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Dissociation, Association and Running Time

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DISSOCIATION, ASSOCIATION

AND RUNNING TIME

by

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ABSTRACT

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The objective of this research was to investigate the relationship between dissociative and associative cognitive strategies for coping with the discomfort of running and running performance.

Subjects were volunteers enrolled in two Dynamic Fitness classes which were taught during Spring Quarter, 1980, at Utah State University. Class A consisted of 36 subjects (24 male, 12 female) and Class B consisted of 28 subjects (13 male, 15 female). All pretest, posttest and treatment procedures were conducted during the class's respective regularly scheduled meeting times.

Subjects completed a 2.75 mile, timed, pretest run and were systematically assigned to one of three groups based on pretest time: 1) Control, 2) dissociation training group, and 3) association training group. Two training sessions were conducted to provide instruction in developing and using a cognitive strategy for both dissociation and association groups. Control group subjects also met with the researcher twice, but no instructions for development and use of a cognitive strategy were given. A posttest 2.75 mile, timed run was completed and subjects completed a posttest questionnaire.

Due to differences in procedures for subject recruitment and weather conditions for the posttest run, data from Class A and B were analyzed separately.

Analysis of covariance revealed no statistically significant relationship between teaching of a cognitive strategy and running time for either class.

Posttest questionnaire information was also analyzed. For both classes, statistically significant negative correlations were found between difference for pretest/posttest timed runs and dissociation points as reported on the posttest questionnaire. Also, t-tests of independent means showed that association group subjects reported significantly higher levels of association than control group subjects for both classes.

It was suggested that although training may have increased the reported use of a cognitive strategy it was not an important factor in running performance. The researcher suggested, instead, that willingness to exert oneself may have been the primary factor in determining performance in relationship to physical limitations.

(94 pages)

CHAPTER I

INTRODUCTION

There has been, during the last decade, enormous growth in the popularity of running as recreation and as a means of improving physical fitness. According to recent estimates, approximately 27 million Americans run on a regular basis (Benyo, 1979). While it is generally accepted that 30 minutes of strenuous physical activity three to four times per week will maintain adequate cardiovascular fitness (Cooper, 1969), an increasingly larger percentage of American runners are training for and competing in the 26 mile, 385 yard marathon. For example, the number of participants in the New York City Marathon has increased from a relative handful in 1972 to 12,000 in 1979. During 1980 approximately 360 marathons have been scheduled in the United States and Canada (Ryun, 1979).

As runners prepare for their first marathon or road race, they almost automatically become concerned about the time it will take them to complete the chosen race. In striving to improve their performance or meet a goal they have set, runners become increasingly aware of their physical and conditioning limitations. Such an awareness is usually the result of encountering fatigue, discomfort, or pain as they approach their individual limitations.

Pain, or at least severe discomfort, seems to be an integral part of running. As was bluntly stated by Kostrubala: "When you run, you will encounter pain" (1977, p. 65). Pain is often fatigue-related. Mathews and Fox (1976) list four factors considered to contribute to fatigue:

1. Low blood glucose levels as a result of the depletion of the glycogen stores in the muscle and liver;
2. Buildup of lactic acid due to insufficient oxygen supply to the muscles;
3. Loss of water through dehydration and volume depletion of electrolytes leading to an increase in body temperature;
4. General boredom coupled with the physical beating the body has experienced in general.

In listing factors which limit human performance, Taylor (1979) agrees with the last two general causes given by Mathews and Fox:

1. Ability of the muscles to perform aerobic and anaerobic work;
2. Ability of the cardiovascular system to provide sufficient oxygen;
3. Psychological factors.

Taylor (1979) further stated that:

> The answer to the question posed by the title ["Human Endurance--Mind or Muscle"] is that psychological factors are important in endurance, but that the mechanism varies according to how the subject perceives their situation (p. 183).

It would seem, then, that agreement exists among writers in the field of sport psychology and sport performance that psychological factors play an important role in fatigue and sport performance.

Statement of the Problem

With the explosion of running popularity, there has likewise been an increasing interest in the psychology of running. Many studies have attempted to characterize psychologically the typical runner, while others have focused explicitly on the elite runner (Morgan & Pollock, 1977) or the marathoner (Morgan & Costill, 1972). Although informative, much of the existing research is of little practical value to runners seeking to improve their performance. For example, although it has been learned through interviews that elite runners tend to associate or focus on their bodies while they run (Morgan & Pollock, 1977), it has not yet been determined whether such a cognitive strategy is of practical benefit to either the elite or the "average" runner seeking to improve performance. Likewise, it has been shown that endurance can be increased by using a dissociative cognitive strategy during walking on a motor-driven treadmill (Morgan, 1978), but the same strategy has not been tested using runners as subjects in field conditions.

Purpose of the Study

Given the limited amount of research of practical value to runners, it was the purpose of this study to investigate one psychological aspect of running which has been hypothesized (Morgan, 1978; Morgan & Pollock, 1977) to be related to improvements in running performance. Specifically, the relationship between training runners in the use of two cognitive strategies, dissociation and association, and running performance was examined.

Objectives

The ability to cope with or manage pain and discomfort while running may determine, to a large degree, whether a runner will perform at his or her potential on a given day. The primary objective of this study was to investigate the effectiveness of two cognitive strategies, dissociation and association, in improving the performance of runners.

Hypotheses

Because the research literature did not provide a basis for expecting dissociation or association to be more effective in improving running performance, hypotheses tested were stated in the null form.

1. There is no significant difference in the time required to complete a 2.75 mile run between control group subjects and subjects who received training in the use of a dissociative cognitive strategy.
2. There is no significant difference in the time required to complete a 2.75 mile run between control group subjects and subjects who received training in the use of an associative cognitive strategy.
3. There is no significant difference in the time required to complete a 2.75 mile run between subjects who received training in the use of a dissociative cognitive strategy and subjects who received training in the use of an associative cognitive strategy.

Definitions

Cognitive strategy. Any cognitive technique used by a person to manage or cope with discomfort, pain, fatigue, or other body sensations related to exertion.

Dissociative cognitive strategy. An attempt by a person to manage or cope with discomfort, pain, fatigue, or other negative body sensations related to exertion by ignoring, distracting oneself, or fantasizing in such a way as to decrease awareness of the sensations.

Associative cognitive strategy. An attempt by a person to manage or cope with discomfort, pain, fatigue, or other negative body sensations related to exertion by focusing on the sensations and/or on how to prevent the discomfort, pain, or fatigue from limiting performance by altering running style.

$\dot{V}O_2$ maximum. Maximum oxygen consumption.

CHAPTER II

REVIEW OF LITERATURE

Due to the limited amount of existing literature which applied to the relationship between cognitive strategy and management of pain resultant from physical activity, it was necessary to broaden the scope of the literature review to include pain management through cognitive processes in general. The literature reviewed was divided into four areas of concern: 1) Pain Control and Tolerance Among Runners and Athletes, 2) Relationship Between Dissociative Cognitive Strategy and Experimentally-Induced Pain, 3) Relationship Between Dissociative Cognitive Strategy and Chronic Pain, 4) Relationship Between Associative Cognitive Strategy and Experimentally-Induced Pain.

Pain Control and Tolerance Among Runners and Athletes

The primary contributor to the existing body of knowledge concerning the relationship between cognitive strategies for pain management and sport performance is William P. Morgan. Morgan (1978) investigated the effects of dissociation on time required to reach exhaustion while walking on a treadmill at 80% of $\dot{V}O_2$ maximum. In the pretest of 30 male subjects, Morgan found that they averaged 15 minutes on the treadmill while walking at 80% of $\dot{V}O_2$ maximum.

In the experimental condition, one third of the subjects were assigned to a dissociation group and were given instructions in using a specific dissociative cognitive strategy. They were asked to stare at a self-selected object, repeat the word "down" each time their foot struck the treadmill surface, and keep their leg movements and repetition of the word "down" in synchrony with their breathing. A second group received a lactose placebo. A third group served as control subjects.

On the posttest, the dissociators' performance showed an average increase in time to exhaustion of 30%. Control and placebo group subjects showed no significant change in time to exhaustion.

These findings lead Morgan to hypothesize that elite distance runners would use elaborate dissociative strategies to manage the discomfort of running. Results of interviews with 24 elite marathoners revealed, however, that they tended to associate with the feelings and sensations of their bodies (Morgan & Pollock, 1977). Common statements of the elite marathoners included: "I read my calves and thighs, and I pay alot of attention to my breathing," or "I repeat silently, 'Relax, hang loose, don't tie up'" (Morgan, 1978, p. 45).

Morgan concluded his study by stating that the average runner would be wise to imitate the elite runner by associating. Associating, he claimed, could be effective in sparing possible injury. Dissociation strategies, he advised, should be used only temporarily to get through difficult portions of a run.

Although the use of dissociative cognitive strategies by the "average" runner and associative cognitive strategies by the "elite" runner has been documented (Morgan & Pollock, 1977), research which would support the encouragement of runners to use one strategy or the other has not been conducted.

In a study designed to compare pain tolerance and threshold differences between contact sport athletes, non-contact sport athletes, and non-athletes, Ryan (1966) used three different methods of experimental pain induction. Using radiant heat as the pain producing stimulus, he found no differences in pain threshold between the three groups. In a test of pain tolerance using gross pressure and muscle ischemia as the painful stimulus, significant differences were found. Contact sport athletes had significantly higher pain tolerances than non-contact sport athletes, who, in turn, had significantly higher pain tolerances than non-athletes. When the subjects were told that they had performed poorly on the first posttest, contact sport athletes had a significant increase in pain tolerance compared to non-contact sport athletes. Non-athletes showed a significant decrease in pain tolerance. Ryan concluded his study by stating that it was impossible to verify whether increased pain tolerance was a result of exposure to pain in sport or whether it was innate.

The results reported by Ryan (1966) were not supported by a study conducted by Ellison and Freischlag (1975). In a comparison of pain tolerance among baseball, basketball, football backfield, football lineman, track distance, track-field and sprint and non-sport subjects, significant differences were not found. Pain tolerance was measured by recording the number of times the subject was able to depress a key-like device with the fifth finger of the dominant hand against a resistance of 8 pounds, 11 ounces. Subjects maintained a frequency of one key press per one-half second. In addition, galvanic skin response measures were taken during the pain tolerance tests to determine arousal level. Significant differences between the various groups of subjects were not found. Differences in strength, which may have been an important variable, were not measured.

