovery. Contrary to Blanchard's results, Kozinski (1970) found that soft-melodic music did not significantly cause a lower recovery heart rate compared to no-music. The after-effect of music on heart rate and work output of short duration in a study conducted by Coutts (1965) paralleled Kozinski's findings. Coutts concluded that fast pace music, slow pace music, and silence did not influence heart rate recovery after a short bout of pedalling on the bicycle ergometer.

Psychological Responses to Music

Music has been shown to affect the human mind in several ways. As a therapeutic measure, hospitals often play a musical stimulus to soothe and relax mentally ill patients, especially the ones displaying emotional instabilities (Blanchard, 1979). Musical therapy with the elderly population was found by Tanner and O'Briant (1980) to increase physical activity and memory span and to enhance concentration.

One's mood, emotion, and feelings can be greatly influenced by music. Hyde (1968) generalized that music characterized by "tragic, mournful tones" had a negative psychological effect on people, while music of a happy, rhythmic, and harmonic nature positively affected them.

Emotional states of the listener have been altered due to the nature of musical stimuli. Past researchers typically have distinguished between sedative and stimulative music as defined by Gaston (1951). According to Gaston, sedative music consists of "melodic passages of a sustained nature in which the percussive element is lacking" (p. 42), while stimulative music "demands physical activity, enhances and builds up physical energy, and stimulates the emotional" (p. 42).

The effects that stimulative and sedative music had on cognitive and emotional components of anxiety were reported by Smith and Morris (1976). Sixty-six college students took

an examination under three types of musical conditions: sedative, stimulative, and no-music. Stimulative music significantly increased both worry and emotionality, while sedative music showed no effect on anxiety relative to the no-music condition. Overall, the sedative music soothed and calmed the subjects, but test performance was not influenced. In contrast to Smith and Morris, exposure to classical (sedative) and rock and roll (stimulative) music improved exam scores of university students (Blanchard, 1979). The two music groups attained a mean score that was considerably higher than that of the no-music group. Secondly, music minimized nervousness, as measured by heart rate, while taking the exam. Pre- and postexam heart rates remained constant under both musical conditions.

Summary

Subjects focusing on an external cue such as scenery or a movie perceived their exertion as less and improved their performance compared to focusing on an internal cue like breathing (Pennebaker & Lightner, 1980; Wrisberg et al., 1988). Furthermore, physical performance (i.e., grip strength, swimming form, and reaction time) was improved as a result of certain types of musical stimuli (Dillon, 1952; Papa, 1988; Vallerga, 1962). Subjects often commented that they felt better during an exercise test accompanied by music (Makowicki, 1982; Nelson, 1963; Wales, 1985). Selected music was shown to have an impact upon

physiological and psychological parameters (Blanchard, 1979; Smith, 1987; Tanner & O'Briant, 1980). It was the purpose of this experiment to examine the effects of attending to an induced internal AF and an induced external AF upon performance time and RPE of a flexed-arm hang in male and female collegiate swimmers.

CHAPTER III

METHODOLOGY

Introduction

The primary purpose of this study was to investigate the effects of attending to an induced internal AF and an induced external AF upon performance time and RPE on a flexed-arm hang test in male and female collegiate swimmers. This chapter describes subject selection, the pilot study, instrumentation, experimental procedures, and data analysis procedures.

Subject Selection

The investigator met with the male and female athletes from the UW-L swimming team for the 1992-1993 season to explain the study. Due to different training regimens, male and female divers were excluded from the study. Through a table of random numbers, 15 male and 15 female swimmers were selected from the team roster as subjects. Due to injuries incurred during the swimming season, one female and two males were unable to complete the study. During the initial meeting, the 30 subjects read and signed the informed consent (see Appendix A). Subjects were excluded if they indicated on the informed consent that they had an audiological impairment and/or physical disability which would not allow them to participate in a flexed-arm hang.

