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Effects of natural and urben settings on moods and cognitions of female runners

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EFFECTS OF NATURAL AND URBAN SETTINGS ON MOODS AND COGNITIONS OF FEMALE RUNNERS

A Thesis

Presented to

The Faculty of the Department of Human Performance

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Ted M. Butryn

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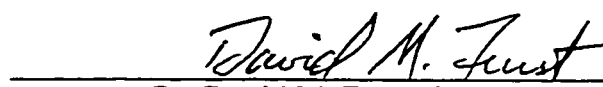
APPROVED FOR THE DEPARTMENT OF HUMAN PERFORMANCE



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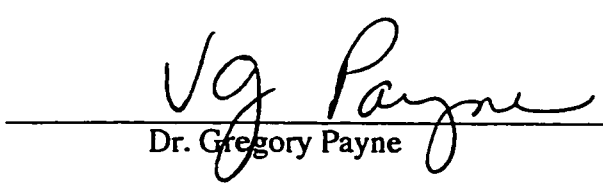

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ABSTRACT

EFFECTS OF NATURAL AND URBAN SETTINGS ON MOODS AND COGNITIONS OF FEMALE RUNNERS

By Ted M. Butryn

This study investigated the effects of park and urban settings on the moods and cognitive strategies of female distance runners. Prior to and following each 4-mile training run, 30 subjects completed questionnaires pertaining to demographic information, moods, cognitions, and preferred run setting. Results indicated that mood improved significantly following the run, regardless of the setting. There was also a strong relationship between positive mood change and dissociative cognitive strategies in the urban setting, suggesting that runners may have used dissociative strategies to distract themselves from negative external stimuli, thereby facilitating positive mood change. Finally, moods and cognitions in the park setting may have been influenced by concerns over personal safety. Therefore, it was determined that the relationship between cognitive strategies, mood, run setting, and exercise may be more complex than previously suggested in the literature.

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CHAPTER 1

Introduction

A substantial body of research has examined the relationship between running and mood change (Dyer & Crouch, 1987; Gondola & Tuckman, 1983; Goode & Roth, 1993; Morgan, O'Conner, Ellickson, & Bradey, 1988; Morgan, O'Conner, Sparling, & Pate, 1987; Morris & Salmon, 1994). While a majority of the research has investigated the chronic mood states of runners (Morgan, et al., 1987; Morgan, et al., 1988), several studies have examined the acute effects of running on mood (Dyer & Crouch, 1987; Harte & Eifert, 1994; Tharion, Strowman, & Rauch, 1988). This research has consistently indicated that mood is significantly enhanced following a single run session. Furthermore, research has suggested that running improves mood, regardless of gender (Morgan, et al., 1987, 1988), skill level (Morgan, et al., 1987), or distance (Gondola & Tuckman, 1983). These findings have particular relevance to mental health, because mood enhancement and overall psychological well-being are intimately connected (Berger, Owen, & Man, 1993).

Another area of research has examined the cognitive strategies of distance runners (Goode & Roth, 1993; Padgett & Hill, 1989; Pennebaker & Lightner, 1980; Schomer, 1986). Cognitive strategies are mental strategies used by endurance athletes to help cope with the physical demands of training or competition (Schomer, 1986), and have generally been separated into two distinct categories: association and dissociation. These two terms, defined by Morgan and Pollock (1977) and Morgan (1978), differentiate between two types of thoughts that may occur during exercise. Association, according to Morgan, is the constant monitoring of bodily signals such as respiration, temperature, and form, while dissociation involves focusing on external stimuli, and diverse thoughts such as performing math problems, listening to music, or building a house. The rationale for using each strategy is fairly simple. Runners use association in an attempt to maximize performance

by staying as close to their physical limits as possible without exceeding them. This, Morgan stated, appears to be especially true of elite marathoners. In addition, associative cognitions have been found to make up the majority of all thoughts while running, regardless of skill level (Goode & Roth, 1993; Silva & Appelbaum, 1989).

Dissociation, in contrast, is employed when runners desire to distract themselves from pain and fatigue. While some research has indicated that association is related to better performance (Morgan, 1978; Morgan & Pollock, 1977; Silva & Appelbaum, 1989), other work has demonstrated that certain dissociative strategies, particularly those that focus on external stimuli, may lead to improved performance, especially among nonelite runners (Padgett & Hill, 1989). In addition, research has suggested that cognitive shifts between association and dissociation at appropriate times during a run may help improve performance (Sachs, 1980; Silva & Appelbaum, 1989).

Finally, research examining the relationship between cognitions and mood has suggested that focusing on internal cues (i.e. association) yields less positive mood changes than attending to external stimuli (i.e. dissociation) (Harte & Eifert, 1995; Pennebaker & Lightner, 1980). Therefore, while a combination of associative and dissociative cognitions appears to be the key to performance enhancement, dissociative thinking may yield greater mood enhancement.

To more precisely identify runners' cognitions, several studies have divided association and dissociation into several specific sub-categories. Padgett and Hill (1989), for example, distinguished between dissociative thoughts and external focus, while Goode and Roth (1993) further separated dissociation into four sub-categories, including external surroundings, interpersonal relationships, daily events, and spiritual reflection. Goode and Roth also state that the division of association and dissociation into even more factors may yield a better model of runners' cognitive strategies. Prior to this suggestion, Schomer (1986), employed a think-aloud data collection technique, in which subjects verbalized their

thoughts at various times during a run, and identified four associative and six dissociative factors.

While a great deal of research has been devoted to the moods and cognitions of distance runners, minimal research has examined the effects of running environment on either moods or cognitions. Harte and Eifert (1995), for example, suggested that while exercise can have beneficial effects on mood, attentional focus (i.e. cognitive strategies) and exercise environment appear to exert a mediating effect, the scope of which remains unclear. Rejeski, Gauvin, Hobson, and Norris (1995) also added that further study is needed to determine the effects of environmental factors on mood and feeling states.

Furthermore, while research in the field of environmental psychology has suggested that natural settings are associated with more positive thoughts and moods than urban settings (Hartig, Mang, & Evans, 1991; Kaplan & Kaplan, 1989; Ulrich, 1993; Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991), very little research has investigated the moods and cognitive strategies of runners in natural and urban environments. While Harte and Eifert (1995) did investigate changes in runners' moods across laboratory and outdoor, semi-rural settings, urban settings were not accounted for, and the outdoor run course was not designed to conform to the characteristics of any specific setting. This is important, because a natural setting, as defined by Kaplan and Kaplan (1989), includes not only wilderness areas devoid of human contact, but parks, abandoned fields, street trees, and gardens as well. In fact, the authors admit that the term "natural" may, in any given study, simply connote a specific level of vegetation, as opposed to human-built structures.

This point is echoed by Sheets and Manzer (1991), who found that, as an urban environment gained vegetation, self-report measures of positive psychological affect rose. Therefore, while a natural setting, in itself, may elicit more positive thoughts and feelings than urban settings, the amount of vegetation present, or perhaps even the presence of

vegetation, may be a mediating factor, particularly if the natural elements in an urban setting are specifically attended to.

Thus, the potential mediating effects of different exercise settings on the mood states and cognitions of runners need to be addressed, as do the mechanisms behind them. In particular, research by Kaplan and Kaplan (1989), Ulrich (1983) and Ulrich, et al. (1991) proposed evolutionary models of environmental affect, which theorized that humans have innate, biologically based predispositions towards positive psychological reactions to natural environments. Therefore, people should exhibit more positive moods and thoughts in natural settings than in urban settings, regardless of past experience in the given environment.

Finally, studies in environmental psychology have largely used slides and short videos to examine the effects of natural and urban scenes on various psychological variables. While simulations of natural and urban settings may be effective in eliciting short-term responses, the extent to which simulated environments represent real environments, in terms of their ability to elicit psychological responses, is still not known (Ulrich, 1993). For example, Harte and Eifert (1995) pointed out that olfactory and tactile stimuli, such as odors and temperature, may contribute to subjects' cognitive and affective reactions to different running environments. Therefore, any study attempting to assess the psychological effects of different settings on distance runners should employ a field study design, so that the potential effects of the full array of sensory stimuli may be measured.

The research on environmental affect which has found that natural settings elicit more positive psychological responses than urban settings is particularly relevant to those who exercise outdoors. With the increase in urbanization comes an increase in people making the daily commute, and for runners this means that it may be too dark, or simply too late, to go for a daily run along the local park trail. So, the runner must schedule a run either immediately prior to or following the work day, or during a lunch break. Either way, the

runner is often forced to forgo the park trail for the sidewalks of a busy, often noisy urban setting. As Kaplan and Kaplan (1989) stated, urbanization has helped create many potential stressors and pressures, and has made many of the "old satisfactions" (p. 172), such as the relative peace and quiet of natural environments, more difficult to obtain. As the previous discussion of the environmental psychology literature suggests, with this shift in running environment comes the potential for shifts in mood states, cognitions, and overall psychological affect. Therefore, the implications of running in a sparsely vegetated urban environment, as opposed to a highly vegetated park, should be an area of great interest and concern for runners who use their daily run as a means of reducing stress and enhancing their psychological well-being. Furthermore, additional research is needed to investigate the complex relationship between physical exercise and the psychological effects of natural and urban settings (Ulrich, 1993), as well as the mechanisms behind environmental affect, in general.