Another study, conducted by Taylor (1979), investigated the effect of reward and punishment conditions on endurance. Subjects were required to maintain 50% maximum isometric handgrip for as long as possible. He recorded heart rate, blood pressure, and assessed "mental ability" (requiring subjects to maintain speed and accuracy while subtracting from 99 by 7's) during the endurance trial. During a total of five trials (3 neutral, 1 reward, 1 punishment), he found that punishment led to a significant increase in blood pressure and heart rate and a decrease in endurance. Reward was associated with an increase in endurance and maximum handgrip. Taylor concluded that if a person felt he could successfully complete a given endurance task, no changes in cardiovascular responses occurred. If, however, they felt that failure was likely, an increase in cardiovascular response and endurance resulted.

In conclusion, it appears that the limited body of research supports the conclusion that psychological variables are important in pain tolerance, pain threshold and endurance among athletes.

Researchers comparing pain tolerance, pain threshold and endurance between specific groups of athletes reported conflicting results.

Dissociative Cognitive Strategy and Experimentally-Induced Pain

The majority of current research in cognitive control of pain has investigated strategies which could be categorized as dissociative (Weisenberg, 1977). In a study designed to compare the effectiveness of two types of cognitive strategies in increasing pain tolerance, Horan and Dellinger (1974) used the cold pressor test as the pain producing stimulus. After having determined pain tolerance by requiring the subjects to leave their dominant hand in ice water for as long as possible, subjects were stratified by sex and assigned to three groups. One group received "in vivo" imagery training, being instructed to imagine themselves walking through a beautiful meadow and admiring the scenery. A second group was taught a distraction strategy (stare at the door and count backwards from 1,000), and a third group served as control subjects. "In vivo" imagery and distraction groups had significantly higher pain tolerances on the posttest than control subjects and "in vivo" imagery was significantly higher than distraction only. No sex differences were found. The generalizability of the study may be limited because the maximum length of exposure to the painful stimulus was five minutes.

The value of "in vivo" imagery for cognitive control of pain is supported by a study conducted to compare "in vivo" imagery and traditional Lamaze childbirth techniques of pain management

(Stone, 1978). The cold pressor test was used as the pain producing stimulus. One control and five experimental groups were used in the study. Three groups used various degrees of visual activity (one used free operant, being permitted to look at whatever they wanted; a second used the traditional Lamaze focal point method, being asked to select an object and stare at it continuously; and a third group used "in vivo" imagery as a means for pain management). Two groups were instructed to manage the cold pressor induced pain through respiration control (either controlled breathing or free breathing). Analysis showed that "in vivo" imagery was significantly more effective in increasing pain tolerance than the Lamaze focal point method. Neither of the respiration conditions produced significant changes in pain tolerance.

Scott and Barber (1977) used two different methods of experimental pain induction to study differences among a variety of cognitive pain control strategies. The cold pressor test and the Forgaine-Barber pain stimulator (a plexiglass wedge placed against the first joint of the forefinger under a set amount of pressure) were used to produce pain. Eight subjects were randomly assigned to four groups. One group of subjects was asked to alternately use five different strategies to reduce pain (decide not to be bothered by the pain, concentrate on other things, dissociate oneself from the pain, reinterpret the sensations as not painful, and imagine the stimulated areas as numb). A second group selected one of the five strategies. A third group was instructed to concentrate on pleasant events and the fourth group served as control subjects. Pain tolerance and a self-report measure of pain intensity were recorded. Results indicated that subjects in groups 1 and 2, using one or more of the five suggested strategies, showed significant increases in pain tolerance. Pain intensity ratings, regardless of cognitive strategy, did not show significant changes. No differences were found for type of pain stimulation.

In a comparison of four treatments for modification of pain threshold, Scott and Leonard (1978) found that covert reinforcement produced significant increases in pain threshold. One group of subjects was instructed to reinterpret the painful situation in a manner incompatible with the experience of pain, then to imagine a pleasant, self-reinforcing image. A second group was told to expect a reduction in pain during the second trial and a third group was instructed to reinterpret the painful situation only. A fourth group served as control subjects. All three experimental groups showed an increase in pain threshold over control subjects and the reinterpretation/reinforcement strategy was superior to the other conditions.

Spanos, Horton and Chaves (1975) conducted a study which suggests that reduction of pain threshold by cognitive strategies may depend on pretest threshold ratings. After having been rated as having high, medium, or low pain threshold on the cold pressor test, subjects were randomly assigned to groups. The "relevant strategy" group members were told to imagine a hot day and focus on the cool aspects of the water. Irrelevant strategy group members were instructed to imagine themselves sitting in a room listening to a lecture. Analysis of posttest data showed that the relevant strategy group had significantly higher pain threshold ratings than the irrelevant strategy group, although both were higher than the control group. Subjects with low pretest threshold ratings showed little change in pain threshold regardless of cognitive strategy.

In an investigation of the relationship between level of attention required on different tasks and pain tolerance, Brucato (1978) found no significant differences. Eighty-three college age female subjects were divided into groups which completed a task requiring high, medium, or low levels of attention during a pain tolerance test using the cold pressor test. In addition, heart rate and galvanic skin response measures were recorded during the painful situation. Although it was found that the treatments were related to different reactions to pain, the physiological variables recorded did not differ significantly between treatments.

Introducing another variable into the study of the effect of cognitions on pain tolerance, Neufeld (1970) examined the effect on pain tolerance of source of endorsement (role of person suggesting strategy) for a specific cognitive strategy. Eighty-three college females were used as subjects. Using radiant heat from a 250 watt infrared lamp delivering 110-mc/cm^2 of heat through a 2 cm hole to the subject's forearm as the pain producing stimulus, he found that a denial strategy produced a significant increase in pain tolerance. The results were true when the strategy was suggested by an obstetrician and a ninth grade student, but not when suggested by a nurse's aide. Intellectualization (think about the physiological causes of pain) and a neutral condition (think of a blank wall) produced increases in pain tolerance regardless of source of endorsement, but not as large as those produced by the denial strategy.

Modeling has also been hypothesized to be an important variable in the cognitive control of pain. Chaves and Barber (1974) divided 120 female college students into four different groups, each of the four groups was then divided into two groups to include an experimenter-modeling condition. The strategy assigned by group was: 1) Imagine pleasant events, 2) imagine insensitivity, 3) expect pain reduction, and 4) control. In the "imagine pleasant events" and "imagine insensitivity", the "model" verbalized images which were used for pain control. Subjects were exposed to the Forgaine-Barber pain stimulator for two minutes and were asked to rate the pain on a 0 to 10 scale. In addition, on the posttest, subjects were asked to report what percentage of time they used the assigned strategy. Subjects who imagined pleasant events and imagined insensitivity showed decreases in pain sensitivity significantly greater than the expectancy and control subjects. The expectancy subjects also demonstrated a reduction in pain sensitivity. A significant correlation of -.67 was found between utilization of strategy and reduction in pain sensitivity. Modeling was found to be effective only for those subjects who had a high pretest pain sensitivity score.

In another study which included a modeling condition and two posttests, the effect of modeling on pain tolerance seemed to be temporary in nature (Fry, 1978). Subjects were divided into seven groups: 1) Selective attention, 2) modeling, 3) selective attention plus modeling, 4) selective attention plus modeled cognitions, 5) demand, 6) expectancy, and 7) control. The selective attention plus modeled cognitions group showed the greatest increase in pain tolerance. Selective attention and modeling groups also showed increases in pain tolerance. On a second posttest, in which subjects received instructions identical to those of the first posttest, the same results were achieved although the groups which included a modeling condition showed a decline in pain tolerance.

Hypnosis has also been widely studied as a means of increasing pain tolerance (Melzak & Perry, 1975; Barber & Hahn, 1962; and Lenox, 1970). Spanos et al (1979) sought to compare the effectiveness of hypnosis in combination with analgesic suggestions. Forty-eight female and forty-eight male subjects were stratified by hypnotic susceptibility based on the Harvard Scale of Hypnotic Susceptibility and assigned to four groups. One group received hypnosis and suggestions to decrease pain sensitivity, a second group received hypnosis only, a third group received suggestions alone (without the hypnosis), and a fourth group received neither hypnosis nor suggestion.

Subjects were exposed to the cold pressor test for one minute and were asked to rate the pain on a 0 to 10 scale. Analysis showed that hypnosis was not a statistically significant factor in the reduction of pain ratings. Subjects receiving suggestions, whether hypnotized or not, showed decreases in pain ratings. It was also learned through posttest interviews that high and medium susceptible subjects used cognitive strategies even though not instructed to do so.

Relaxation training has also been widely studied as a means of pain control. Stevens and Heide (1977) required subjects to rate pain intensity during six pain tolerance trials. Subjects were divided into groups receiving relaxation training, relaxation plus feedback (experimenter touching relaxed limb), attention focusing (Lamaze focal point), attention focusing plus relaxation training, and control subjects. The cold pressor test was used as the pain producing stimulus. All experimental groups improved in pain tolerance, although no single treatment was significantly more effective than another. Perception of pain intensity did not differ among experimental groups. Control group members, however, reported the pain on the sixth trial as being more intense than the pain on the first trial. The effectiveness of the focal point method in increasing pain tolerance contradicts earlier research performed by Stone (1978), cited previously.

Neufeld and Thomas (1977) added positive and negative feedback conditions to an experiment using relaxation training as a method of cognitive pain control. Pain tolerance and pain threshold levels for the cold pressor test were recorded for subjects receiving relaxation training only, relaxation plus positive feedback, relaxation plus negative feedback and control group. Maximum exposure to the painful stimulus was limited to five minutes. The group receiving relaxation plus positive feedback had a significantly higher pain tolerance level than the other groups, which did not differ from each other. The researcher concluded that "it would appear that subjects' appraisal of the effectiveness of the experimental coping resources was the critical factor in their increased coping performance" (p. 229).

McKinlay (1979) attempted to differentiate between the effectiveness of relaxation training, self-instruction (subject received training for specific statements which were to be repeated to enhance control), and cognitive coping (using various visual focusing and imagery training) in increasing pain tolerance and reducing pain intensity ratings. He found no differences between pain intensity ratings but did report significantly higher pain tolerance levels among self-instruction and cognitive-coping subjects.

Turk (1972) tested role-play and repeated exposure to pain as experimental conditions to study cognitive pain control. One group of subjects was instructed regarding the components of pain and were permitted to role-play being in painful situations. A second group received education and opportunity for actual practice, but were also taught specific skills for cognitive pain control (relaxation, cognitive coping, and self-instruction). A third group did not receive training, but did receive repeated exposure to pain. Results indicated that the group which received education, skill acquisition training, and opportunity for practice showed significant increases in pain tolerance and decreases in reported discomfort for the task.