Pilot Study

A pilot study was conducted prior to the actual collection of data on three students who did not serve as subjects. Techniques designed to assess procedures, instrumentation, and equipment were practiced. All procedures were conducted in the precise manner as the experimental procedures.

Instrumentation

The following was the equipment used for measuring muscular strength: A standardized chin-up bar that was approximately 1.5 inches in diameter and attached to a wall served as the arm-hang bar. The bar was adjustable to accommodate height differences of the subjects. A 4 x 1' mirror was attached to the wall approximately 18 inches in front of the chin-up bar which allowed subjects to view themselves performing the test during the self-reflection (internal focus) condition. A movable chalk board was placed opposite the wall and behind the chin-up bar to eliminate the chance of distractions during testing. The American Alliance for Health, Physical Education, Recreation, and Dance's (1976) flexed-arm hang test to measure upper body muscular strength was modified for this investigation. Subjects grasped the bar with their palms facing their body and thumbs over the bar. This grip yields the longest hang time (Gabbard, Gibbons, & Elledge, 1983). With the aid of one spotter standing behind, subjects raised

their body off the floor until reaching a position where their chin was over the bar and their arms flexed at the elbow. Subject's feet remained free from the floor and wall throughout the duration of the test. Subjects held this static position free from assistance for as long as possible. A stopwatch was used to record each subject's score to the nearest second.

The following was the equipment used for producing sound: A Sony MGP23 stereo cassette player played the prerecorded music, while earphones conveyed the stimulus without outside noise. The stimulative music condition was James Brown is Dead by L. A. Style, and the sedative music condition was Plainsong by The Cure. Each of the conditions were recorded on separate TDK D90 cassette tapes. Both conditions met Gaston's (1951) criterion of stimulative and sedative music.

Experimental Procedures

Prior to the first testing session, subjects were told that the purpose of the study was to collect data and establish norms for the flexed-arm hang of collegiate swimmers. Subjects were informed that they would be completing three separate flexed-arm hangs to exhaustion and answering some verbal questions after each test. In order to prevent bias, the subjects were not told the true purpose of the study or their scores until all testing was completed.

All subjects were tested on three consecutive Sundays at least 24 hours after a collegiate swim meet. In comparison to the other days of the week, this was a time when the swimmers were at a low level of fatigue. All testing took place in UW-L's natatorium. There were three test administrators during each session. The spotter operated the stereo cassette player and assisted subjects into the flexed-arm position, while the timer recorded subjects' test times. Both were blind to the true purpose of the study. The author of the investigation read the standardized instructions and asked the posttest questions to each subject.

As subjects approached the chin-up bar during each testing session, they were read the standardized procedural instructions (see Appendix B). Next, subjects were read the set of instructions corresponding to the assigned testing condition (see Appendix C). Immediately after test termination, subjects were asked to rate their perceived exertion, to indicate what they were thinking about during the test, and to specify the usefulness of the attentional focus strategy induced (see Appendix D).

To decrease the influence of testing order on the results, the order was counter-balanced over the three testing periods and randomly assigned to subjects. All subjects were tested under the following conditions: stimulative music, sedative music, and self-reflection.

After subjects were read their instructions, the spotter prepared them for the test. For the external focus condition, subjects were blindfolded and wore headphones. For the internal focus condition, subjects were only reminded to watch themselves in the mirror. Since subjects undergoing the external focus condition were blindfolded, it was unnecessary to remove the mirror from the wall. When subjects said that they were ready to begin, the spotter started the music when appropriate and assisted in raising the subjects off the floor and into the flexed-arm position.

The timer started the stopwatch as soon as the subjects were free from the spotter's assistance. The time was stopped when one of the following criteria was met: 1) chin touched bar, 2) chin tilted backward or upward, or 3) chin moved below horizontal bar. The score was the number of seconds (to the nearest second) that subjects held the hanging position. Subjects' legs and trunk remained motionless throughout the entire test, knees were not raised, and kicking was not permitted. All testing information was recorded on each subject's data sheet (see Appendix E). Subjects were not motivated in any way during testing periods. After subjects completed their third and final test, they answered the AFQ (see Appendix F). The ratings of the 11 statements on the questionnaire were summed to obtain each subject's score.