Finally, it must be noted that much of the aforementioned research may not generalize to females, because it involved predominately male subjects. While several studies have found little differences in mood states (Morgan, et al., 1987, 1988) and cognitive strategies (Goode & Roth, 1993) between male and female runners, research by Ulrich (1981) indicated that female subjects reported far lower levels of positive affect after viewing slides depicting urban settings than did male subjects. Therefore, whether or not differences exist between male and female runners in their psychological responses to natural and urban settings remains unclear.

Statement of the Purpose

While previous research has examined the mood states and cognitive strategies of female distance runners, very few studies have accounted for the potential effects of different exercise environments on these phenomenon. Therefore, the purpose of this study was to

examine the mood states and cognitive strategies of female distance runners in both natural and urban environments.

Null Hypotheses

The following null hypotheses were posed for the present study on the moods and cognitions of women distance runners in park and urban settings:

1. No change in mood states will occur following either of the runs.
2. No differences in mood states will exist between the two run conditions.
3. No single cognitive strategy will be most prevalent during either of the runs.
4. No single dissociative sub-category will be most prevalent during either of the runs.
5. Minimal relationships will exist between moods and cognitive strategies.
6. Minimal relationships will exist between skill level and/or run time, and cognitive strategies or mood between the run settings.

Delimitations

This study was delimited to the following subjects:

1. Female runners who had the ability to comfortably complete the 4-mile runs.
2. Female runners who resided near San Jose, California, and had transportation to the test sites.
3. Female runners who had minimal, if any, running experience in the test sites.

This study is delimited to the following instruments:

1. Demographic questionnaire
2. Thoughts During Running Scale (TDRS, Goode and Roth, 1993), which was used to assess subjects' thoughts while running.
3. Exercise-induced Feeling Inventory (EFI, Gauvin & Rejeski, 1993), which was used to assess the feelings of subjects before and after the run.
4. Shortened (30-item) Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971), which was used to assess the moods of subjects before and after the run.

5. Follow-up questionnaire which assessed runners' preferred run, as well as the degree to which any external events may have affected their moods or feelings during the study.

Limitations

The limitations of the present study included the following:

1. The small subject size may limit the generalizibility of any findings.

2. The exclusively female sample may limit the generalizibility of any findings to male runners.

3. Subjects' inability to accurately recall what they thought about during the run may have affected the cognitions data.

4. Possible differences in environmental factors on different test days (i.e., varied temperatures) may have affected subjects' moods and/or cognitions.

5. Other intervening variables due to the nature of field setting research, including traffic and noise, may have affected subjects'moods and/or cognitions.

6. Subjects ability to view minimal vegetation in the urban run condition may have affected subjects' cognitions and/or moods.

7. Subjects' fears concerning their safety in the park setting may have affected their moods and/or cognitions.

Definition of Terms

1. Association: cognitive strategy in which athletes monitor their bodily signals, such as breathing and muscle fatigue. (Morgan, 1978)

2. Attentional focus: is the direction of one's thoughts or attention while running, and is directly related to cognitive strategies.

3. Cognition: refers to mental activity, in general (Matlin, 1994), but for the purposes of this study it refers to what subjects think about while running.

4. Cognitive strategy: a mental strategy used by endurance athletes, in which different types of cognitions are used to cope with the physical demands of training or racing. (Schomer, 1986)

5. Dissociation: cognitive strategy in which athletes purposely cut themselves off from sensory feedback. (Morgan, 1978)

6. Mood: transient, fluctuating affective states having both positive and negative qualities (Leith, 1994).

7. Natural setting: an environment that is dominated by vegetation and/or water, and where human-made features such as buildings and automobiles are absent or inconspicuous (Ulrich, et al., 1991).

8. Urban setting: an environment that is dominated by man-made structures, such as buildings and automobiles, and contains substantial pedestrian traffic. This environment is also characterized by a sparse amount of vegetation. (Ulrich, et al., 1991).

CHAPTER 2

Review of Literature

This chapter reviews the literature on environmental psychology, the psychological effects of urban and natural environments, the moods of distance runners, the cognitive strategies of distance runners, and the relationship between runners' moods and cognitions. The purpose of this study was to examine the moods and cognitive strategies of female distance runners in urban and natural environments.

Natural and Urban Environments: A General Overview

In a recent review of environmental psychology, an emerging field which examines the relationships between humans and their physical surroundings, Sundstrom, Bell, Busby, and Asmus (1996) noted the steady increase in publications, in which research on natural settings has dominated. More specifically, much of this research has involved differences in preference ratings and psychological affect between natural and urban environments (Herzog, 1989; Kaplan, 1987; Kaplan & Kaplan, 1989; Ulrich, 1981; Ulrich, et al., 1991). In general, this research has indicated that people, across cultures, prefer natural environments over urban environments, and that exposure to natural environments may elicit positive psychological and physiological responses. Although the precise mechanisms behind these differences remain unclear, two separate but overlapping theories have emerged, both of which revolve around evolutionary adaption. However, determining the precise mechanisms behind any differences between run settings was beyond the scope of the present study.

Kaplan and Kaplan (1989) have proposed that natural settings are more preferred and more psychophysiologically restorative because they provide a release from prolonged attention to other less positively affective stimuli. Also, they suggested that evolutionary success depended on the ability of humans to explore environments to gain information,

and to quickly process that information once it was obtained. The authors labeled these two processes 'mystery' and 'legibility'. Therefore, subjects responded positively to natural scenes because the paths concealed what was around the bend, yet were not so complex that they overwhelmed the senses (Parsons, 1991).

However, settings providing mystery have also been related to low preference ratings and psychological benefits, particularly when the scenes were perceived as dangerous. Schroeder and Anderson (1983), for example, found that openness increased safety ratings, while the prominence of vegetation decreased safety ratings because dense areas of vegetation close to the path were perceived as hiding places for potential predators. Furthermore, according to this theory, simple urban settings which provided a relief from mental fatigue, a sense of mystery, and legibility may also be preferred.

Ulrich (1983), on the other hand, has developed a psychoevolutionary model of environmental affect. Acording to this theory, the initial perception of a given setting involves a rapid analysis of the broad structural aspects of the setting, as well as its content, particularly with regard to the presence of vegetation and water. Depending on the environment, this perception may lead to strong preferences and restorative benefits or feelings of fear and dislike (Parsons, 1991). While Ulrich's theory is quite similar to that of Kaplan and Kaplan (1989), it differs in that Ulrich proposes that exposure to natural settings may provide restorative benefits regardless of one's level of mental fatigue or general stress.

Psychological Effects of Natural and Urban Environments

Early research on the effects of natural and urban settings was conducted by Ulrich (1981), who hypothesized that exposure to natural settings, dominated by water of vegetation, would elicit more positive psychological states than exposure to urban scenes lacking natural elements. In a within-subjects design, nine male and nine female subjects viewed three sets of color slides depicting natural settings with water, natural settings with

vegetation, and urban scenes. Before and after each set, subjects were administered a semantic rating scale and the Zuckerman Inventory of Personal Reactions (ZIPERS: Zuckerman, 1977). The ZIPERS is a 10-item test which measures individuals' emotions and anxiety states, and assesses fear, anger, positive affect, sadness, and attentiveness. Results of the semantic scale indicated that slides depicting natural scenes maintained Attentiveness/Interest significantly more than those depicting urban scenes. Also, ZIPERS results revealed that subjects felt greater levels of Sadness and Fear Arousal in the urban condition than in the natural condition, although significant differences were found only between the urban with water scenes and urban scenes. For male subjects, Positive Affect decreased slightly regardless of the condition, while females showed a strong decline in the urban condition, while they remained more constant in the natural conditions. This result provides initial evidence that gender may play a role in how people react to different environments. Lastly, no differences were discovered in the Anger/Aggression factor. The physiological data generally echoed the findings of the psychological measures, with both data indicating that exposure to natural environments elicits a more positive psychological state than exposure to urban environments, but that the overall effects of viewing urban and natural scenes are not global, but more specific, in nature.

More recently, Ulrich, et al. (1991) looked at the extent to which outdoor settings foster or inhibit recovery from stress, and hypothesized that natural settings would promote more stress recovery, or more positive mood benefits, than urban settings. One-hundred and twenty subjects viewed a stressful video (workplace accidents), followed by a 10 minute video of natural settings or increasingly urban scenes, and completed the ZIPERS (Zuckerman, 1971) and several other measures. Results from the ZIPERS data revealed that natural settings were rated as significantly higher than urban settings on the Positive Affects subscale, and lower on the Anger/Aggression and Fear subscales. These findings, then, provided further evidence suggesting a relationship between natural settings and

positive psychological affect, and generally concured with the previous findings of Ulrich (1981). The authors suggested that since stress often has behavioral manifestations, the positive affects associated with natural settings may also appear in observable behaviors or enhanced functioning. Therefore, they recommend further research in this area, taking both visual and auditory stimuli into account, and examining the effects of natural and urban environments on unstressed subjects.