Using a cognitive strategy labeled "stress inoculation", Horan (1978) studied the effectiveness of a multicomponent approach to pain control. One group of subjects received non-specific treatment (information about the psychological aspects of pain and vague suggestions about how to relieve it), a second group received training in a variety of coping methods (relaxation, distraction and imagery), a third group received frequent exposure to the cold pressor-induced pain, and a fourth group received the "stress inoculation" treatment (information, coping, training, and practice). Stress inoculation produced significantly greater increases in pain tolerance than the other strategies. Practice alone did not increase pain tolerance.

Relationship Between Dissociative Cognitive Strategy and Chronic Pain

Studies thus far considered utilized volunteer subjects, usually of college age, and have relied upon experimentally-induced pain. A different approach was taken by Stenn, Mothersill and Brooke (1979). Eleven subjects with myofascial pain dysfunction syndrome (2 male, 9 female) were used to assess the effectiveness of a variety of behavioral approaches in the treatment of chronic pain. The treatment consisted of three phases: 1) Subjects met with the psychologist for a complete interview in which symptoms were recorded, a pain questionnaire was completed, and a daily pain log was initiated, 2) subjects received training in "in vivo" progressive relaxation (all were also attached to a biofeedback machine, half received feedback and half received no feedback), 3) all subjects met with the psychologist for cognitive behavior therapy in which the pain response was analyzed, and coping skills and stress inoculation was taught. After seven training sessions, significant reductions in muscle tension were reported with no differences found between the feedback and no feedback groups. The feedback subjects, however, reported significantly lower pain ratings than the no feedback subjects. A follow-up of the subjects after a three-month interval found that two were symptom-free and the remaining seven reported markedly reduced pain.

In interviews with 148 patients in five different hospitals, Copp (1974) found that the reported methods of coping with pain could be grouped into six general categories: 1) Counting, 2) word--including repeating phrases or single words ranging from prose to profanity, 3) deep thinking and visualization, 4) separation (mentally "removing" oneself from the painful situation), 5) distraction (thinking of other things), and 6) people (focusing attention on other patients and visitors). Although no actual scientific experimentation was performed, results of the interviews do support the notion that people seem to naturally use dissociative strategies for pain control.

Not all of the literature reviewed provided unconditional evidence to support the use of cognitive strategies for pain control. Many of the studies cited have required the subjects to use fantasy to manage pain (Horan & Dellinger, 1974; Stone, 1978; Scott & Barber, 1977; Scott & Leonard, 1978; Spanos, Horton & Chaves, 1975; Neufeld, 1970; Chaves & Barber, 1974; McKinlay, 1979; Turk, 1972; and Horan, 1978). Knox (1973) conducted a study in an attempt to understand the effect of ignoring versus acknowledging the pain within the fantasy used for pain control. Male and female college students were used as subjects. He found no differences in pain tolerance between a group which transformed the context of the pain to incorporate it into the fantasy and a group which attempted to divert their attention to a fantasy without acknowledging the presence of pain.

In a study of the effectiveness of three different distraction techniques, Barber and Cooper (1972) achieved results which raise some questions to be considered in pain management research. Three distraction strategies were evaluated: 1) Listening to a tape-recorded story (passive distraction), 2) adding aloud, and 3) counting aloud. Subjects were required to rate the intensity of the pain produced by the Forgaine-Barber pain stimulator at one minute into and at the end of the two minute exposure to pain. The posttest was also followed by an interview. During the first minute of exposure to pain, listening to a story and adding aloud groups reported significantly lower pain ratings than counting or control subjects. By the end of the second minute of exposure to the pain, however, the differences were no longer significant. A posttest questionnaire revealed no significant differences in the percentage of time subjects thought about the pain. Interviews showed that most subjects used their own cognitive strategies on the pretest and that control subjects also used a cognitive strategy for pain control on the posttest. Barber and Cooper cautioned future researchers to be aware that the superiority of one cognitive strategy over another may diminish as exposure to pain is prolonged. They also stated that research which does not take into account the spontaneous strategies employed by subjects may be seriously flawed.

Another study reporting results which do not support the majority or previous work was performed by Kegel (1977). Four variables were considered for analysis: 1) Pleasantness of cognitive strategy, 2) relevance of strategy to painful stimulus, 3) degree of experimenter definition of strategy, and 4) anxiety level as measured by galvanic skin response. Male and female college age subjects were exposed to a maximum of six minutes of cold pressor induced pain during which quitting time, pain threshold, pain intensity rating, and pain intensity rating at quit point were recorded. No significant correlations were found between the four variables considered and the four measures taken.

Relationship Between Associative Cognitive Strategy and Experimentally-Induced Pain

A few studies relating to cognitive control of pain have used at least one treatment condition which fit the category of association. Beers and Karoly (1979) compared four different strategies for pain control: 1) Task irrelevant (count backwards from 1,000 by 3's), 2) incompatible imagery (imagine a warm, pleasant scene during the cold pressor test), 3) compatible imagery (imagine a pleasant, cold-related scene), and 4) rational thinking (make positive self-statements which emphasized the positive and minimized the negative aspects of the cold pressor test). Analysis revealed significant increases in pain tolerance for all four experimental treatments. The rational thinking condition, it seems, approached an associative strategy to pain control because subjects appraised their feelings of pain and emphasized their ability to successfully cope with the pain.

Another study utilizing associative cognitive strategies was conducted by Johnson (1972). Twenty college age male subjects were divided into two groups: 1) Received relevant information about the sensations to expect from the experimentally-induced pain, and 2) received non-relevant information. Pain was produced using the submaximal ischemic tourniquet technique:

> The subject extends non-dominant towards the ceiling. Venous blood is drained by use of an Emarch bandage. Prior to removing the bandage a 3 inch pneumatic tourniquet is placed around the subject's upper arm and inflated to a pressure of 250 mm Hg. The subject

> lowers his arm and after a 60 second pause squeezes a handspring exerciser 20 times. The subject then rests his arm with the tourniquet still inflated (Weisenberg, 1977, p. 1014).

The group receiving relevant information showed significantly lower distress ratings. In a second condition, subjects were given relevant or non-relevant information about what to expect and were further required to either look at and think about their arm during the pain or to distract themselves by reciting multiplication tables. The results showed that focusing on the area of the pain did not reduce distress ratings except when it was paired with relevant information about what to expect. Johnson concluded that accurate expectations about pain were more important than focusing or distraction.

Association and chronic pain. Although the data were not subjected to statistical analysis, Rybstein-Blinchik (1978) hypothesized that reinterpretive cognitive strategies were superior to distraction or focusing on chronic, clinical pain. Subjects were instructed to use one of three strategies: 1) Reinterpret the painful stimuli as non-painful, 2) divert attention to something else, and 3) focus and concentrate on the pain. Measures of strategy effectiveness were subjective pain rating, behavioral observations, and amount of medication requested. Subjects who were instructed to focus on the pain did not report lower pain ratings as did subjects using reinterpretive and distraction strategies.

Conclusions

It is evident that pain tolerance can be altered by cognitive strategies. A wide body of research supports Morgan's (1978) conclusion that pain tolerance can be increased by utilizing dissociative cognitive strategies. Morgan's study, however, stands as the only research to evaluate the effectiveness of dissociative strategies in increasing physical endurance among athletes. Studies which evaluate the effectiveness of associative strategies in improving athletic endurance or performance are non-existent.

Considerable speculation is currently circulating in athletic circles regarding the relative merits of one cognitive strategy over another. A study comparing cognitive strategies was deemed important in so far as it might help to settle the speculation.

CHAPTER III

METHODOLOGY

Subjects and Design

Since speculation concerning running performance or endurance and cognitive strategy is centered on the non-elite runner, "average" runners were designated as the target population. Prior work reported by Morgan (1978) used college age subjects. For these reasons, college age, non-elite runners were solicited for subjects.

Participants for the study were members of two Dynamic Fitness classes at Utah State University. Dynamic Fitness is a course taught by Utah State University's Health, Physical Education and Recreation Department. The class met on a daily basis with Monday, Wednesday and Friday designated as activity days which were spent doing warm-up and flexibility exercises, running, and swimming. Tuesdays and Thursdays were spent in in-class instruction regarding training routines and physiological aspects of fitness. At the time that the study was conducted, class members had been participating in the vigorous exercise and fitness program of the Dynamic Fitness course for 6-8 weeks and were running 3-4 miles on a regular basis as part of the course requirements. Members of the Dynamic Fitness classes therefore met the researcher's criterion for participation in the study.

The first group of subjects (Class A) were members of Dr. Lanny Nalder's Spring Quarter 1980 Dynamic Fitness class which met each day at 10:30 a.m. On the day of the pretest, all 36 class members in attendance were required to complete the timed, 2.75 mile run as part of their regular training program. Class members who did not complete the timed run on the designated day ran the test on the next class meeting day. A total of 45 subjects completed the timed 2.75 mile pretest run.

Following the pretest run, subjects were rank ordered according to times for completion of the run. They were then alternately assigned to one of three treatment groups (control, dissociation, and association) using systematic assignment to achieve near equal pretest mean running times.

All training sessions were conducted during regular class meeting times. During the first training session with each group in Class A, subjects were asked to volunteer to participate in a study about the psychology of running. General questions were answered and subjects were informed of the optional nature of participation in the experiment and their right to withdraw at any time. The Informed Consent Agreement was then completed. (A copy of the Informed Consent Agreement can be found in Appendix A.) No subjects withdrew from the study.

A total of 45 subjects (30 male, 15 female) from Class A began the study. Of the original 15 subjects (8 male, 7 female) in the control group, one was dropped from the study for not attending either of the two training sessions and three were dropped from the study because they did not complete the posttest run on the scheduled day. Eleven subjects (6 male, 5 female) comprised the control group.

The dissociation group in Class A originally had 15 subjects (10 male, 5 female), but one subject was dropped for not attending the training sessions and two did not complete the posttest on the required day. Twelve subjects (7 male, 5 female) comprised the dissociation group.

The association group in Class A also began with 15 subjects (12 male, 3 female). Two subjects were dropped from the study for not completing the posttest on the required day. Thirteen subjects (11 male, 2 female) comprised the association group.

A total of 36 subjects (24 male, 12 female) from Class A completed the experiment and were included in analysis of the results.