Data Analysis Procedures

MANOVAs with repeated measures were calculated at the $p < .05$ level to determine 1) if males had a significantly longer hang time than females, 2) if females had a significantly higher RPE than males, 3) if there were significant differences in hang time between the experimental conditions for males and females, and 4) if there were significant differences in RPE between the experimental conditions for males and females. A Newman Kuels post-hoc test was calculated to determine where differences occurred.

CHAPTER IV
RESULTS AND DISCUSSION

Introduction

This study examined the effect of an induced AF upon an upper body strength test in male and female collegiate swimmers. The investigation measured hang time and RPE during a flexed-arm hang and assessed the AF strategy swimmers used while swimming. This chapter includes the results and a discussion of the data collected in comparison to the related literature. The .05 level of significance was used throughout all statistical calculations.

Subjects

Two males and one female did not complete the study due to injuries incurred during the swimming season, thus reducing sample size to 13 males and 14 females. Mean ages of the males and females were 20.2 years (SD = 1.19) and 19.2 years (SD = 1.01), respectively.

Results

Hang Time

Males, on the average, had a significantly longer hang time than females, $F(1, 25) = 17.85, p < .05$. The mean hang times for males and females were 53.6 (SD = 14.9) seconds and 34.5 (SD = 12.5) seconds, respectively. Both the main

effect of condition and the interaction of gender by condition on hang time were not significant.

RPE

No significant differences were found between males and females on RPE. Figure 1 illustrates a significant interaction of gender by condition on RPE, $F(2, 50) = 7.32$, $p < .05$. Newman Kuels post-hoc comparisons found that for the sedative music condition, females ($M = 8.2$, $SD = 1.4$) rated their perceived exertion significantly higher than males ($M = 6.7$, $SD = 1.2$). The same results were found for the self-reflection condition. The mean RPE for females was 7.5 ($SD = 1.3$) and for males 6.4 ($SD = 1.2$). No significant difference in RPE was found for the stimulative music condition between males and females.

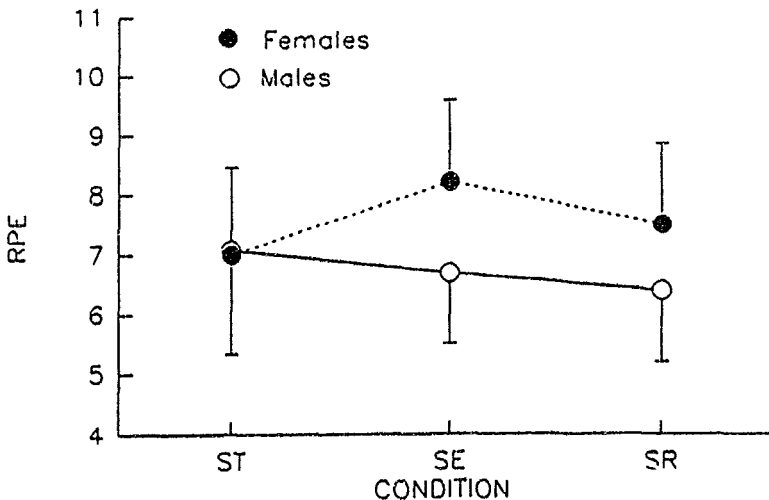


Figure 1. RPE scores for males and females by condition

Additional Newman Kuels post-hoc comparisons revealed that males did not have significantly different ratings of perceived exertion between the three conditions; however, females rated their perceived exertion significantly higher for the sedative music ($M = 8.2$, $SD = 1.4$) condition compared to both stimulative music ($M = 7.0$, $SD = 1.7$) and self-reflection ($M = 7.5$, $SD = 1.3$) conditions. There was no significant difference between the stimulative music and self-reflection conditions.