Hartig, Mang, and Evans (1991) also looked at the relationship between environment and psychological affect, and employed both a field study and experimental designs. Results from the field study data revealed that subjects who engaged in a 4 to 7 day wilderness vacation rated themselves as significantly more happy than those who took non-wilderness (i.e. friend/family visits) vacations, or those who took no vacation. The wilderness vacation group also tended to perform better than the other groups on a proofreading task. In study 2, an experimental design was employed, and subjects took a leisurely walk through a park setting, urban setting, or relaxed in a lab setting. Results indicated that subjects in the natural settings group rated the highest on a self-report scale designed to measure the restorative properties of various environments (.92 alpha for internal consistency of items). Also, self-reports of mood and affect showed that the park group had significantly higher ratings of overall happiness, as well as ZIPERS Positive Affect scores. The park group also had lower scores for the Anger/Aggression subscale than the other two groups.

Taken together, the authors conclude that this research provides further support for the hypothesis that natural settings promote greater mood enhancement than urban settings. However, since the intensity of the walk was not held constant, any changes in mood may have been due to differences in exercise intensity, and not solely from the environment. Also, subjects' responses to the settings may have been influenced by the presence of the researcher, who accompanied the subjects during the walk. Finally, the authors suggest

that future research should further examine the possibility that pre-designed interactions with restorative environments may provide a degree of recovery from the stressors of modern life.

Hull and Harvey (1989) examined psychological responses to suburban parks, and hypothesized that specific characteristics of park settings, such as vegetation density, would explain some of the variance in subjects' emotional responses. A second major hypothesis of this study was that subjects from an area towards the center of a large city would differ in their responses from subjects who resided in a more rural area outside of the city. Thirty subjects were randomly selected from an urban area and a more rural area, and shown a series of color slides depicting parks with differing combinations of vegetation density and other physical characteristics. Subjects then completed a questionnaire designed by the authors to measure preference, as well as the emotions subjects expected to feel at the various settings.

Results indicated that, while subjects from the outer area of the city found the park settings to be more pleasing, but less arousing, than the residents of the more urban area, there were generally few differences between the two groups in their reactions to the parks. This finding, though not expected, did concur with the theories of Kaplan and Kaplan (1989) and Ulrich (1981, 1993), who suggested that humans have an evolutionary-based, not a socially-based, affiliation with natural settings. In addition, the authors also found that tree density was the most important characteristic in explaining affect, and that the presence of a trail through an open, easily navigable park decreased positive feelings. This finding concurred with the research which has suggested that human-built structures generally decrease subjects' preference ratings and positive psychological affect (Kaplan & Kaplan, 1989; Sheets & Manzer, 1991). As with much of the previously discussed research, however, these findings must be interpreted with caution, because subjects

responded to slides, not real settings, and simply indicated how they thought they would feel in the actual environment.

The cognitive and emotional effects of urban vegetation was studied by Sheets and Manzer (1991) in a pair of experiments. In the first, subjects were asked to evaluate several slides of drawings depicting an urban street scene with varying degrees of vegetation. Results of the 21-item questionnaire indicated that subjects rated highly vegetated scenes as less industrial, having a better quality of life, and having a significantly higher positive affect than sparsely vegetated scenes. No differences were found between scenes on items pertaining to interest and attention, however. In the second study, the authors tested the generalizibility of their previous findings in a similar design which employed several before and after slides of an actual city road which had gone from having virtually no vegetation to having a high level of trees, bushes, and grass. Results showed that, as in the previous study, subjects rated the post-development, vegetated scenes as significantly less industrial, as having a better quality of life, and as having higher positive affective qualities. Again, no differences were found on items pertaining to interest and attention, which the authors suggest may be due to the fact that their slides may have lacked the lush undergrowth that Hull and Harvey (1989) found was needed to elicit more interest and attention. The authors concluded that their results further the idea that human responses to vegetation are affective and cognitive, and not simply aesthetic. They also added that the quality of the vegetation, as well as the growing season, must be considered, as previous research by Hull and Harvey (1989) has suggested. It appears, then, that the overall quality of urban nature may influence peoples' reactions to it, and that simply lining an urban road with trees may not elicit greater cognitive or affective responses.

Honeyman (1992) also examined the effects of varying degrees of vegetation on psychological affect. Two-hundred and thirteen college students completed the ZIPERS immediately following an hour long examination. Subjects were then randomly divided into

three groups, and shown slides of a green countryside, an urban setting with vegetation present, or an urban setting without vegetation. After viewing the slides, subjects again completed the ZIPERS.

Results indicated that subjects who viewed the countryside and urban with vegetation slides had significantly lower scores on the fear subscale, and that the urban with vegetation group had significantly lower anger scores as well. Also, subjects who viewed the urban without vegetation slides showed significantly lower scores for positive affect, while they exhibited slight increases in fear, anger, and sadness, and attentiveness. Overall, while the authors had hypothesized that negative affect would be reduced as the amount of vegetation present in the scenes increased, they found that the urban scenes with vegetation elicited more positive mood changes than the countryside scenes. They concluded that an important aspect of stress reduction may not have been the amount of vegetation, but simply the presence of vegetation. Thus, it may have been that subjects sought out and attended to vegetation in the scenes, and that they simply had less of it to observe in the urban with vegetation scene. This conclusion conflicts with the research of Sheets and Manzer (1991), which suggested that it was the quality of the vegetation, and not simply its presence, that elicited positive psychological responses.

The Honeyman (1992) study had several limitations, however. First, subjects were shown scenes of the three settings, but may have been affected by their associations with similar real scenes. For example, if subjects had been attacked by a dog in a countryside, or had never been to the countryside, then the scene may not have elicited a positive reaction. Also, subjects may have shown positive mood changes because they continued to feel relief after the examination they has just completed. Despite these potential flaws, this study illustrated the possibility that the presence of vegetation in an urban scene is an important factor in eliciting positive mood change.

Although primarily concerned with leisure experiences and not exercise, Hull and Michael (1995) also examined activity, in this case passive recreation, across settings. In the first experiment, the authors instructed 108 people recreating at a park to complete a 16-item mood questionnaire, based on Thayer's (1989) model of mood, before, during, and after engaging in various non-strenuous leisure activities. Results indicated that, as hypothesized, anxiety ratings decreased over time. No changes in calmness ratings were discovered, however. In a follow-up study, the authors instructed 20 subjects, who had participated in the previous experiment, to complete the same mood measures again, this time at home while engaging in similar leisure activities. Results of the data showed that subjects felt significantly less calm, more tired, and more anxious at home than at the park, regardless of the time of mood assessment. However, no significant interactions were found between leisure setting and mood change over time. Therefore, the authors conclude that their results offer no evidence to support their hypothesis that recreating in natural settings is more restorative than recreating indoors, although they admit that the small sample size and lack of control in study 2 may have influenced their results. Finally, they do point out that the reason for the consistently higher mood scores in the park is still unclear, and suggest that future work should sample moods before and after experiences in various settings.

In summary, research which has investigated the psychological effects of natural and urban settings has generally concluded that natural settings are preferred, and elicit more positive psychological responses, than urban settings. Furthermore, research has indicated that vegetation density, along with the presence of water, are the key components of natural environments, and that the addition of human-made objects in natural settings reduce preference ratings and positive responses. In contrast, the addition of natural elements to urban settings tends to elicit more positive responses, although it is not clear whether it is the quality of vegetation, or simply the presence of vegetation, which causes these changes.

Finally, much of the research has employed simulations of natural and urban settings, and therefore may not have accounted for the nuances of real environments (Ulrich, 1993).

Effects of Distance Running on Mood

Seminal research on the relationship between distance running and mood states was conducted by Morgan (1978) and Morgan and Pollock (1977), who used the Profile of Mood States (POMS: McNair, Lorr, & Droppleman, 1971) to examine the general mood states of 20 elite, male distance runners. Subjects completed the general form of the POMS, which instructed subjects to indicate their moods during the preceeding week, including the test day. The authors found that subjects scored higher on vigor, and lower on tension, depression, anger, fatigue, and confusion, than college norms. This positive mood pattern, or profile, was labeled the "iceberg profile" by the authors, because when the scores were distributed they resembled an iceberg, with high vigor scores forming the apex. Since this early study, subsequent research has found that the iceberg profile was present in other populations, including nonelite runners (Gondola & Tuckman, 1982) and women runners (Gondola & Tuckman, 1983; Morgan, et al., 1987). In short, moderate levels of distance running has been associated with chronic positive mood states in most populations.

In the years following Morgan (1978) and Morgan and Pollock's (1977) early work, research began to investigate the effects of a single run session on mood. The acute effects of distance running on mood, across different skill levels, were examined by Dyer and Crouch (1987), who hypothesized that, while advanced runners and joggers would both exhibit iceberg profiles, the higher mileage advanced runners would have healthier mood states. Furthermore, the authors sought to determine the possible effects of commitment to running on mood. Twenty beginning runners (13 males and 7 females), and 20 cross-country runners (10 males and 10 females), all of whom were college students, completed the POMS 3 hours prior to, and following, the activity, as well as 10 minutes before and

after the activity. Beginning runners engaged in 15 minutes of calisthenics and 30 minutes of running, while advanced runners ran for an unspecified amount of time.