A second group of subjects (Class B) were members of Ms. Frankie Clark's Spring Quarter 1980 Dynamic Fitness class which met daily at 11:30 a.m. Class B began the experiment one week later than Class B. The researcher met with the class prior to the pretest timed run and asked class members to volunteer to participate in a study about the psychology of running. General questions were answered and subjects were informed of the optional nature of participation in the experiment and their right to withdraw at any time. The Informed Consent Agreement was then completed.

A total of 39 (out of 51) class members from Class B volunteered to participate in the study. Following the pretest run, held during regular class time, subjects were rank ordered by pretest running time and assigned to a group using systematic assignment. The control group was comprised of 13 subjects (6 male, 7 female) originally, but three subjects were dropped from the study for not completing the posttest run on the required day. Subjects who did not complete the posttest run on the required day were dropped to insure that posttest weather conditions would be the same for all subjects within Classes A and B and to maintain a standard time interval between first training session and the posttest run for each group. Ten subjects in the control group (6 male, 4 female) completed the study.

Of the original 13 members (6 male, 7 female) of the dissociation group, 10 completed the study (6 male, 4 female). Two subjects were dropped from the study because they did not complete the posttest on the required day, and one subject who completed the posttest was ill with stomach flu during the run and requested to be dropped from the study.

The association group in Class B was also originally comprised of 13 members (4 male, 9 female). Eight subjects completed the study (1 male, 7 female). One subject dropped the Dynamic Fitness class from his schedule and four group members did not complete the posttest run on the required day.

Subjects in both Class A and Class B were asked to limit their discussion of the experiment with members of other groups and with other students enrolled in the Dynamic Fitness classes. They were also informed that the results of the experiment would be made available to them upon request at the completion of the study. The researcher met with members of Class B at the completion of the study and explained the details and tentative findings of the experiment. Although similar information was offered to members of Class A, Class A's instructor did not request that the results be reviewed with his class. This was in part because the posttest questionnaire made the specific purpose of the experiment quite clear.

Measures

The 2.75 mile course used for the pretest and posttest runs was measured using a bicycle wheel with revolution counter. The course was measured by the researcher walking with the wheel on the pavement of the road approximately one foot from the left-hand curb or edge of the pavement.

The course began on 7th North Street on the Utah State University campus in Logan, Utah, at a point directly south of the southeast corner of the Health, Physical Education and Recreation (HPER) building. It proceeded east on 7th North to 12th East; then northward on 12th East to 14th North; then west on 14th North to 8th East; then south on 8th East to 7th North; then east on 7th North to the point of origin. The course was run entirely on asphalt road surfaces and included flat, downhill, and uphill sections.

Temperature readings for the pretest and posttest runs were taken using a standard laboratory thermometer. Relative humidity readings were obtained using an Abbeon Certified Hygrometer, Model No. AB 167.

Pretest and posttest times were measured in minutes and seconds using an electronic stopwatch with digital display.

A posttest questionnaire was initially administered to five persons not involved in the study to determine if directions and questions were clear and easily understood. Minor revisions in the directions for control group members were necessary. The posttest quetionnaire was administered, following the posttest run, to each group participating in the experiment. The questionnaire requested information concerning: 1) Strategy used during posttest run, 2) degree and percentage of time strategy was used, 3) running experience prior to the Dynamic Fitness class, 4) extent to which subjects were aware of other group's treatment, 5) effect knowledge of other group's treatment had on strategy used on posttest run, and 6) cognitive strategy used prior to participation in the experiment. A copy of the posttest questionnaire for each group can be found in Appendix B.

Procedures

Pretest. As previously noted, members of Class A were not informed of the experiment until after the 2.75 mile pretest run had been completed. The 2.75 mile run was, however, included as part of the regular course curriculum. Although this difference existed between Class A and Class B pretest runs, the following procedures were followed for both classes.

As part of the exercise routine on activity days, all Dynamic Fitness class members performed warm-up exercises. On the day of the pretest, class members performed stretch exercises to prepare them for the running activity. Class A members were permitted to perform exercises on their own, under supervision of the course instructor. Class B members were lead through a set exercise routine by the instructor.

After the warm-up exercises, the researcher was introduced by name to the subjects and were told that he would explain the course for the day's timed run and would be recording their times at the completion of the run, or would announce times and have students record their own time.

The researcher then carefully explained the route of the course, with which most subjects were familiar, and asked for questions about the route. Subjects were then lead to the starting line of the course and given the following specific verbal instructions:

"You will be timed today during this 2.75 mile run. It is important that you do your best and run the course as quickly as possible. Are there any questions about the route? Are you ready? Get set. Go!"

Subjects then completed the course and time for completion was recorded in minutes and seconds by the researcher.

The temperature for the pretest run in Class A was 59° and the relative humidity was 69%. The wind was calm. The temperature for the pretest run in Class B was 61° and the relative humidity was 63%. The wind was calm.

Following the pretest, subjects were encouraged to perform various cooldown exercises and were instructed to keep walking for a few minutes to prevent muscle soreness and stiffness.

Treatment. As previously stated, subjects were assigned to groups using a systematic assignment based on pretest time. On the first activity class period following the pretest, the researcher met with each class during the time alloted for warm-up exercises. He informed study participants of their group assignment by number only. Group 1 served as control subjects, Group 2 subjects received training in dissociation, and Group 3 subjects received training in association.

Since the Dynamic Fitness classes had three activity days each week, Monday, Wednesday and Friday, the training sessions were carried out over a two-week period and the researcher met with each of the three groups twice. It was felt that two training sessions, accompanied by four regular class physical activity days would be long enough to permit subjects to develop the designated strategies. During the first week of treatment, Group 2 met with the researcher on Monday, Group 3 on Wednesday, and Group 1 on Friday. During the second week of treatment, Group 3 met with the researcher on Monday, Group 1 on Wednesday, and Group 2 on Friday.

All training sessions were conducted at the Ralph Maughan Track Stadium on the Utah State University campus on good days and in the George Nelson Fieldhouse on days with poor weather conditions. The Track Stadium has a standard 440-yard circular track and the Fieldhouse contains an indoor 220-yard track.

Control group. Members of the control group in both Class A and B received all training sessions at the Track Stadium.

Session 1. Upon arrival at the track, a record was made of those in attendance. Subjects were allowed to perform their own exercise routine to insure adequate warm-up. Class A subjects, and as a review for Class B subjects, received the following outline of the experiment: "You will meet with me during the next two weeks for one day each week here at the track. While we are at the track we will perform the usual stretch and warm-up exercises to which you are accustomed. I will also meet with other class members here at the track. I would encourage you to limit your discussion of the experiment with other class members and members of other Dynamic Fitness classes. It will help me considerably if you would cooperate with me in this matter. At the completion of the experiment in two weeks, I will share the details of the experiment if you would like." Class A subjects then completed the Informed Consent Agreement. Class B subjects had completed the form previously.

Control group subjects were then instructed to run two laps around the track (880 yards) at their own speed. They were told that they would not be timed and were to perform some cooldown exercises after completion of the 880-yard run. Subjects then performed the run.

Following the run, while subjects were doing the cooldown exercises, the researcher interacted with individual subjects in an informal manner, asking such questions as: "How long have you been running?" or "How are you feeling today?" An effort was made to include all group members in the informal interaction. Interaction with the subjects and cooldown exercises were limited to five minutes from the time that the last subject completed the 880-yard run. The subjects were then instructed to complete another 880-yard run at their own pace, which was to be followed with cooldown exercises. Following the second 880-yard run, cooldown exercises were performed and the researcher again interacted informally with all subjects. They were reminded to limit their discussion of the experiment with other Dynamic Fitness class members. They were also told that they would meet at the track again on the following Wednesday.

Session 2: The second training session with control group members was identical to the first session with two exceptions: 1) The Informed Consent Agreement had already been completed, and 2) the second run of the training session was 1760 yards (one mile) instead of 880 yards. At the completion of the session, subjects were reminded that they would be running the 2.75 mile course again on the following Monday and were asked again to limit their interaction with other class members concerning the experiment.

It was noted during the control group training session that some of the group members thought that running on the track was not as personally rewarding as a similar workout on the road. Subjects also had a tendency to run the 880-yard and one mile distances at a pace much faster than they would have when completing a longer workout run.

Dissociation group. Members of the dissociation group in Class A received both training sessions at the Track Stadium. Class B dissociation group members had one training session at the Track Stadium and one in the Fieldhouse.

Session 1: Upon arrival at the Track Stadium or Fieldhouse, a record was made of those in attendance. Subjects were then allowed to perform their own exercise routine to insure adequate warm-up. Class A and Class B subjects were given a brief outline of the experiment using the same instructions given the control group. Class A members then completed the Informed Consent Agreement.

The researcher then informed the subjects that, during the next two weeks, they would be asked to attempt to learn a new way of thinking while they ran. The process of dissociation was introducted in the following manner: "Many of you have already become aware of thinking about specific things while you run. One popular mental strategy, used by many marathoners, is called dissociation. By dissociation, I mean the ability to mentally block out the physical sensations of fatigue, discomfort and pain which are often experienced while running."

Examples of strategies used by runners were then discussed. The strategies discussed were some of those cited by Morgan (1978), such as retracing your educational career during running or mentally building a house from blueprint to finish while running. The subjects were also told that some people have been successful with dissociation by keeping a song or a specific piece of music playing in their mind while they ran.

A suggested strategy, similar to the one used by Morgan (1978) in his study of dissociation, was then explained. The subjects were told that they might try to find a point to visually concentrate on while they ran. They should also keep their breathing in synchrony with their leg movements and repeat the word "go" every other time their right foot struck the track surface. The subjects were, however, told they could develop their own strategies if the suggested strategy did not seem to be effective.

Subjects were then instructed to complete an 880-yard run, two laps around the outdoor track or four laps around the indoor track, and to practice a dissociation strategy as they ran. Subjects were instructed to complete the run at their own speed.

After completion of the 880-yard run, subjects were encouraged to do cooldown exercises. During the cooldown exercise period, limited to five minutes from the time the last subject completed the run, a discussion was conducted by the researcher to assess the success subjects had in employing a dissociative strategy. Questions posed were: "Were you able to dissociate?" "What worked for you personally?" "What didn't work, and what distracted you or brought your thinking back to the sensations of running?" and "What suggestions can you make for other group members?"

Following the discussion, all subjects completed a second 880-yard run at their own speed and were again encouraged to practice the dissociation strategy. They were urged to achieve a higher degree of dissociation on the second run.