Attentional Focus

The type of AF strategy that the subjects utilized while swimming was assessed by summing the ratings of the 11 statements on the AFQ (Wrisberg & Pein, 1990). Table 1 indicates that 96.2% of the subjects tended to utilize neither an internal nor external focus of attention while swimming.

Table 1. Attentional focus questionnaire results

Focus	Sum of ratings	% of subjects
Internal	11 - 33	3.7
Neutral	34 - 54	92.7
External	55 - 77	3.7

$N = 27$

Discussion

Hang Time

Male's hang time was significantly longer than female's hang time. This result was expected due to the apparent upper body strength differences between males and females. The results of this study support previous studies (Gould et al., 1980; Wrisberg et al., 1988). Males were significantly stronger on a leg strength task and significantly exceeded female's endurance time on a treadmill test.

Although the interaction of gender by condition on hang time was nonsignificant, two trends emerged from the data. First, while females' hang times were very consistent, males' hang times were more variable. Both genders demonstrated the longest hang times while listening to stimulative music. These results coincide with the trend that stimulative music positively affects performance of a strength test relative to sedative music (Papa, 1988; Pearce, 1981).

Secondly, females had longer hang times when focusing upon both external cues (stimulative and sedative music) than when focusing on internal cues (self-reflection). Males only had a longer hang time for one external focus (stimulative music). These results are consistent with studies concluding that adopting an external AF enhances performance of a task (Gill & Strom, 1985; Gould et al., 1980; Papa, 1988; Pearce, 1981).

Improved performance for males and females during the external focus conditions in this investigation is not supported by Wrisberg et al. (1988). Males and females exercising on a treadmill had longer endurance times when focusing on internal cues.

In summary, the interaction of gender by condition on hang time was not significant. Only the main effect of gender was significant.

RPE

The current finding of no significant differences on RPE by gender is not supported by Wrisberg et al. (1988). Men were found to have higher RPEs than women during all stages of a treadmill endurance test. In addition, the RPEs for the maximal exercise and taper-down stages were significantly higher. Wrisberg et al. suggested that factors other than the extent to which attention was self-directed or externally directed contributed to subjects' RPEs.

Males and females rated their relative perceived exertion significantly different for the sedative music and self-reflection conditions. Females rating their RPE significantly higher than males during both the sedative music and self-reflection conditions is not supported by Wrisberg et al. (1988). Males had higher RPEs than females throughout all stages of a treadmill endurance test. The finding that males rated their RPE higher during the

stimulative music condition is consistent with Wrisberg et al. In accordance with Tinker (1984), as cited by Wrisberg et al., this investigation found that females gave higher effort ratings of stress than men under equal conditions.

Although males perceived the highest RPE while listening to stimulative music and the lowest while watching their reflection in the mirror, the RPEs for males did not significantly differ. This is supported by Van Laarhoven (1985) who found that stimulative and sedative music did not affect the RPEs of males during a submaximal treadmill test.

Females, on the other hand, did exhibit significant differences in RPE throughout the testing conditions. Rating of perceived exertion for sedative music was significantly higher relative to both stimulative music and self-reflection conditions. Listening to stimulative music seemed to lessen perceived exertion for females; however, the current results are not supported by Smith (1987). Females exercising to a submaximal treadmill test did not have significantly different RPEs. In accordance with the present research, stimulative music has been found to lessen perceived exertion during treadmill running (Makowicki, 1982; Wales, 1985). The female swimmers reacted similarly.

Males perceiving the two external focus conditions as eliciting a higher effort rating than the internal focus condition is partially consistent with Wrisberg et al. (1988). Females varied from previous research findings

regarding the effects of an internal or external AF on RPE. They perceived the least amount of exertion under the stimulative music-external focus condition which is consistent with Pennebaker and Lightner (1980) and Wrisberg et al.; however, they perceived the most exertion while listening to sedative music rather than watching their reflection in the mirror.