Results indicated that both groups showed the iceberg profile, and that both groups were significantly less depressed, angry, confused, and tense following the test session. No differences were found between groups on vigor or fatigue, however. Furthermore, in conflict with the authors' hypothesis, there were no mood differences between skill levels. Finally, the authors suggested that anticipation of running may have influenced positive mood change, since confusion and depression were lower 10 minutes before the run than 3 hours before. While other studies have shown slightly depressed moods immediately prior to running, it must be noted that runners in this study were engaging in practice, and not an actual race. Therefore, anticipation of running may yield minor positive or negative mood affects, depending on whether the run is a non-competitive practice, or a highly competitive race.

One flaw in this study was the lack of specificity as to the nature of the advanced runners' activity. From the information given, it is impossible to determine whether the advanced runners actually engaged in an "advanced" activity. For example, subjects who completed an exceptionally long or difficult run, as opposed to a short, easy run, may have had different mood states. Despite this drawback, the study employed a sound time series design, and contributed to the literature which suggested that distance running is beneficial to mood, regardless of skill level.

Gondola and Tuckman (1983) examined the mood states of women distance runners, and administered the POMS to 210 experienced 10km runners, 186 novice runners, and 68 marathoners, prior to their events. The authors hypothesized that 10km runners would demonstrate healthier mood profiles than the low-mileage novice runners, or the high-mileage marathoners. Results indicated that 10km runners were significantly less tense, less depressed, and less angry than marathoners, and tended to be equally as vigorous and

confused, but less fatigued, than marathoners. Compared with the aspiring 10km runners, 10km runners were also significantly less tense and more vigorous, and tended to be equally as angry and fatigued, as well as less depressed and confused. Thus, the authors' hypothesis was confirmed, because 10km runners, perhaps due to an optimal level of training, exhibited healthier mood profiles than novice runners or marathoners. This finding is consistent with similar research involving male subjects (Morgan, Roberts, Brand, & Feinerman, 1970), but conflicts with research by Dyer & Crouch (1987), which found no differences in mood states across skill or experience level.

Several possible methodological flaws may have affected this study's generalizibility, however. First, while the subjects were selected at random time periods, they were not actually randomly selected from the registration lines, and thus may not represent the total race population of 16,000. Also, the subjects' moods, particularly tension, may have been affected by the fact that they were standing in long lines, and preparing for a big race. Finally, while differences were found between skill levels in the general mood states of women runners, the study lacked a post-run mood measure. Therefore, mood change was not accounted for.

The relationship between gender and the mood states of distance runners was also addressed in two separate studies by Morgan and his colleagues. Morgan, O'Conner, Ellickson, and Bradley (1988), examined the mood states of 14 elite male distance runners, and hypothesized that the runners would exhibit the iceberg profile, and that performance would be significantly correlated to certain psychological traits (i.e. mood). Subjects completed the POMS general form on a chosen day of testing, and results indicated that the subjects exhibited the healthy mood profile of the iceberg profile. This finding, the authors stated, further demonstrated the presence of the iceberg profile in elite athletes.

Also, significant negative correlations were discovered between performance and global mood scores, which demonstrated that the highest performance levels in the test activity

were associated with the lowest amount of mood disorder. Finally, the authors found that Global Mood State (the sum total of all six POMS scores) accounted for 36% of variance in performance, and concluded that chronic, trait-like mood states are important determining factors in the success and failure of athletes. This suggests that, even among elite athletes, there are quantitative differences in mood scores which may affect performance. The direction of this mood-performance relationship remains unclear, however. For example, is not known whether high-performers are successful because they have more positive mood states, or whether improved performance leads to positive mood changes. Morgan and Pollock (1977) seemed to suggest that, since runners are similar to the general population in relatively stable mood characteristics, it is the running that causes enhanced mood, and not the opposite. Overall, this study employed a logical and sound methodology, and created a blueprint for the general mood states of elite male distance runners.

In related research, Morgan, O'Conner, Sparling, & Pate (1987) examined the moods of both elite (n=15), and nonelite (n=12), female distance runners. The authors sought to determine the relationship between skill level and mood, as well as the relationship between skill level and mileage to negative mood affects caused by staleness and overtraining. Subjects completed the general form of the POMS, as well as a 24-hour history questionnaire, in the same manner as the previous study (Morgan, et al., 1988). The 24-hour history questionnaire was given to account for any acute external mood disturbances that the subjects may have had. Data involving training load and staleness was obtained in subsequent 1 hour interviews.

Results indicated that all subjects exhibited the iceberg profile, and that no significant differences existed between elite and nonelite runners. So, both elite and nonelite female distance runners exhibited positive mood states similar to those of elite male distance runners. Furthermore, the authors found that runners who specialized in 5km or 10km

races scored significantly higher on vigor than 1500 meter runners or marathoners. In fact, statistical analyses revealed that the iceberg profile was, in general, more pronounced for both elite and nonelite 5km and 10km runners. This finding agreed with the previously discussed work by Gondola and Tuckman (1983), who also suggested that 10km runners have healthier mood profiles than other runners, perhaps because of an optimal training level.

Finally, the study also found that elite runners had a higher incidence of staleness than lower-mileage, nonelite runners, although no differences in the POMS data were detected. This apparent contradiction may have been caused by the fact that runners were simply asked to report previous bouts of staleness, and not whether they were experiencing staleness at the time of testing. Overall, results of this study indicated a great degree of similarity between the mood configurations of male and female distance runners of varying skill levels.

Recent research by Gauvin, Rejeski, and Norris (in press) also examined the acute effects of physical activity on the feeling states of women exercisers, though not necessarily runners. Eighty-six female subjects were recruited from fitness classes for participation in an 11-week program. Subjects completed a measure of positive and negative affect, as well as the Exercise-induced Feeling Inventory (EFI; Gauvin & Rejeski, 1993), before and after their regularly scheduled exercise sessions, and at random times during the test period. Subjects were instructed to follow this protocol every other week for the duration of the study. However, no specific mode of aerobic exercise was designated.

Results indicated that there were significant decreases in Positive engagement, Revitalization, and Tranquility subscales of the EFI, while no effects were found on the Physical exhaustion subscale. In addition, the authors found that a majority of subjects

experienced greater changes in feeling and mood states when they were feeling worse prior to exercise.

One weakness of the study was that exercise was not held constant, and therefore it may have been that different modes and intensities of exercise influenced the results. Also, only 51 out of the 86 subjects completed the full test session, which meant that partial data had to be used for the remaining subjects. These drawbacks were difficult to avoid, however, given the naturalistic design of the study. In these terms, the study contributed valuable insight into mood and feeling changes following regular physical activity outside of the confines of the lab.

Morris and Salmon (1994) also studied the effects of running on mood, and hypothesized that positive and negative mood states are two separate structures, and may be more precisely measured using an instrument including both positive and negative mood scales. One-hundred and sixty-five participants in a 3-mile run completed the authors' mood adjective list prior to, and immediately following, the run. The 41 items contained on the adjective list were adapted from the POMS, which contains five negative and one positive subscale, and Hendrick and Lilly's (1970) mood scale, which contains a high proportion of positive items. Subjects rated how they were feeling "right now" on a 5-point Likert scale, much like that of the POMS.

Analysis of the data revealed that runners' scores for positive mood increased, while negative mood scores decreased. These findings agreed with previous research which suggests that mood improvements may follow completion of a single run (Dyer & Crouch, 1987; Harte & Eifert, 1995, Harte, Eifert, & Smith, 1995). Finally, the data confirmed the authors' hypothesis, and identified runners' positive and negative moods as two distinct concepts.

In summary, several conclusions may be made regarding the moods of distance runners. First, aerobic exercise, including distance running, has been associated with both

acute (Dyer & Crouch, 1987, Gauvin & Rejeski, in press) and chronic (Gondola & Tuckman, 1983; Morgan & Pollock, 1977; Morgan et al., 1987) mood enhancement. Also, there appear to be no differences in mood states across gender or skill level, although 10km runners have been found to have slightly more positive mood profiles than novice runners or higher mileage marathoners (Gondola & Tuckman, 1983; Morgan, et al., 1987). Finally, while much of the research on runners' mood states has employed the POMS, some research has suggested that mood measures which account for changes in both positive and negative aspects of mood should be employed.

Cognitive Strategies of Distance Runners

Pennebaker and Lightner (1980) examined internal and external attentional focus, and their respective effects on perceived fatigue and several other psychological variables. In experiment 1, 57 college-aged males completed an 11-minute walking session on a treadmill. Subjects were randomally assigned to one of three conditions. In condition one, subjects listened to an audio tape of street sounds (external focus), including pedestrians and traffic, while subjects in condition two listened to amplifications of their own breathing (internal focus). In the third condition, subjects heard nothing through their headphones (control). The authors found that treadmill runners who listened to their own breathing reported significantly higher levels of fatigue and tension than those who listened to various street sounds. The authors conclude that, in non-elite runners, attention to internal cues results in greater perceptions of fatigue and other negative affects.

In the second experiment, eight male and five female subjects completed both a cross-country course and lap course for 10 consectutive days, alternating courses each day. Both courses were 1800 meters in length. The cross-country course passed through a wooded area near several sports fields, while lap course consisted of nine circular 200-meter laps around an open field. Results indicated that subjects ran faster on the cross-country course than on the lap course. No differences in reported fatigue or physical symptoms were

discovered, however. Also, results of additional self-report items indicated that subjects were significantly more satisfied with their performance on the cross-country course than on the lap course, and enjoyed the cross-country course more than the lap course. Furthermore, lap course runners reported feeling significantly more frustrated than the cross-country course runners.