Following the second 880-yard run, all subjects were encouraged to perform cooldown exercises and a discussion was conducted to provide the opportunity for subjects to share what worked or what didn't work for them while trying to dissociate. The researcher directed questions to subjects who had previously reported difficulty dissociating in an effort to ascertain whether any changes had been experienced. Also, an effort was made to include all group members in the discussion.

Subjects were then reminded to limit their discussion of the experiment with other class members and were told that they would meet with the researcher again on the following Friday. They were asked to practice dissociating during other running they might do as part of the Dynamic Fitness class or on their own.

Session 2: The second training session for the dissociation group was similar to the first training session. In a group discussion prior to beginning the first 880-yard run, however, subjects were asked to relate their success or failure in using the strategy during other training runs. Attendance was also recorded.

Following warm-up exercises, subjects completed an 880-yard run at their own pace. After the 880-yard run, subjects, as a group, reported their success or failure in using the strategy or related strategies which had been particularly effective. Following the five minute break in which cooldown exercises were performed and the discussion was conducted, subjects completed a 1760-yard (one mile) run on the track at their own speed. The one mile run was also followed by cooldown exercises and a group discussion, both lasting five minutes from the time the last subject completed the one mile run.

Prior to dismissal, subjects were reminded to limit their discussion of the experiment with other class members, to practice the strategy of dissociation in any training runs they might make, and were told that they would be running the 2.75 mile course again on the following Monday.

During the dissociation training sessions, a variety of strategies was developed by the subjects. One subject practiced sign language while she ran, increasing her speed of signing as her leg movements increased in speed. Several subjects reported having success in dissociating by synchronizing their breathing with their leg movements. Subjects reported having success with planning future activities as a means of dissociation, but had difficulty concentrating on past events because they often lost their train of thought or repeated the same event or sequence over and over.

A common complaint by the subjects was that the 880-yard and one mile runs were not long enough to develop a dissociation strategy and use it with any degree of depth. It was also reported that being passed by or passing another runner made it difficult to dissociate. Problems were also reported by subjects who claimed that they were trying so hard to dissociate that they became more aware of their body sensations. Some subjects reported difficulty in dissociating when they ran faster than normal, which seemed to be common while performing workouts on the track.

Association group. Members of the association group in Class A received one training session at the Track Stadium and one in the Fieldhouse. Class B association group members received both training sessions at the Track Stadium.

Session 1: Upon arrival at the Track Stadium or Fieldhouse, a record was made of those in attendance. Subjects were then allowed to perform their own exercise routine to insure adequate warm-up. Class A and Class B subjects were given a brief outline of the experiment using the same instructions given the control group. Class A members then completed the Informed Consent Agreement.

The researcher then informed the subjects that, during the next two weeks, they would be asked to attempt to learn a new way of thinking while they ran. The process of association was introduced in the following manner: "Many of you have already become aware of thinking about specific things while you run. One popular mental strategy, used by many marathoners, is called association. By association, I mean the ability to mentally focus on the sensations of fatigue, discomfort and pain which are often experienced while running. It may include making slight adjustments in style to improve efficiency or maximize performance as required by focusing on body sensations".

Examples of strategies used by runners were then discussed. The strategies discussed were those reported by Morgan and Pollock (1977). Subjects were told to remind themselves to relax, to "hang loose", and "don't tie up". They were told that they might try reading their calves and thighs and to pay attention to their breathing. In addition, the researcher suggested that the subjects perform a mental body check as they ran, saying to themselves: "Are the feet okay? Calves okay? Knees okay?" and etc. Emphasis was placed on remaining relaxed and efficient. The subjects were, however, encouraged to develop their own strategy if the suggested strategies did not seem to be effective in helping them focus on their body sensations while they ran.

Subjects were then instructed to complete an 880-yard run, two laps around the outdoor track or four laps around the indoor track, at their own speed. They were asked to practice an associative strategy as they ran.

After completion of the 880-yard run, subjects were encouraged to do cooldown exercises. During the cooldown exercise period, which was limited to five minutes from the time the last subject completed the run, a group discussion was conducted by the researcher to assess the success subjects had in employing an associative strategy. Questions posed were: "Were you able to associate?" and "What suggestions can you make for other group members?"

Following the discussion, all subjects completed a second 880-yard run at their own speed and were again encouraged to practice the associative strategy. They were also urged to achieve a higher degree of association during the second run.

Following the second 880-yard run, all subjects were encouraged to perform cooldown exercises and a group discussion was conducted to provide subjects with the opportunity to share what had worked or what didn't work while trying to associate. The researcher directed questions to subjects who had previously reported difficulty associating in an effort to ascertain whether any changes in ability to associate had been experienced. An effort was also made to include all group members in the discussion.

Subjects were then reminded to limit their discussion of the experiment with other class members and were told that they would meet with the researcher again on the following Monday. They were also asked to practice associating during other running they might do as part of the Dynamic Fitness class or on their own.

Session 2: The second training session for the association group was very similar to the first training session. In a group discussion prior to beginning the first 880-yard run, however, subjects were asked to relate their success or failure in using the strategy during other training runs. Attendance was also recorded.

Following the warm-up exercises, subjects completed an 880-yard run at their own pace. After the 880-yard run, subjects reported their success or failure in using the strategy or related strategies which had been particularly effective. Following the five-minute break in which cooldown exercises were performed and the discussion was conducted, subjects completed a 1760-yard (one mile) run on the track at their own speed. The one mile run was also followed by cooldown exercises and a discussion, lasting five minutes from the time the last subject completed the one mile run.

Prior to dismissal, subjects were reminded to limit their discussion of the experiment with other class members, to practice the strategy of association in any training runs they might make, and were told that they would be running the 2.75 mile course again on the following Monday.

During association training many of the subjects complained that associating made running more unpleasant and difficult. A few subjects also reported having difficulty focusing on their body sensations, being constantly aware of the mental effort it took to maintain concentration. A few of the subjects' strategies for association were discouraged by the researcher because, in his mind, they were more dissociative than associative. One such strategy was reported by a subject who imagined himself being a steam engine, being driven along by powerful bursts of strength in his legs.

Posttest

On the day of the posttest, all subjects were allowed to perform their normal warm-up exercise routine. Subjects in Class A performed their own exercises under the instructor's supervision. Class B subjects were lead through a set routine of warm-up exercises by the instructor.

After the warm-up exercises were completed, the researcher met with all subjects and reviewed the course of the 2.75 mile run. The subjects were then divided into their respective groups for separate instructions from the researcher. While the researcher met with each group separately, the remaining groups continued to do warm-up exercises.

Control group subjects received the following instructions: "Today, as you know, we will be running the 2.75 mile course again. Are there any questions about the route of the course? You will be timed, so it is important that you do your best and run the course as quickly as you possibly can".

Dissociation group subjects were instructed as follows: "Today, as you know, we will be running the 2.75 mile course again. Are there any questions about the course? You will be timed, so it is important that you do your best and run the course as quickly as you possibly can. Remember, you have been learning to dissociate while running, and I want you to practice dissociating while you run today".

Association group subjects' instructions were as follows: "Today, as you know, we will be running the 2.75 mile course again. Are there any questions about the course? You will be timed, so it is important that you do your best and run the course as quickly as you possibly can. Remember, you have been learning to associate while running, and I want you to practice associating while you run today".

Subjects then walked to the starting line and were told by the researcher that all of them would be asked to complete a questionnaire after completing the timed run. All subjects were then given the following verbal instructions: "You will be timed again today during this 2.75 mile run. It is important that you do your best and run the course as quickly as possible. Are there any questions about the route? Are you ready? Get set. Go!"

Subjects then completed the course and time for completion was recorded in minutes and seconds by the instructor. Subjects were also encouraged to do cooldown exercises after the run.

The temperature and relative humidity readings were very different for Class A and Class B on the posttest. During Class A's posttest the temperature was 48° and the relative humidity was 74%. A light rain was falling, but the wind was calm. Class B's posttest run was performed during 66° temperatures, with no rain, and a relative humidity reading of 64%. The wind was calm.

Subjects then completed the posttest questionnaire under the supervision of the researcher. All questionnaires were handed out and completed in the Human Performance Laboratory in the HPER building at Utah State University immediately following completion of the timed posttest run. Questionnaires were completed and received from all subjects who completed the posttest run.

A summary of procedures is presented in diagram form in Appendix C.

Statistical Analysis

All analyses were computed using the Statistical Package for the Social Sciences at Utah State Unversity's Computer Services Center.

Due to previously explained differences in subject recruitment and posttest weather condition differences between Class A and Class B, analysis of the data was computed separately for each class.

Hypotheses 1, 2, and 3 were tested with analysis of covariance. The mean posttest time, by group, was analyzed using pretest time as a covariate. The alpha level was set at .05.

Questionnaire information regarding reported use of dissociative or associative cognitive strategies was converted to a single score in the following manner: Subjects were asked to report degree and percentage of time during the posttest run to that degree, for use of the dissociative and/or associative strategies. Degree of strategy use and percentage of time to that degree were treated as follows:

Degree of strategy use	Percentage of time						"Points"
"Not at all"	0	20	40	60	80	100	0
"Very little"	0	20	40	60	80	100	1
"Moderately"	0	20	40	60	80	100	2
"To a large degree"	0	20	40	60	80	100	3
"Completely"	0	20	40	60	80	100	4

The percentage of time at each degree of use was multiplied by the "point" value at each level. Points were then totaled, yielding a single score for dissociation and/or association points.

The posttest questionnaire also asked subjects to indicate their experience in running prior to the Dynamic Fitness class and average miles per week during the past year. Subjects were asked to indicate how much knowledge they had about what the other experimental groups were being taught and how much their knowledge effected the cognitive strategy they used on the posttest run. Subjects rated their knowledge and the effect of knowledge on strategy used on a one (not at all) to five (completely) scale. Subjects were also asked to indicate the cognitive strategy they normally used prior to participating in the experiment.

Data from the posttest questionnaire was also subjected to statistical analysis. Pearson product-moment correlations were computed for all groups to determine if difference between pretest and posttest time was correlated with: 1) Reported use of dissociation, 2) reported use of association, 3) reported knowledge of treatment received by other groups, and 4) reported effect of that knowledge of treatment received by other groups had on cognitive strategy used during the posttest run.

Also, to determine if reported knowledge of treatment received by other groups differed significantly between groups, analysis of variance was computed. The alpha level was set at .05.

To determine if reported effect of knowledge of treatment received by other groups on strategy used on the posttest run differed significantly between groups, analysis of variance was computed. The alpha level was set at .05.