In conclusion, men and women perceive the same relative stress differently. Little experimental attention has been devoted to the assessment of differences in the perceptual characteristics of men and women. However, Frazier and Fatis (1980) have suggested that trait measures may be more appropriate for predicting the behavior of females while situational analyses (state measures) may be more accurate predictors of the behavior of men. Frazier and Fatis found in a study of the self-monitoring styles of men and women that women tended to focus more on inner mood states to mediate behavior while men relied more on environmental cues. It appears that the different patterns of psychophysiological responses for men and women in the current study were at least in part related to gender differences in self-monitoring style.

Furthermore, stimulative music was found to lessen the perceived exertion of females, but males' RPE was lessened by sedative music. Therefore, an external focus lessened

RPE for both genders in accordance with Morgan's (1978) ideas of dissociation.

Attentional Focus

According to the AFQ results (see Table 1), 92.6% of the subjects did not clearly utilize either an internal AF or an external AF strategy when swimming. Only two subjects were identified as being an associator or dissociator. Through interviews, Morgan (1978) concluded that the top 5% of elite marathoners utilized an associative cognitive strategy when they ran. This may be generalized to the top 5% of elite swimmers. Since the subjects in the current investigation were not within the top 5% of all elite swimmers, Morgan's theories of association and disassociation are supported.

As illustrated in Table 2, subjects' responses to postexperimental questioning indicated that the manipulation of the three AF conditions was partially successful. Inducing an internal AF appeared to be more successful than inducing an external AF. Even when the external focus was induced, some subjects were unable to concentrate on the music. Subjects still concentrated more on the fatigue felt in their arm muscles. In this study, music may not have been powerful enough to capture subjects's attention. Females were more likely than males to concentrate upon the stimulative music, yet males were more likely than females to concentrate upon the sedative music. These results suggest stimulative music heightened female arousal levels

Table 2. Percentage of subjects adopting specified attentional focus

Group	Condition			
	n	Stimulative	Sedative	Self-reflection
Males	13	54	54	100
Females	14	64	43	93

and eased their minds of fatigue more than sedative music. This is in agreement with earlier studies suggesting that fast tempo, upbeat, or stimulative music tends to diminish feelings of fatigue (Nelson, 1963; Wales, 1985).

Although inducing the self-reflection condition was 100% successful in males and 93% successful in females, inducing the external focus was not as successful (see Table 2). Past research has been successful in inducing both an internal and external focus of attention (Gill & Strom, 1985; Wrisberg et al., 1988). Since approximately 50% of the subjects actually adopted the specified external AF, the results related to these two treatments may be equivocal. The differences observed in RPE values may be attributed to the subjects associating when they were specifically instructed to dissociate. There is evidence to support that associating may increase perceived exertion and feelings of

fatigue during physical activity (Morgan, 1978; Wrisberg & Pein, 1990). Had there been a higher adherence rate to the specified focus, then the current results may have been less equivocal. There is a need for better methods to induce AF. In addition, the music played during the induced external focus conditions may have not been favored by the subjects. One female commented that the stimulative music was irritating. Makowicki (1982) attributed subject's familiarity with the self-selected music to feelings of less exertion on a treadmill endurance test.

Relative to subject's perceptions of each condition helping, hindering, or not affecting their performance, the external focus conditions were perceived to be helpful, but the internal focus was felt to hinder performance. The current results are supported by other literature. Subjects tended to increase their time to fatigue during a treadmill run (Wrisberg et al., 1988) and increase the number of leg extension repetitions (Gill & Strom, 1985) when focusing on external stimuli such as a movie or collage as opposed to concentrating on internal bodily cues. Furthermore, of the two external focuses, subjects perceived stimulative music as being more helpful than sedative music. Stimulative music has been found to facilitate physical performance more than sedative or no music. Grip strength was found to increase when listening to stimulative music relative to sedative music or silence (Papa, 1988; Pearce, 1981).

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Psychological cognitive strategies can be utilized to enhance the performance of an elite athlete or a recreational exerciser. The current study was undertaken to compare the effects of an induced external AF and an induced internal AF upon hang time and RPE.