The authors conclude that their work indicates the potential importance of environmental factors in attentional focus and sensory awareness, and suggest that future research should examine the types of environmental cues that are most likely to be processed, when both sensory and environmental cues are present. One important weakness of the study was the small number of subjects included. Also, neither experiment utilized actual runners as subjects, therefore limiting the generalizability of any findings to runners.

In a similar study, Padgett and Hill (1989) examined the relationship between attentional focus, or cognitive strategies, and performance. In experiment 1, the authors found that subjects who engaged in associative body-monitoring on stationary bikes reported greater perceived effort and faster time passage ratings than those who completed a distracting "body image" survey during a similar ride.

In a second experiment, dissociation and external focus were compared, and 12 experienced runners competed a mile track run in three conditions: 1) control-no imagery, 2) dissociation, and 3) external focus, in which subjects were instructed to observe various aspects of the track and its surroundings (i.e. how many cars were parked in the lot, how many hurdles on the track, etc.). Results indicated that, as hypothesized, runners in the external focus group produced the fastest actual times, followed by the dissociation and control group. Results were only significant, however, between external focus and control groups.

The authors concluded that their results largely concurred with the findings of Pennebaker and Lightner (1980), and that, while dissociative thoughts may be difficult to

maintain, external focus (i.e. observing the environment) can be done with little effort. Furthermore, the authors suggested that experienced runners do not need cross-country courses to engage in external focus, but may simply apply their focus to the many various environmental cues in a given setting. Therefore, any external environment may have the ability to distract the runner. However, as Harte and Eifert (1995) have suggested, the content of the external stimuli may mediate both mood changes and performance.

Further research into the relationship between cognitive strategy and performance was conducted by Silva and Appelbaum (1989). Thirty-two U.S. Olympic Marathon Trials runners subjects completed the authors' Running Styles Questionnaire (RSQ), which contained several items which dealt with the cognitive strategies the runners intended to use during the following day's race. The results indicated that subjects finishing in the top 50 reported that their cognitions shifted between association and dissociation during the early part of the race (5-8 miles), while the subjects finishing below 50th place reported adopting dissociation early in the race and maintaining it over most of the race. While the top 50 placers reported use of associative strategies during most of the race, they also showed what the authors labeled cognitive flexible strategies, which meant that the runners used dissociation to distract themselves from the pain late in the race. They concluded that while the use of association is related to better performance, an ability to shift between cognitive strategies at appropriate times may also benefit performance.

One weakness of the study, however, was that the questionnaire used to measure cognitions was given before the race, and therefore may not have actually represented runners' actual thoughts. Also, the subjects indicated the cognitive strategies they intended to use during a race, and not in training. Finally, the study was limited to elite male runners, and therefore may not generalize to women runners or less skilled runners.

Masters and Lambert (1989) also studied several marathoners' cognitive strategies. After a race, 30 men and 18 women completed the Marathon Race Diary, which instructed

the subjects to report their thoughts during five 5-mile sections of the race (the last section was 6.2 miles, however). Runners' responses were placed into Schomer's (1986) 10 sub-category model of cognitive strategies by two independent raters. Results indicated that the marathoners used association much more than dissociation, though less so during the fourth section of the race when, the authors suggest, runners may dissociate to cope with "the wall". In pre-race questionnaires, though, more runners reported using dissociative strategies more often while training, a finding which agreed with previous literature (Summers et al., 1982; Okwumabua et al., 1987).

Another finding showed that association was related to faster times, echoing previous research by Morgan and Pollock (1977) and Silva and Appelbaum (1989). In addition, the authors suggested that runners may have employed dissociative strategies because dissociative thinking is a relatively effortless and natural activity that provides a variety of psychological and emotional benefits, thereby reinforcing positive aspects of endurance exercise. Finally, Masters & Lambert (1989) concluded that since methods of data collection in cognitive strategy research are of critical importance, future studies should use a variety of methods. Only through comparisons of these methods will the data on the cognitions of athletes become clear.

Research by Acevedo, Dzewaltowski, Gill, and Noble (1992) investigated the cognitive patterns of 112 ultramarathoners, and administered subjects both closed- and open-ended questions dealing with their thoughts during the race. The closed-ended question asked respondents to indicate whether their thoughts during a race are mainly external or internal, while the open-ended question simply asked subjects to list the thoughts they had while racing. Results of the closed-ended question revealed that approximately half of the subjects reported having more external thoughts, while half reported experiencing more internal thoughts. However, results of the open-ended question indicated that about 75% of the thoughts listed were categorized by two independent raters as external, or

dissociative. The authors suggest that, as several of the subjects noted, dissociative strategies may not only be used as a distraction from pain or discomfort, but simply to enjoy the scenery as well. Finally, the authors point out that external thoughts of this type may not be as necessary or enjoyable while running a shorter race on the road, since the duration of the run may not require dissociative strategies, and the scenery, particularly in heavy urban areas, may not be as aesthetically pleasing.

Relationship between Moods and Cognitions of Distance Runners

Goode and Roth (1993) examined how runners' cognitions during training relate to mood changes, and developed a Thoughts During Running Scale (TDRS), consisting of 38 items loading on one associative and four dissociative factors (External Surroundings, Interpersonal Relationships, Daily Events, Spiritual Reflection). Subjects indicated how often they experienced cognitions reflected in the items on a 5-point scale (0=never, 4=very often). One hundred and fifty runners completed the TDRS after a daily run, as well as the POMS prior to and following the run. Results of the POMS data indicated that runners rated themselves as significantly less depressed, anxious, angry, fatigued, and confused following their runs, a finding which agreed with the previously discussed research by Morgan and Pollock (1977) and Dyer and Crouch (1987). No differences in vigor scores were observed, however.

Statistical analyses of the TDRS data revealed that a five-factor model of cognitive strategies provided a better fit to runners' thoughts than earlier models that limited non-associative thoughts to two or three subscales. Results also revealed that while thoughts represented by all factors were somewhat common, associative thoughts were significantly more common than the four non-associative factors. Also, the External Surroundings, Interpersonal Relationships, and Daily Events subscales were significantly associated with increases in vigor on the POMS. While thoughts of relationships and daily events were

related to decreases in fatigue, thoughts of an associative nature were related with increases in fatigue.

Finally, a slight positive correlation was also found between the length and duration of the run and the prevalence of cognitions relating to external stimuli. Therefore, runners may have attended to the external environment to a greater degree as the distance or duration of the run increased. Also, while the External Surroundings subscale appeared to play a minor role in the findings, it may be noted that the external stimuli experienced by the subjects may have varied greatly, since there was no designated run course.

Research by Harte and Eifert (1995) attempted to account for differences in run setting, and examined the attentional focus and moods of endurance athletes in different environmental settings. The authors hypothesized that the predicted positive mood changes following exercise would be mediated by exertion, attention, and environment. In a repeated measure, within-subject design, 10 male amateur triathletes and marathoners were tested in four conditions: 1) an outdoor 12km run around campus, which took less than 45 minutes to complete; 2) Indoor run-external stimuli, in which subjects ran 45 minutes on a treadmill while listening to a tape cassette of "outdoor noises", including wind, animals, cars, and people; 3) Indoor run-internal stimuli, where subjects completed a similar run, except listening to amplifications of their own heartbeats; and 4) a 45 minute control session, during which subjects sat quietly in the lab with reading materials. Attentional focus was measured using a 28-item checklist of words describing 17 external and 11 internal phenomenon, while mood was assessed using the POMS, as well as several physiological measures.

POMS data revealed significant differences between conditions for all subscales except confusion-bewilderment, with the outdoor run eliciting the greatest positive mood changes. Of the two indoor runs, the external stimuli condition elicited more positive mood effects. Results also indicated that, as expected, attention toward environmental cues was most

prevalent during the outdoor run, and toward internal items during the internal stimuli condition. Finally, subjects rated the outdoor run significantly higher than all other runs on a subjective liking scale. The authors suggested that the relationship between attentional focus and mood needs further study, and that simply attending to distracting external stimuli may not completely account for mood changes. Factors such as odor and temperature, they added, may have played a role. Therefore, the content and quality of the external stimulus attended to may be directly related to the degree of positive mood change.

In subsequent research by Harte and Eifert (1995), a visual analogue mood scale was employed (VAMS; Sutherland, Newman, & Rachman, 1982), rather than the POMS, to assess the mood states of 11 elite male runners following a 15km run. The authors noted that the VAMS contains both positive (Happiness, Relaxation) and negative (Sadness, Irritation, Anxiety) affect subscales, and may have provided a better global measure of mood changes associated with running. Results indicated that positive affect increased, while negative affect decreased. Thus, general mood was elevated following the run. While the relatively small, homogenous sample may have limited the generalizability of the findings, the results provide further evidence of a relationship between running and mood enhancement. Furthermore, the authors' use of the VAMS, along with the previously discussed concerns over the use of the POMS in mood research, may indicate that future research involving mood assessment in runners should be done using an instrument containing separate subscales for both positive and negative affect.