To determine if reported prior cognitive strategy of control group subjects was significantly related to the number of dissociation points received on the posttest questionnaire, analysis of variance was computed. Alpha was set at .05.

To determine if reported prior cognitive strategy of control group subjects was significantly related to the number of association points received on the posttest questionnaire, analysis of variance was computed. The alpha level was set at .05.

The difference in mean dissociation points on the posttest questionnaire between subjects in the dissociation group who reported having previously used dissociative, associative, or other cognitive strategies was analyzed using analysis of variance. The alpha level was set at .05.

The difference in mean association points on the posttest questionnaire between subjects in the association group who reported having previously used dissociative, associative, or other cognitive strategies was analyzed using analysis of variance. The alpha level was set at .05.

In order to determine if a significant difference in mean dissociation points on the posttest questionnaire existed between control group and the dissociation group, a *t*-test for independent means was computed. The alpha level was set at .05.

In order to determine if a significant difference in mean association points on the posttest questionnaire existed between control group and the association group, a _t_-test for independent means was computed. The alpha level was set at .05.

CHAPTER IV

RESULTS

Tests of Hypotheses

It will be recalled that the following hypotheses were central to the study:

1. There is no significant difference in the time required to complete a 2.75 mile run between control group subjects and subjects who received training in the use of a dissociative cognitive strategy.

2. There is no significant difference in the time required to complete a 2.75 mile run between control group subjects and subjects who received training in the use of an associative cognitive strategy.

3. There is no significant difference in the time required to complete a 2.75 mile run between subjects who received training in the use of a dissociative cognitive strategy and subjects who received training in the use of an associative cognitive strategy.

Pretest and posttest data are reported in Table 1. Analysis of covariance, with pretest time as the covariate, revealed no statistically significant differences in posttest times among groups. Hypotheses 1, 2, and 3 were, therefore, retained. The results indicate that instruction in a specific cognitive strategy (dissociation or association) or lack of instruction was not significantly related to time required to complete a 2.75 mile run.

Table 1

Means, Standard Deviations, Adjusted Posttest Means and Correlation Coefficients for Pretest and Posttest Time

Class/Group	PRETEST		POSTTEST			Mean pretest-posttest difference	Pretest-Posttest *r*
	Mean	S.D.	Mean	S.D.	Adjusted Mean		
A							.960
Control	22.03	4.01	21.34	3.56	21.24	-.69	
Dissoc	22.72	4.27	21.68	3.49	20.96	-1.02	
Assoc	21.10	2.97	20.84	3.53	21.58	-.26	
B							.973
Control	23.48	4.86	22.92	4.77	23.60	-.56	
Dissoc	22.49	3.75	21.68	3.48	23.26	-.81	
Assoc	27.37	5.34	26.85	4.71	24.03	-.52	

Table 2

Analysis of Covariance for Posttest Time by Group with Pretest Time as Covariate

Class	Source of Variance	df	MS	F
A	Group	2	1.131	1.111
	Pretest time	1	377.776	371.241
	Residual	32	1.018	
B	Group	2	1.129	0.857
	Pretest time	1	437.837	332.592
	Residual	24	1.316	

Pearson product-moment correlations were computed between difference in pretest-posttest times (DIFF) and dissociation points (DISSOC), association points (ASSOC), knowledge of treatment received by other groups (KNOL), and reported effect of knowledge of treatment received by other groups on strategy used during posttest run (EFF) (see Table 3). Analysis revealed a significant correlation between dissociation points and difference in pretest-posttest time for members of the dissociation group in both Class A and B (-.51 and -.85, respectively). The correlation coefficients between the listed variables are presented in Table 4.

Table 3

Means and Standard Deviations for
DISSOC, ASSOC, KNOL, and EFF by Group

Class/ Group	DISSOC		ASSOC		KNOL		EFF	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
A								
Control	121.82	85.067	100.00	65.115	1.72	0.786	1.45	1.036
Dissoc	171.667	102.144	--	--	1.83	0.718	1.67	0.985
Assoc	--	--	247.692	66.603				
B								
Control	166.00	83.293	100.00	77.172	1.80	1.229	1.20	0.422
Dissoc	200.00	63.246	--	--	1.30	0.675	1.50	0.972
Assoc	--	--	265.00	73.873	1.50	0.535	1.50	0.756

--dissociation group members did not rate themselves on association, and association group members did not rate themselves on dissociation

Table 4

Correlation Between DIFF, DISSOC, ASSOC, KNOL, and EFF

Class/ Group	DIFF-DISSOC	DIFF-ASSOC	DIFF-KNOL	DIFF-EFF	Degrees of Freedom	_r_ necessary for significance at .05
A						
Control	.42	-.13	.20	.28	10	.58
Dissoc	-.57*	--	-.51	.22	11	.55
Assoc	--	.17	.00	-.04	12	.53
B						
Control	.19	-.27	-.39	.47	9	.60
Dissoc	-.85**	--	.29	-.17	9	.60
Assoc	--	-.44	-.03	.21	7	.67

*significant at the .05 level.
**significant at the .01 level.
--dissociation group members did not rate themselves on association, and association group members did not rate themselves on dissociation, thus no correlation coefficients are reported.

Analysis of variance between groups for knowledge of treatment received by other groups (KNOL) revealed no significant differences. Means and standard deviations are presented in Table 5. A summary of analysis of variance findings is presented in Table 6.

Table 5

Mean and Standard Deviation for
KNOL by Group

Class/ Group	Mean	Standard Deviation
A		
Control	1.72	0.786
Dissoc	1.83	0.718
Assoc	2.23	1.235
B		
Control	1.80	1.229
Dissoc	1.30	0.675
Assoc	1.50	0.535

Table 6

Analysis of Variance for KNOL Between Groups

Class	Source of Variance	d.f.	M.S.	F
A	Between Groups	2	0.866	0.948
	Within Groups	33	0.914	
B	Between Groups	2	0.632	0.802
	Within Groups	25	0.788	

Analysis of variance between groups for reported effect of knowledge of treatment received by other groups on strategy used during posttest (EFF) revealed no significant differences. Means and standard deviations are presented in Table 7. A summary of the analysis of variance findings is presented in Table 8.

Table 7

Means and Standard Deviations
for EFF by Group

Class/Group	Mean	Standard Deviation
A		
Control	1.45	1.036
Dissoc	1.67	0.985
Assoc	1.62	1.044
B		
Control	1.20	0.422
Dissoc	1.50	0.972
Assoc	1.50	0.756

Table 8

Analysis of Variance for
EFF Between Groups

Class	Source of Variance	d.f.	M.S.	F
A	Between Groups	2	0.140	0.134
	Within Groups	33	1.045	
B	Between Groups	2	0.289	0.513
	Within Groups	25	0.564	

Analysis of variance of subjects' mean reported prior cognitive strategy (PRIOR) and dissociation points on the posttest run (DISSOC) for control group members revealed no significant differences at the .05 level. It appears, then, that prior cognitive strategy did not have a significant relationship with reported degree of dissociation on the posttest run. Means and standard deviations are presented in Table 9. A summary of the analysis of variance findings is presented in Table 10.

Table 9

Means and Standard Deviations for DISSOC
by PRIOR for Control Group

Class	Prior Strategy	Mean	Standard Deviation	n
A	Association	66.67	23.09	3
	Dissociation	88.26	88.26	7
	Other	40.00	--	1
B	Association	140.00	141.42	2
	Dissociation	183.33	86.18	6
	Other	140.00	28.28	2

Table 10

Analysis of Variance for DISSOC
by PRIOR-Control Group

Class	Source of Variance	d.f.	M.S.	F
A	Between Groups	2	12277.06	2.054*
	Within Groups	8	5976.19	
B	Between Groups	2	2253.33	0.272
	Within Groups	7	8276.19	

*df = 2/8: F .05 = 4.46

Analysis of variance of subjects' mean reported prior cognitive strategy (PRIOR) and association points on the posttest run (ASSOC) for control group members revealed no significant difference at the .05 level. It appears, then, that prior cognitive strategy did not have a significant relationship with reported degree of association on the posttest run. Means and standard deviations are presented in Table 11 and a summary of the analysis of variance findings is presented in Table 12.

Table 11

Means and Standard Deviations for ASSOC
by PRIOR for Control Group

Class	Prior Strategy	Mean	Standard Deviation	n
A	Association	160.00	69.28	2
	Dissociation	71.42	51.46	8
	Other			0
B	Association	130.00	155.56	2
	Dissociation	73.33	57.50	6
	Other	150.00	42.43	2

Table 12

Analysis of Variance for ASSOC
by PRIOR-Control Group

Class	Source of Variance	d.f.	M.S.	*F*
A	Between Groups	2	8457.14	2.655*
	Within Groups	8	3185.71	
B	Between Groups	2	5533.33	0.911
	Within Groups	7	6076.19	

*df = 2/8: $F_{.05} = 4.46$

Analysis of variance between subjects' reported prior cognitive strategy (PRIOR) and dissociation points on the posttest run (DISSOC) for dissociation group members revealed no significant difference at the .05 level. For dissociation group members it appears prior cognitive strategy had no significant relationship with reported degree of dissociation on the posttest run. Means and standard deviations are presented in Table 13 and a summary of the analysis of variance findings is presented in Table 14.

Table 13

Means and Standard Deviations for DISSOC
by PRIOR for Dissociation Group

Class	Prior Strategy	Mean	Standard Deviation	n
A	Association	260.00	28.28	2
	Dissociation	155.00	115.51	8
	None	180.00		1
	Other	120.00		1
B	Association	165.00	34.16	4
	Dissociation	255.00	61.91	4
	None	140.00		1
	Other	180.00		1

Table 14

Analysis of Variance for DISSOC
by PRIOR-Dissociation Group

Class	Source of Variance	d.f.	M.S.	F
A	Between Groups	3	6855.56	0.582
	Within Groups	8	11775.00	
B	Between Groups	3	7000.00	2.800*
	Within Groups	6	2500.00	

*df = 3/6: F .05 = 4.76

Analysis of variance of subjects' reported prior cognitive strategy (PRIOR) and association points on the posttest run (ASSOC) for association group members revealed no significant difference at the .05 level. It appears that prior cognitive strategy did not have a significant relationship with association points for the posttest run for association group members. Means and standard deviations are presented in Table 15 and a summary of the analysis of variance findings is reported in Table 16.