Analysis of the data indicated that there was a significant main effect of gender on hang time, but not on RPE. Males had a significantly longer hang time than females. Secondly, there was a significant interaction of gender by condition on RPE, but not on hang time. Newman-Kuels post-hoc comparisons revealed that female RPEs were significantly higher than male's for both the sedative music and self-reflection conditions. The RPEs for males were not significantly different for the three conditions; however, female RPEs were significantly different. Sedative music significantly heightened RPE relative to both stimulative music and self-reflection conditions for females. This investigation provided evidence for differences in the perceptual characteristics of men and women.

Analysis of the AFQ revealed that the male and female collegiate swimmers tended not to be classified as either

associators or dissociators. The techniques used to induce the three types of AF were partially successful. In general, subjects commented that the stimulative music and sedative music was felt to help their performance, while watching oneself in a mirror was felt to hinder performance.

Conclusions

Based upon the limitations of this study, the following conclusions were made:

1. Males had significantly longer hang times than females.
2. There were no significant differences in hang time between the experimental conditions for males and females.
3. Males and females did not have significantly different RPEs.
4. Females had significantly higher RPEs than males for both the sedative music and self-reflection conditions relative to the stimulative music condition.
5. Males did not have significantly different RPEs between the three conditions.
6. Females had significantly higher RPEs for the sedative music condition relative to both the stimulative music and self-reflection conditions.
7. Males and females did not have different attentional focus strategies while swimming.

Recommendations

The results of this study warrant the following recommendations for future study:

1. An investigation inducing AF more successfully.
2. Comparing the results of manipulating the AF of known associators and dissociators.
3. A study inducing different AFs such as listening to one's breathing, watching a film, or fixating upon a collage may produce different results from the current investigation.
4. A study measuring strength (e.g., bench press or squat), endurance time (e.g., stair-climbing or simulated skiing), or physical performance (e.g., reaction time or force of muscular contraction) is advisable for further investigation.
5. Testing various groups of athletes may allow for comparisons.
6. A similar study with a larger sample size may produce different results.

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APPENDIX A
INFORMED CONSENT

INFORMED CONSENT FORM
University of Wisconsin-La Crosse
La Crosse, Wisconsin 54601

Project Title: The effects of an internal and external attentional focus upon upper body strength.

Principal Investigator: Richard Pein, Ph.D / Erica J. Hein

Your written consent is needed prior to your participation in this study. Please read this consent form carefully and sign your name in the space provided.

Purpose: To gather strength data and psychological information on collegiate swimmers.

Procedures: You will be asked to complete an attentional questionnaire and three separate flexed-arm hangs to exhaustion. During each testing session, you will complete one flexed-arm hang and state how hard the test felt. During two of the tests, you will be blindfolded while listening to music via headphones. During the other test, you will be watching yourself in a full-length mirror. Each testing session will be spaced at least 48 hours apart. Each session will last approximately 10 minutes. It is asked that you refrain from exhaustive upper body exercise at least 48 hours prior to the initial test and for each subsequent test.

Discomfort or Risks: Following testing there is a likelihood of muscle soreness in the arms. During the test systolic blood pressure may rise. There is always some "unknown risk" with any physical exercise, however, the risks of this activity are minimal.

Benefits: Your participation in this study will allow you to compare your upper body strength score with others of your same gender and age. You will also serve to contribute to the scientific knowledge of human performance and psychology.

Questions and Answers: Questions you may have regarding any of the procedures are welcomed and encouraged. If you have any doubts or concerns, please ask any of the investigators for further explanation.

Withdrawal: You are free to stop participation at any time without penalty.

Confidentiality: All data will be kept confidential. No data will be identified by name or any other means in any summaries, publications, or reports resulting from this study.

_____ I confirm that I have no known auditory or physical impairment which would exclude me from this study.

I have read this form and I understand the test procedures that I will perform. I consent to participate in this study.