Summary of Literature Review

Several things may be concluded from the preceding review of the literature. First, research on environmental preference and affect has indicated that natural settings with dense vegetation and a water source are generally preferred over urban settings dominated by traffic, buildings, and other human-built constructions (Kaplan & Kaplan, 1989; Ulrich, et al., 1991). Furthermore, natural settings have also been found to elicit more positive

psychological responses than urban settings. While the reasons for these differences remain unclear, research has suggested that positive responses to natural settings were beneficial to human evolution. Therefore, humans should respond more favorably to natural settings than urban settings, regardless of where they were born or raised (Ulrich, 1993).

Second, while research has indicated that running generally leads to mood enhancement the potential effects of the external running environment on mood change have gone largely unexplored (Harte & Eifert, 1995). Specifically, it is unclear whether running in natural settings elicits more positive preference ratings and mood changes than running in urban settings. Furthermore, while dissociative thinking has been found to be related to positive mood changes in runners, this relationship may be influenced by run setting (Harte & Eifert, 1995). Therefore, the purpose of the present study was to examine the moods and cognitions of female distance runners in natural and urban settings.

CHAPTER 3

Methods

This chapter details the selection of subjects for the present study, and describes the characteristics of each of the two run environments. Also, this chapter discusses the methods and instruments that were used to collect data on the mood states and cognitions of distance runners in park and urban settings, as well as the methods and statistics used to analyze the data. The purpose of this study was to examine the cognitive strategies and mood states of distance runners in both natural and urban environments.

Selection and Description of Subjects

Thirty non-elite female distance runners were recruited through mailings and telephone contacts to several local running clubs, as well as through flyers posted in the campus fitness facility. Subjects were informed that the study dealt with the moods and thoughts of runners, but were not informed of the relevance of run setting. The subject number is comparable to that of other experimental research involving runners' cognitive strategies and moods. Harte and Eifert (1995), for example, used 10 subjects in their study of attentional focus, mood, and running environment.

Subjects in the present study ranged from 18 to 55 years of age ($\underline{M} = 31$, $\underline{SD} = 10.45$) and ran an average of approximately 28 miles a week ($\underline{SD} = 17.25$). Twenty-one subjects also had a mean 10km race time of 44:57. Approximately 93% of subjects had at least some college education, and subjects were ethnically diverse, with approximately 23% describing themselves as either Mexican-American, Hispanic, African-American, or racially mixed. Subjects were also diverse in the regions in which they were born and raised. Approximately 27% of the subjects originated from urban areas, 40% from suburban areas, and 33% from rural areas. However, most subjects indicated that they currently reside in urban (47%) or suburban (43%) areas, with only a few (10%) residing in rural areas.

As previously discussed in Chapter 1, subjects were required to provide their own transportation to the test sites, and be able to comfortably complete the course. Finally, subjects had minimal, if any, experience running in the two test sites, as research by Kaplan and Kaplan (1989) has found that familiarity may effect psychological reactions to environments. While several participants had run or cycled on the park trail, they had not done so often or recently.

Description of Research Assistants

At least one female research assistant was present during each test session. The assistant(s) helped store subjects personal items in the researcher's vehicle, and then stationed themselves at the 2-mile turn-around point on the course until the subject arrived. (See appendix A for a complete script read by the researcher prior to each run.)

Description of the Test Conditions

A within-subjects design was employed for the present study. Subjects completed two 4-mile runs, one in the park setting and one in the urban setting. The length of the run was determined by previous studies which investigated the moods and cognitions of distance runners. In these studies, the run length varied from 1800 meters (Pennebaker & Lightner, 1980), to over 9 miles (Harte & Eifert, 1995). Therefore, the 4-mile distance represents a distance within the range established by previous work in this area. In each of the courses, subjects ran to the 2-mile mark, turned around, and returned along the same route. The order of the runs was counterbalanced to control for any possible effects due to order. All data obtained from subjects were numerically coded from 1 to 30 for anonymity, with each subject's data receiving the same number. The conditions consisted of the following:

1) **Natural setting**: Subjects completed the 4-mile out-and-back course at Coyote Hellyer Park Trail in south San Jose, approximately 15 minutes from campus. The predominately flat paved trail travels along a highly vegetated route, with occasional views of the adjacent creek. However, several sections of the trail also offer brief views of the

highway and a nearby housing community. Also, while it was not possible to control pedestrian traffic, testing was conducted either earlier or later in the day when possible in an attempt to provide the most sparsely populated, serene natural setting possible. The potential effects of viewing other runners, cyclists, or pedestrians during testing was also a concern because research by Ulrich, et al. (1991) indicated that the presence of other people makes a difference in the affective properties of a given environment.

2) Urban setting: Subjects completed the flat 4-mile out-and-back course in an industrialized area near downtown San Jose, several miles from the campus. Subjects ran on the sidewalk or shoulder of the road for the majority of the course. However, they had to cross one intersection on the way out, and again on the way back. This setting exposed subjects to heavy vehicular and pedestrian traffic, as well as various houses and businesses. Also, because of the sounds of vehicles passing and the buzzers, etc. from nearby wherehouses, the urban setting was generally more noisy than the park setting. Finally, a light amount of vegetation was present along the course, which also offered occasional views of the hills several miles away.

Description, Reliability, and Validity of Instruments

Demographic Questionnaire (Appendix C)

A demographic questionnaire was designed by the author. Along with items relating to basic demographic information, including age, education, ethnicity, and running experience, this instrument also contained questions relating to the subject's life and exercise experience in each setting.

Profile of Mood States (Short Form)

Although several instruments have been used to assess runners' mood states, the Profile of Mood States (POMS; McNair et al., 1971) has been employed almost exclusively in the research, due to its sensitivity to mood improvements in a wide variety of settings (Leith, 1994). The shortened POMS is a 30 item mood-assessment rating scale which instructed

subjects to indicate on a 5-point scale the extent to which they feel each item. The instrument has six factors, which include: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia, Vigor-Activity, and Confusion-Bewilderment.

While the general form of the POMS instructs subjects to complete the instrument according to how they have been feeling during the past week, the present study instructed subjects to complete the POMS according to how they felt "right now". These instructions allowed the primary researcher to obtain subjects' mood states immediately before and after the run. In comparison to the original 65-item POMS, the shortened version takes subjects approximately half the time to complete. The validity of the short POMS has been established, with alpha reliabilities for a sample of college students ranging from .67 to .93.

In addition, a global estimate of affective state was obtained by computing the Total Mood Disturbance (TMD) score. The TMD score is found by taking the sum total of the five negative subscales and subtracting the Vigor subscale score. To eliminate the possibility of negative values, some researchers have suggested adding a constant of 100 to the TMD score (Morgan, et al., 1988). Thus, in the present study, a constant of 100 was added to subjects' TMD scores.

Finally, some research has criticized the POMS on the grounds that it deals mainly with negative moods, and fails to account for positive mood states (Gauvin & Rejeski, 1993; Leith, 1994; McAuley & Courneya, 1994; Morris & Salmon, 1994). Furthermore, these authors suggested that positive and negative moods are not simply high and low points on a continuum, but rather independent constructs which should be measured as such. Recent research involving distance runners, and exercisers in general, has employed mood measures which consist of separate scales for positive and negative aspects of mood (Gauvin & Rejeski, 1993; Harte, Eifert, & Smith, 1995; McAuley & Courneya, 1994; Morris & Salmon, 1994). Therefore, while the POMS has been the instrument of choice in

assessing the mood states of runners, it may be argued that a better, more comprehensive measure of mood should include distinct positive and negative factors.

Exercise-Induced Feeling Inventory (EFI) (Appendix D)

The EFI (Gauvin & Rejeski, 1993) is a 4-factor, 12-item scale that measures the feelings of exercisers. Subjects indicated on a 5-point scale the extent to which they were presently experiencing the feelings reflected in each item. Subscale scores were obtained by summing or averaging the numerical responses for each adjective within the four subscales. Changes in feeling states were obtained by computing the differences between the sums of pre- and post-test subscale scores. The subscales included: Revitalization, Tranquility, Physical Exhaustion, and Positive Engagement.

The four subscales have been shown to have good internal consistency (reliabilities all > .70), as well as construct and discriminant validity (Gauvin & Rejeski, 1993). Also, preliminary and subsequent work has shown the EFI to be sensitive to exercise manipulations in a variety of social contexts. (Gauvin & Rejeski, 1993; Rejeski, Gauvin, Hobson, & Norris, 1995).

The EFI was employed along with the POMS because, while the subscales of the POMS are predominantly negative, three of the four EFI subscales deal with positive feelings. Therefore, using both instruments allowed the researcher to fully investigate the full spectrum of the subjects' moods and feelings.

Thoughts During Running Scale (TDRS) (Appendix E)

The TDRS (Goode & Roth, 1993) is a five-factor, 38-item scale that assesses runners' thoughts. For each item, subjects indicated on a 5-point Likert scale how often the thoughts reflected in the item occurred during the run. Both item and subscale totals were then averaged to obtain individual item and subscale scores. The five subscales included: Association, External Surroundings, Interpersonal Relationships, Daily Events, and Spiritual Reflection.