Table 15

Means and Standard Deviations for ASSOC
by PRIOR for Association Group

Class	Prior Strategy	Mean	Standard Deviation	n
A	Association	260.00	107.08	4
	Dissociation	242.22	47.38	9
B	Association	286.67	41.63	3
	Dissociation	252.00	90.11	5

Table 16

Analysis of Variance for ASSOC
by PRIOR-Association Group

Class	Source of Variance	d.f.	M.S.	*F*
A	Between Groups	1	875.21	0.184
	Within Groups	11	4759.60	
B	Between Groups	1	2253.33	0.376
	Within Groups	6	5991.11	

T-tests for independent means were computed between dissociation points for control group members and dissociation group members to determine if significant differences existed. No differences at the .05 level were found. This indicates that control group subjects, who did not receive dissociative training, did not differ statistically in their reported degree of dissociation on the post-test run from dissociation group members. A summary of *t*-test findings is presented in Table 17.

Table 17

t-tests for DISSOC Between Control Group and Dissociation Group

Class/Group	Mean	S.D.	d.f.	t value	2-tail probability
A Control	121.82	85.07	21	-1.27	0.220
Dissoc	171.67	102.14			
B Control	166.00	83.29	18	-1.03	0.318
Dissoc	200.00	63.45			

T-tests for independent means were computed between association points for control group members and association group members to determine if significant differences existed. A significant difference ($p < .01$) was found. This indicates that control group subjects, who did not receive associative training, had a statistically significant lower reported degree of association on the posttest run than association group members. A summary of _t_-test findings is presented in Table 18.

Table 18

_t_-tests for ASSOC Between Control Group and Association Group

Class/Group	Mean	S.D.	d.f.	t value	2-tail probability
A Control	100.00	65.12	22	-5.47	0.001
Assoc	247.69	66.60			
B Control	100.00	77.17	16	-4.59	0.001
Assoc	265.00	73.87			

In summary, the results indicate that teaching of a dissociative or associative cognitive strategy was not significantly related to time required to complete a 2.75 mile run. The extremely high correlation coefficients between pretest time and posttest time (Class A, .960; Class B, .973) indicate that pretest time is the best predictor of posttest time, as would be expected. Significant correlations between pretest-posttest time difference and dissociation points for the dissociation group in Class A and B were discovered. Groups did not differ on reported knowledge of other groups' treatment or effect of knowledge of other groups' treatment on posttest cognitive strategy. In addition, it was found that prior cognitive running strategy was not significantly related to degree of association or dissociation reported on the posttest run. Although dissociation group members received two training sessions for developing and using dissociative cognitive strategies, they did not differ statistically from control group members in their reported degree of dissociation on the posttest run. Association group members, however, reported statistically significant higher degrees of association on the posttest than control group members.

CHAPTER V

DISCUSSION AND CONCLUSIONS

The primary purpose of this study was to investigate the relationship between the teaching of a dissociative or associative cognitive strategy and time required to complete a 2.75 mile run. One group of subjects in each of two Dynamic Fitness classes received training in the development and use of a dissociative cognitive strategy to be used while running. A second group of subjects in both classes received training in the development and use of an associative cognitive strategy to be used while running. Two control groups, one from each of the two classes, were also included in the experiment.

Results indicated that neither of the independent variables, teaching of a dissociative or associative cognitive strategy, was significantly related to time required to complete a 2.75 mile run. The high correlations between pretest and posttest running time (Class A, .960; Class B, .973) may, however, have limited possible treatment effects.

A possible explanation for the lack of a statistically significant relationship between cognitive strategy and running time is that the training runs of one-half and one mile may not have been long enough for the subjects to effectively learn either cognitive strategy. The subjects in the association and dissociation groups were, however, asked by the researcher to practice the strategy during their longer runs which were scheduled as part of the Dynamic Fitness class schedule.

Statistically significant correlations (Class A, -.57; Class B, -.81) were, however, found between pretest-posttest time differences and dissociation points on the posttest questionnaire for dissociation group subjects. This finding indicates that, as the difference between pretest and posttest time decreased, the number of dissociation points tended to increase. All groups showed an improvement in performance (a decrease in running time) on the posttest. It is possible that those subjects who reported using dissociation to a lesser degree may have showed the greatest improvement in performance.

Weather conditions may have played a role in the results obtained in the present study. Class A completed the pretest run and posttest run under very dissimilar conditions (pretest, 59° F., 69% relative humidity, no wind; posttest, 48° F., 74% relative humidity, and a slight rain). The pretest and posttest run weather conditions for Class B were, however, very similar (pretest, 61° F., 63% relative humidity, no wind; posttest, 66° F., 64% relative humidity, no wind). Had the pretest and posttest run weather conditions been more similar for Class A, results may have been different. The effect of weather on performance was not tested in this study.

The lack of a significant relationship between cognitive strategy and running time does not seem to support the results of an earlier study conducted by Morgan (1978) in which he found an average of a 30% increase in time to exhaustion among subjects who had received training in utilization of a dissociative cognitive strategy. However, there were many dissimilarities between the study by Morgan and the present study. Subjects in Morgan's study were walking on a motor-driven treadmill rather than running, they were required by the nature of the experiment to perform at a steady rate of 80% of VO_2 maximum rather than at a self-selected level, and they performed the exercise under laboratory rather than field conditions. The artificiality of the laboratory may have been a significant factor in the results Morgan obtained.

A possible explanation for the finding that training in developing and using a dissociative cognitive strategy to be used while running was not significantly related to time required to complete a 2.75 mile run is raised by the results of previous work done by Scott and Barber (1977). They reported that many subjects in a control group during one of their experiments on cognitive control of pain reported using their own dissociative cognitive strategies. This finding supports the results of interviews with hospitalized persons conducted by Copp (1974) in which it was learned that patients in pain report using a variety of dissociative cognitive strategies for pain management.

A t-test comparing mean dissociation points on the posttest run between control group and dissociation group subjects was computed to determine if a statistically significant difference existed. Despite a point difference (Class A, 50 points; Class B, 34 points), the two group means did not differ statistically in their reported use of a dissociative strategy. It is possible that any relationship which might exist between dissociative cognitive strategy and time required to complete the 2.75 mile run was negated by the fact that control group members reported dissociating to nearly the same degree as dissociation group members.

The present study also included a condition in which subjects received training in developing and using an associative cognitive strategy. Results indicated that this variable was not significantly related to time required to complete a 2.75 mile run. The review of existing literature revealed that prior research in this area had not been reported.

Prior research (Scott & Barber, 1977; Copp, 1974) did, however, lead the writer to expect that association group members and control group members would differ significantly in their reported use of an associative cognitive strategy on the posttest run. Analysis of mean association points on the posttest questionnaire revealed a statistically significant ($p < .01$) difference in the reported use of an associative strategy. This finding supports the notion that the training given to association group members in developing and using an associative strategy was effective in raising their reported association level above the reported association level of control group subjects. Although the difference in association points between control and association subjects was statistically significant, the reader is reminded that statistically significant differences in running time did not exist.

The possibility exists, however, that the training sessions for the control group members may have been less rewarding due to a difference in the nature of the discussion which took place between training runs. The association and dissociation groups may have felt more reinforcement for development of a strategy and for participation in the study. Association and dissociation group members may have been more motivated to exert themselves on the posttest run than control group members, although statistically significant differences in posttest time were not found.

The present study asked subjects to indicate the cognitive strategy they had normally used while running prior to participation in the experiment. Subjects who reported having used a dissociative cognitive strategy prior to participation in the experiment did not differ significantly in their reported level of association or dissociation from subjects who reported previously having used an associative strategy. It appears that prior cognitive strategy was not significantly related to reported level of dissociation or association.

Results of interviews with elite distance runners reported by Morgan and Pollock (1977) indicated, however, that association is the prevalent cognitive strategy used by elite distance runners. In a comparison between world class and non-world class runners, Morgan reported differences in perceived effort at various workloads. In addition, world class runners had significantly lower heart rates, were using a lower percentage of their $\dot{V}O_2$ maximum and had lower lactate levels while running at 12 miles per hour than non-world class runners. Correlation coefficients between perceived effort, heart rate, volume of oxygen expended per minute and lactate level showed lactate accumulation to be the best predictor of perceived effort.

World class runners probably experience less pain while running because of their superior physical conditioning. Concentration on body sensations during running is, therefore, not as uncomfortable as it might be for less well-conditioned runners. Comments made by subjects of the association groups supported this conclusion. Several subjects, during the training sessions, reported that using that associative cognitive strategy made their running much less enjoyable and more difficult.

Non-world class runners, which would certainly include subjects of the present study, have higher heart rates, use a higher percentage of their $\dot{V}O_2$ maximum, and have higher lactate accumulation levels while performing at a given speed compared to world class runners. Non-world class runners may, for that reason, find it difficult to manage the discomfort of performing at high levels of their individual capacity without using some type of cognitive strategy which minimizes the discomfort they feel.

Although very high correlation coefficients between pretest and posttest time for the 2.75 mile run (Class A, .960; Class B, .973) were found, wide variations in pretest/posttest time were also found. The range in Class B's association group for pretest-posttest difference was +2.33 to -2.98 minutes (mean = -.51, standard deviation = 1.82 minutes), for example. Given that instructions for the pretest and posttest runs were similar and that subjects completed the same course for each run, such a large variation is difficult to explain without speculating about the existence of other important variables.

Although it was not considered in the present investigation, the willingness of the subject to exert himself/herself, it would seem, plays an important role in determining running performance. In witnessing the finish of the pretest and posttest runs, the researcher noted that subjects appeared to be exerting themselves at different levels of their individual capacity. Some subjects appeared to be straining to reach their maximum capacity as they approached the finish line, while others seemed content to cross the finish line at some predetermined, submaximal pace. The differences in exertion level were also evident in subjects' reactions after completing the timed runs. Some appeared to be near collapsing, gasping for air and lying down immediately after the run. Others, who had finished at or near the same time, walked around the finishing area and were able to converse with friends and other subjects with little effort.

It is likely that differences in willingness to exert oneself (motivation) existed between subjects. It is also likely that motivation for the pretest and posttest run differed within each subject. Motivation or willingness to exert oneself is difficult to quantify or control. The role of motivation in running performance was untested in this study.