Subject's Signature: _____ Date: _____

Witness's Signature: _____ Date: _____

APPENDIX B
STANDARDIZED PROCEDURAL INSTRUCTIONS

"You will grasp the bar shoulder width apart with your palms facing your body and thumbs over the bar. The spotter will assist in raising your body off the floor until you reach a position where your chin is over the bar and arms flexed at the elbow. Your feet will be free from the floor with your legs straight and body held still throughout the test. Hold this position for as long as possible. Knees must not be raised, and kicking is not permitted. Your time will begin when you are in the flexed-arm position and free from the spotter's assistance. The time is stopped when your chin touches the bar, tilts backward or upward, or moves below the horizontal bar."

APPENDIX C
TESTING CONDITION INSTRUCTIONS

External attentional focus condition: "During this trial you will be listening to music. Focus all of your attention toward the sound of the music. Simply block out all other thoughts and concentrate on the music as you hang for as long as possible."

Internal attentional focus: "During this trial you will be watching yourself in the mirror. As you watch yourself, narrow your attention to the muscles in your arms and focus on the internal feelings of those muscles. Simply block out all outside thoughts and concentrate just on the internal feelings of your arm muscles as you hang as long as possible."

APPENDIX D
POSTTEST QUESTIONS

1. "Taking into consideration how your body totally felt throughout the entire test, rate your exertion on a scale of 0 to 10 with 0 being the lightest exertion possible and 10 being the heaviest exertion possible."
2. "What were you thinking about as you were hanging?"
3. "Do you feel the attentional focus used helped, hindered, or had no effect upon your performance?"

APPENDIX E

DATA SHEET

Data Sheet

Name:

Sex:

Age:

	Order	Time	RPE 0 to 10	Focus Y or N	Usefulness +, -, 0
Stimulative					
Sedative					
Self Reflection					

Y = subject did concentrate upon induced focus

N = subject did not concentrate upon induced focus

+ = attentional focus helped performance

- = attentional focus hindered performance

0 = attentional focus had no effect upon performance

APPENDIX F
ATTENTIONAL FOCUS QUESTIONNAIRE

INSTRUCTIONS FOR ATTENTIONAL QUESTIONNAIRE

The following statements concern your attention while swimming. Please indicate on a scale from 1 to 7 how true you feel statements are of you. Please do not leave any statement unmarked.

EXAMPLE: I listen to music while I swim.

1 2 3 4 5 6 7

- Mark:
1. Never or almost never true
 2. Usually not true
 3. Sometimes but infrequently true
 4. Occasionally true
 5. Often true
 6. Usually true
 7. Always or almost always true

Thus, if you listen to music every time you swim, you would circle 7.

EXAMPLE: I listen to music while I swim.

1 2 3 4 5 6 ⑦

Name:

- | | | | |
|---|---------------------------------|---|------------------------------|
| 1 | Never or almost never true | 5 | Often true |
| 2 | Usually not true | 6 | Usually true |
| 3 | Sometimes but infrequently true | 7 | Always or almost always true |
| 4 | Occasionally true | | |

1. I listen to music when I swim.

1 2 3 4 5 6 7

2. When I swim I listen to my breathing.

1 2 3 4 5 6 7

3. When I swim I think about concerns other than exercise.

1 2 3 4 5 6 7

4. I feel discomfort when I swim.

1 2 3 4 5 6 7

5. When I swim I try not to think about how my body feels, but I do anyway.

1 2 3 4 5 6 7

6. When I swim I sing to myself in my mind.

1 2 3 4 5 6 7

7. When I swim I talk to myself in my mind.

1 2 3 4 5 6 7

8. When I swim I think about my form.

1 2 3 4 5 6 7

9. When I swim I look at the surrounding environment.

1 2 3 4 5 6 7

10. I notice my heart beating when I'm swimming.

1 2 3 4 5 6 7

11. I like to swim in time to the beat of certain music.

1 2 3 4 5 6 7