A confirmatory factor analysis (LISREL 7; Joreskog & Sorbom, 1989) was conducted by the authors to determine the relative fit of the five-factor model, as well as two- and three-factor models of runners' cognitions previously proposed by Morgan and Pollock (1977), and Padgett and Hill (1989), respectively. Results indicated that the five-factor TDRS provided a better fit to runners' thoughts than the other two models. Measures of internal consistency for the subscales were also calculated using Cronbach's alpha, with results ranging from .77 to .85. A within-subjects ANOVA using the multivariate approach to repeated measures effects (O'Brian & Kaiser, 1985) on the mean item ratings for each item indicated a significant overall difference among these means, $F(4,146) = 36.22$, $p < .0001$.

Finally, subjects were given the opportunity to add other cognitions they may have had, but were not represented on the TDRS. This is consistent with the procedures of Goode and Roth (1993).

Follow-up questionnaire (Appendix F)

A follow-up questionnaire was designed by the primary researcher to investigate run preference, as well as subjects' perceptions of each run setting. For the latter question, subjects were asked to indicate, using a 5-point Likert scale (1 = nature setting, 5 = urban setting), how natural or urban they thought each of the run settings was. Finally, questions 3 and 4 dealt with whether any external life events, including menstruation, may have affected subjects' moods during the course of the study. As Porter (1985) discovered in her study of average female runners, many women reported feeling more fatigued and having less energy during the week preceeding their periods. Subjects were also given the opportunity to elaborate on any of their responses.

Procedures

Pre-run

For time management and organizational purposes, subjects were assigned times to report to the test sites, and were scheduled at least 30 minutes to 1 hour apart. Upon arrival at each test session, the weather conditions, including approximate temperature, cloud cover, and wind, were recorded by the primary researcher.

Prior to the first run, subjects read and signed the informed consent form (Appendix B), and completed the demographic questionnaire. Prior to each run, subjects completed the short form of the POMS, using the form which instructs the subjects to indicate how the items relate to their feelings "right now", as well as the EFI. Immediately prior to each run, subjects were reminded that the course was 4 miles, and that they were to run to the 2-mile mark, where a research assistant was stationed, and return along the same route. Because the urban run route included one three-way intersection, subjects were shown a small map of the course. No map was necessary for the park setting, since the course followed a simple out and back route.

Finally, subjects were instructed to run at a comfortable training pace, and informed that finishing time was not important. While subjects' training paces inevitably varied, this instruction was given to help prevent subjects from potentially racing the course, and therefore differing in mood cognitive or strategy simply because of the effort exerted.

Post-run

Immediately following the run, the finishing times were recorded by the primary researcher. Subjects were offered a comfortable chair, and their choice of water or sports drink. Subjects were, however, allowed up to 2 minutes to consume fluids and stretch before completing the post-run questionnaires. Subjects again completed both the POMS and the EFI, as well as the TDRS, and were verbally asked to rate their perceived effort as either "easy", "medium", or "hard". Following the second run, subjects also completed the

follow-up questionnaire. Lastly, subjects were again thanked for their participation, informed of the actual purpose of the study, and reminded that they were free to contact the primary reseacher in several months if they were interested in the results.

Analysis of the Data

To answer the hypotheses of the present study, both descriptive and inferential statistics were performed on the questionnaire data. The discussion of the analyses used in the present study will include the following sections: (a) analysis of the demographic data; (b) analysis of the POMS and EFI data; (c) analysis of the TDRS data; (d) analysis of the interactions between the POMS and EFI data and the TDRS data; (e) analysis of the follow-up questionnaire data; and (f) analysis of the run time and run effort data.

Analysis of the demographic data

Simple descriptive statistics were performed to obtain the means and medians for age, miles run per week, best 10km race time, and number of days run in the five settings. Items 8 and 9 asked subjects to describe, as either urban, suburban, or rural, the areas where they currently live, and where they were born. For analysis of these items, urban, suburban, and rural were first assigned the numbers 1, 2, and 3, respectively. Frequencies and percentages were then computed for each response. Similarly, item 10 asked subjects to describe the weather, terrain, and time of day in which they usually ran. For the weather, the possible responses of hot, mild, and cold were assigned the numbers 1, 2, and 3, respectively. For the terrain, the possible responses of flat, hilly, and both were also assigned the numbers 1, 2, and 3. Again, frequencies and percentages were computed for the responses. Lastly, the possible responses for the time of day, including morning, afternoon, and evening, were assigned the numbers 1, 2, and 3, respectively, and the frequencies and percentages computed.

Additionally, to investigate any possible relationships between skill level and cognitions, correlational analyses were performed on the mileage per week data and the

TDRS data, including the five subscales and three individual items from the External Surroundings subscale. The three individual items were: (a) nature; (b) environmental hazards; and (c) scenery. These items were selected for analysis because, given the importance of run setting to the present study, it was determined that analysis of these items would provide additional specific insight into subjects' thoughts pertaining to the external environment. Mileage was used as an indication of skill level because approximately 30% of the subjects had never run a 10km race.

Analysis of the POMS and EFI data

Descriptive statistics were run on the four EFI subscales, Positive Engagement, Revitalization, Tranquility, and Physical Exhaustion, as well as the Total Mood Disturbance scores. From these analyses, the means and standard deviations of the pre- and post-run scores were obtained, and raw change scores were computed for each of the five mood measures.

A within-subjects repeated measures ANOVA was then run to determine if significant differences existed between pre- and post-run TMD, positive engagement, revitalization, and tranquility values for both the park and urban settings. To identify any significant differences in mood changes across run setting, a second repeated measures ANOVA was run on the change scores of the TMD, positive engagement, and revitalization scores. The TMD was chosen for analysis because it has often been used as an indicator of overall mood. The Positive Engagement subscale was selected for analyses because, as discussed in the instrumentation section of Chapter 3, this subscale measures increases in positive affect, and not decreases in negative affect as the POMS does. The Revitalization and Tranquility subscales were analyzed because they were determined by the primary researcher to be related to the Environmental Psychology concept dealing with the restorative properties of natural settings. Finally, because of the number of analyses done, an alpha value of .01 was set for the present study.

Analysis of the TDRS data

Descriptive statistics were performed on the five TDRS subscales, as well as the three External Surroundings subscale items pertaining to thoughts of nature, environmental hazards, and scenery. From these analyses, the means and standard deviations were obtained for both the park and urban settings.

Analysis of the relationship between the mood and cognition data

Pearson product-moment correlational analyses were performed to identify any possible relationships between mood change and cognitive strategies. Correlation coefficients were obtained for the 11 mood change scores, including the six POMS subscales, TMD scores, and four EFI subscales, and the five TDRS subscales and additional three items pertaining to thoughts of nature, environmental hazards, and scenery. Because of the exploratory nature of the present study, moderate correlations of .40 or greater (Safrit, 1986) were considered meaningful. Analyzing moderate correlations of .40 or greater allowed for the observation of general trends in the data.

Analysis of the follow-up questionnaire data

Frequency distributions were calculated for question 1, which asked subjects to indicate their preferred run, as well as for question 2, which asked subjects to rate their perceptions of each run setting on a 5-point Likert scale, where 1 = nature setting and 5 = urban setting. Frequency distributions were also obtained for questions 3 and 4, which dealt with any external sources, including menstruation, which subjects believed may have affected their moods at any time during the course of their participation in the study.

Analysis of the run time, skill level, and run effort data

Mean run times were calculated for both run settings. In addition, correlational analyses were performed to investigate any possible relationships between run time or skill level, as measured by weekly mileage, and TDRS data, as previous research has indicated that pace and cognitive strategies are related (Silva & Appelbaum, 1989). Weekly mileage was used

as an indicator of skill level because several of the runners had not run a 10km race during the past year, or were unable to provide an estimate. Finally, means and standard deviations were calculated for the subjective effort ratings of each run setting.

CHAPTER 4

Results

The following chapter discusses the results of the present study. The purpose of the present study was to investigate the moods and cognitive strategies of women distance runners in park and urban settings. The results will be discussed in the following order: (a) results of the POMS and EFI data; (b) results of the TDRS data; (c) results of the correlational analyses performed on the POMS, EFI, and TDRS data; and (d) results of the follow-up questionnaire.

Results of the POMS and EFI Data

Hypotheses 1 stated that there would be no mood changes following the completion of a 4-mile run, while hypothesis 2 stated that there would be no differences in mood change between the natural and urban settings. To test these hypotheses, a repeated measures ANOVA was conducted on the change scores of the TMD scores, as well as the positive engagement, revitalization, and tranquility subscale scores of the EFI. Results indicated that TMD scores decreased significantly in both run settings following the run, while positive engagement and revitalization scores increased. In addition, while there was also a significant increase in tranquility scores following the park run, the increase in tranquility scores following the urban run were not significant (see Table 2).

Between the park and urban settings, however, there were no significant differences in TMD, positive engagement, or revitalization change scores (see Table 1). Therefore, mood was significantly enhanced following the 4-mile run, regardless of run setting.

Results of the TDRS Data

Analysis of the TDRS data indicated that associative thoughts were most prevalent in both the park and urban settings, followed by thoughts pertaining to daily events.