In summary, the writer suggests that the use of a specific cognitive strategy is not significantly related to an improvement in running performance. The cognitive strategy runners use may be a result of a combination of variables, the most important of which may be the fitness level of the individual and his/her individual willingness to exert himself/herself. If running at a certain speed or level in relation to one's individual capacity at the time results in discomfort or fatigue, the individual must make a decision. He/she can either choose to slow down or stop to reduce the discomfort, or he/she can choose to cope with the discomfort by using a cognitive strategy. Dissociation is the more common strategy used for coping with discomfort among runners, although association may also be used. At what level to perform in relationship to one's individual capacity is a decision made by individuals within the limits of their physical condition. The decision of the individual regarding how much he/she will exert himself/herself probably preceeds the selection and use of a specific cognitive strategy.

Limitations of the Study

1. Subjects for the study were college students, which may limit the generalizability of the findings to other populations.

2. The majority of the subjects had not had prior running experience before participating in the Dynamic Fitness classes.

3. The pretest and posttest runs of 2.75 miles were not long enough to allow generalization of the findings to long distance and marathon running.

4. The training time for teaching the cognitive strategies was limited to a two-week period and was limited to two sessions.

5. Subjects were allowed to develop their own specific strategy within the general classifications of association and dissociation. Generalization of the results to studies in which experimenter-determined strategies may be limited.

6. All training of the subjects was performed by the researcher, which may have introducted experimenter bias in some form.

7. Motivation levels for each subject were not assessed to insure that each was performing at the maximum level of which they were capable.

Recommendations

For further study of the relationship between cognitive strategy and running performance, it is recommended that:

1. The relationship between physiological variables (including heart rate, blood pressure and lactate accumulation) and cognitive strategy be investigated.

2. Running ability be included as a variable to determine if cognitive strategy is related to running performance for runners at certain ability levels.

3. A distance longer than 2.75 miles be used to test the relationship between cognitive strategy and running performance.

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APPENDICES

APPENDIX A

INFORMED CONSENT AGREEMENT

Informed Consent Agreement

Utah State University

The Effects of Dissociation and Association Cognitive Strategies on Time Required by Runners to Run 2.75 Miles

I hereby give my consent to participate in a project involving human subjects. I understand that I will be asked to participate in two, timed 2.75 mile runs. I understand the procedure which will be followed in the study and am aware of the discomforts involved in my participation. I will receive answers to my inquiries regarding the project and am free to withdraw my participation in the project at any time.

____________________ ____________________

Name Date

____________________ ____________________

Dana L. Miller Date

APPENDIX B

POSTTEST QUESTIONNAIRES

*For example, if you dissociated moderately 40% of the time, circle 40% under "Moderately" on the dissociation scale. If you focused or associated to a large degree the remaining time, circle 60% under "To a large degree" on the association scale. Your percentage is equal to 100%.

TOTAL PERCENTAGE________________

(should equal 100%)

3. Were you running regularly prior to this quarter's Dynamic Fitness Class? Yes or No (circle one)

   If yes, how long have you been running?

   On the average, how many miles per day have you been running during the past year?__________

4. To what extent were you aware of what the other groups were being taught during the experiment?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

5. To what extent did this knowledge effect the strategy of thinking you used while you ran today?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

6. Before you participated in this experiment, what did you usually think about while you ran?

   A. Focused on my body and the sensations of running.
   B. Tried to think of something else, or block out the sensations.
   C. Nothing
   D. Other (please specify)____

   ____

Name______________________________

GROUP 1 QUESTIONNAIRE

It has been learned that people, when running, usually think about specific things. Some people dissociate from the sensations of running, trying to think of other things or blank their minds out so they don't feel discomfort or fatigue. Other runners handle the discomfort of running by focusing on their body sensations and making slight adjustments in style or reminding themselves to remain relaxed. I am interested in learning to what degree and what percentage of time you focused or tried to blank out the sensations of running during today's run.

The following items ask you to indicate both degree and percentage of time to that degree. Please circle the correct percentages for each degree and make sure that the total of all percentages circled adds up to 100%.*

1. To what degree and what percentage of time to that degree, did you dissociate or blank out the sensations of running during today's run?

DEGREE	PERCENTAGE					
1. Not at all	0	20	40	60	80	100
2. Very little	0	20	40	60	80	100
3. Moderately	0	20	40	60	80	100
4. To a large degree	0	20	40	60	80	100
5. Completely	0	20	40	60	80	100

2. To what degree and what percentage of time to that degree, did you associate or focus on the sensations of running during today's run?

DEGREE	PERCENTAGE					
1. Not at all	0	20	40	60	80	100
2. Very little	0	20	40	60	80	100
3. Moderately	0	20	40	60	80	100
4. To a large degree	0	20	40	60	80	100
5. Completely	0	20	40	60	80	100

Name________________________________

GROUP 2 QUESTIONNAIRE

During the past two weeks, you have received instructions on learning to dissociate or block out the sensations and feelings of discomfort sometimes experienced while running. I am interested in learning to what degree and what percentage of time you dissociated or blocked out the sensations of running during today's run.

The following items ask you to indicate both degree and percentage of time to that degree. Please circle the correct percentage for each degree and make sure the total of the percentages equals 100%.*

1. To what degree and what percentage of time to that degree, did you dissociate or block out the sensations of running during today's run?

DEGREE	PERCENTAGE					
1. Not at all	0	20	40	60	80	100
2. Very little	0	20	40	60	80	100
3. Moderately	0	20	40	60	80	100
4. To a large degree	0	20	40	60	80	100
5. Completely	0	20	40	60	80	100

TOTAL PERCENTAGE__________

*For example: If you were able to dissociate all during the run, you circle 100% under "Completely".

2. Were you running regularly prior to this quarter's Dynamic Fitness Class? Yes or No (circle one)

   If yes, how long have you been running?___________

   On the average, how many miles per day have you been running during the past year?__________

3. To what extent were you aware of what the other groups were being taught during the experiment?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

4. To what extent did this knowledge effect the strategy of thinking you used while you ran today?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

5. Before you participated in this experiment, what did you usually think about while you ran?

   A. Focused on my body and the sensations of running.
   B. Tried to think of something else, or block out the sensations.
   C. Nothing
   D. Other (please specify)____

   ____

Name______________________________

GROUP 3 QUESTIONNAIRE

During the past two weeks, you have received instructions on learning to "associate" or focus on your body and the discomforts sometimes experienced while running. I am interested in learning to what degree and what percentage of time you associated or focused on your body during today's run.

The following items ask you to indicate both degree and percentage of time to that degree. Please circle the correct percentage for each degree and make sure the total of the percentages equals 100%.*

1. To what degree and what percentage of time to that degree did you associate or focus on your body and its sensations during today's run?

DEGREE	PERCENTAGE					
1. Not at all	0	20	40	60	80	100
2. Very little	0	20	40	60	80	100
3. Moderately	0	20	40	60	80	100
4. To a large degree	0	20	40	60	80	100
5. Completely	0	20	40	60	80	100

TOTAL PERCENTAGE__________

*For example: If you were able to focus completely all during the run, you circle 100% under "Completely".

2. Were you running regularly prior to this quarter's Dynamic Fitness Class" Yes or No (circle one)

   If yes, how long have you been running?__________

   On the average, how many miles per day have you been running during the past year?__________

3. To what extent were you aware of what the other groups were being taught during the experiment?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

4. To what extent did this knowledge effect the strategy of thinking you used while you ran today?

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Completely

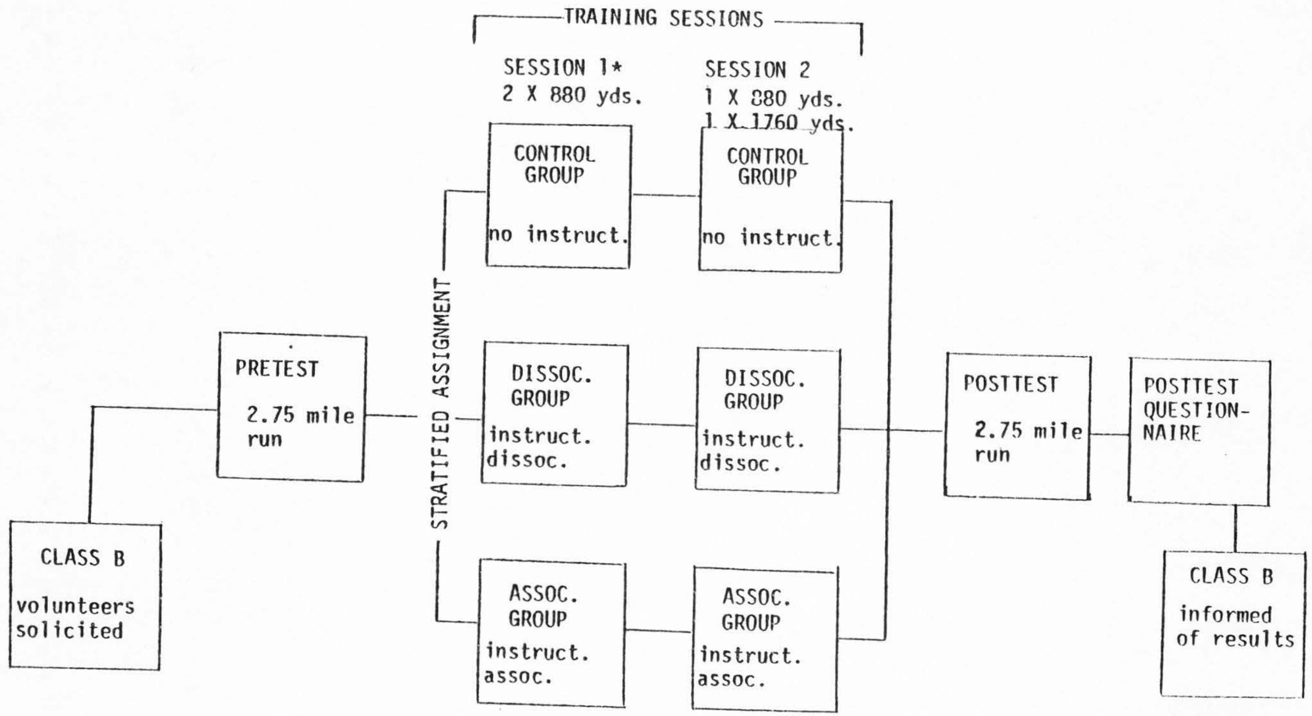
5. Before you participated in this experiment, what did you usually think about while you ran?

   A. Focused on my body and the sensations of running.
   B. Tried to think of something else, or block out the sensations.
   C. Nothing.
   D. Other (please specify)____

   ____

APPENDIX C

DIAGRAM OF PROCEDURES



*Members of Class A were solicited as volunteers in Session 1