Table 1

Results of Repeated Measures ANOVA on Mood Change Scores

	Mean change(SD)	Mean difference	DF	F-value	Sig. of F
TMD Park	-8.97(2.40)	-.17	29	.00	.95
TMD Urban	-9.13(2.40)				
Positive eng. Park	1.87(3.96)	-.34	29	.22	.64
Positive eng. Urban	1.50(3.26)				
Revital. Park	3.70(3.94)	0	29	.00	1.00
Revital. Urban	3.70(4.27)				

* $p < .01$

Table 2

Analysis of Variance for Mood Scores

	Park run			
	Pre (SD)	Post (SD)	Change	F
TMD	105.43 (12.53)	96.47 (7.39)	-8.96	14.00*
Positive Engagement	6.13 (2.69)	8.00 (3.14)	1.87	6.66*
Revitalization	4.23 (2.80)	7.93 (2.64)	3.70	26.45*
Tranquility	6.33 (2.84)	8.33 (2.54)	2.00	9.67*

* $p < .01$

	Urban run			
	Pre (SD)	Post (SD)	Change	F
TMD	104.87 (11.01)	95.73 (7.26)	-9.14	14.87*
Positive Engagement	6.23 (2.76)	7.73 (2.70)	1.50	6.76*
Revitalization	4.0 (2.42)	7.70 (2.88)	3.70	26.45*
Tranquility	6.33 (3.39)	7.07 (3.40)	0.74	1.11

* $p < .01$

In the park setting, thoughts about interpersonal relationships ranked third in prevalence, followed by thoughts involving external surroundings, while in the urban setting, thoughts pertaining to external surroundings ranked third, followed by interpersonal relationships. In both settings, thoughts involving spiritual reflection were least prevalent. In addition, there were minimal differences between the park and urban settings on all five TDRS subscales. There were also slight differences in the expected directions on the individual TDRS items pertaining to thoughts of nature, environmental hazards, and scenery. For the nature and scenery items, scores were slightly higher in the park setting, while the environmental hazards item was higher in the urban setting. These differences were not significant, however (see Table 3).

Results of Correlational Analyses on the POMS, EFI, and TDRS Data

To test null hypothesis 5, which stated that there would be minimal relationships between moods and cognitive strategies, Pearson product-moment correlational analyses were performed on the change scores of the 11 individual POMS and EFI subscales, the five TDRS subscales, and the three individual External Surroundings subscale items. These analyses yielded several interesting findings. Correlations $\geq .40$, while moderate, were considered meaningful, due to the exploratory nature of the present study. In addition, patterns in the data began to emerge when correlations of $\geq .40$ were examined (See tables 4 & 5).

In the park setting, moderate positive correlations were found between Interpersonal Relationships scores and Revitalization (.41) and Tranquility (.47). Therefore, thoughts about relationships were associated with increased feelings of revitalization and tranquility. Moderate positive correlations were also found between the environmental hazards item and fatigue (.47), which indicated that as fatigue increased, thoughts of crime, etc. also increased.

Table 3

TDRS Mean Scores

	TDRS mean scores	
	Park run (SD)	Urban run (SD)
Associative	20.30 (5.88)	19.50 (6.90)
External surroundings	12.57 (3.50)	12.47 (3.99)
Interpersonal relationships	13.60 (6.34)	12.07 (7.58)
Daily events	18.60 (8.49)	18.37 (9.25)
Spiritual reflection	2.47 (2.40)	2.43 (2.56)
Nature	3.20 (.85)	2.00 (1.31)
Environmental hazards	1.63 (1.38)	2.57 (1.36)
Scenery	3.20 (.89)	2.87 (1.07)

Table 4

Correlation Matrix: Park Run

POMS / EFI subscales	TDRS subscales: Association	External surroundings	Interpersonal relationships	Daily events	Spiritual reflection
Anger	.10	-.11	-.21	-.23	-.21
Confusion	.02	.00	-.16	-.17	.17
Depression	.22	.05	-.21	-.08	.06
Fatigue	.04	.23	-.16	-.08	-.06
Tension	-.26	.03	-.39	-.36	-.14
Vigor	-.03	-.11	.25	.12	-.12
TMD	.09	.10	-.26	-.18	-.01
Pos. eng.	-.11	-.25	.38	.29	.07
Revitalization	-.05	.01	**.41**	.28	.12
Tranquility	-.07	.13	**.47**	.26	.24
Physical ex.	.05	.15	-.28	-.02	-.02

POMS / EFI subscales	External Surroundings items: Nature	Environmental hazards	Scenery
Anger	-.06	.04	-.09
Confusion	.04	.01	.02
Depression	.14	.00	.04
Fatigue	-.02	**.47**	.02
Tension	.10	.08	-.09
Vigor	-.02	-.34	.16
TMD	.04	.28	-.04
Pos. eng.	-.10	-.21	-.10
Revitalization	.13	-.17	.15
Tranquility	.10	.11	.07
Physical ex.	.02	.36	-.14

* Correlations of $\geq .40$ are highlighted in boldface and underlined.

Table 5

Correlation Matrix: Urban Run

POMS / EFI subscales	TDRS subscales: Association	External surroundings	Interpersonal relationships	Daily events	Spiritual reflection
Anger	.02	.25	**-.49**	-.26	-.37
Confusion	-.35	-.24	**-.43**	**-.42**	-.34
Depression	.03	-.02	**-.52**	-.18	-.20
Fatigue	-.02	-.10	-.21	-.25	-.26
Tension	.05	-.04	**-.66**	**-.45**	-.39
Vigor	.18	.13	.39	**.41**	**.48**
TMD	-.03	-.08	**-.57**	**-.47**	**-.46**
Pos. eng.	.10	.09	.37	**.48**	**.49**
Revitalization	.11	.17	**.50**	**.55**	**.53**
Tranquility	-.31	.02	.30	**.52**	**.44**
Physical ex.	-.01	-.12	-.36	**-.40**	-.34

POMS / EFI subscales	External Surroundings items: Nature	Environmental hazards	Scenery
Anger	-.07	**.49**	.07
Confusion	-.28	.16	-.29
Depression	-.26	.38	-.14
Fatigue	-.36	-.03	-.19
Tension	-.39	.28	.00
Vigor	.22	-.16	.28
TMD	-.35	.24	-.24
Pos. eng.	.16	-.04	.05
Revitalization	.25	-.10	.28
Tranquility	.21	-.12	.05
Physical ex.	-.34	.03	-.21

* Correlations of $\geq$ .40 are highlighted in boldface and underlined.

In the urban setting, moderate negative correlations were found between Interpersonal Relationships subscale scores, and scores for Anger (-.49), Confusion (-.43), Depression (-.52), Tension (-.66), and TMD (-.57). Also, a moderate positive correlation was found between Interpersonal Relationships scores and Revitalization scores (.50). Therefore, an increase in thoughts pertaining to interpersonal relationships in the urban setting was associated with decreases in anger, confusion, depression, tension, and TMD, and increases in feelings of revitalization.

Also, moderate negative correlations were found between Daily Events scores and Confusion (-.42), Tension (-.45), TMD (-.47), and Physical Exhaustion (-.40). Similar positive correlations were also found between Daily Events scores and Vigor (.41), Positive Engagement (.48), Revitalization (.55), and Tranquility (.52). Thus, as subjects thought more about daily events, they experienced lesser feelings of confusion, tension, TMD, and physical exhaustion, as well as increased feelings of vigor, positive engagement, revitalization, and tranquility.

Spiritual Reflection scores were negatively correlated with TMD scores, and positively correlated with scores for Vigor (.48), Positive Engagement (.49), Revitalization (.53), and Tranquility (.44). So, as subjects thought more about spiritual items, they also felt less disturbed overall, and more vigorous, positive, revitalized, and tranquil.

Finally, a positive correlation ($r = .49$) was found between the environmental hazards item score and Anger. This indicated thoughts about environmental hazards were associated with increased feelings of anger.

In summary, while there was little relationship between runners' moods and thoughts in the park setting, there were several moderate correlations between runners' moods and thoughts in the urban setting. Specifically, a relationship appears to have existed between runners' dissociative cognitions and mood enhancement, because as four dissociative TDRS subscale scores increased, mood generally improved. Thus, the results of the urban

run correlations generally agree with research by Goode and Roth (1993), which suggested a relationship between dissociative thoughts and mood enhancement. In fact, correlations between cognitions and moods in the urban setting were much more numerous than those found in the Goode and Roth study. However, while these authors found positive correlations between associative thinking and fatigue, as well as between the External Surroundings subscale and Vigor, no such relationships were found in the present study.

Results of the Follow-up Questionnaire Data

Item 1 asked subjects to indicate their preferred run, and the results indicated that 93% ($\underline{n} = 28$) of subjects preferred running in the park setting, while only 7% ($\underline{n} = 2$) preferred the urban setting.

Results of item 2, which asked subjects to rate their perceptions of each setting as being either natural or urban, indicated that approximately 77% ($\underline{n} = 23$) of subjects perceived the park run as either a 1 or 2, where 1 = a nature setting and 5 = an urban setting. On the same scale, approximately 97% ($\underline{n} = 29$) of subjects perceived the urban as either a 4 or 5. Therefore, while subjects definitely perceived the urban setting as urban, they did not appear to view the park setting as a nature setting to the same degree.

Item 3 asked subjects to indicate if there was any event(s) which they thought may have affected their moods during the course of their participation in the study. Responses revealed that 71% ($\underline{n} = 21$) of subjects indicated that an event, or events, occurred during the course of their participation in the study which may have affected their moods. Of these subjects, approximately 19% ($n = 6$) reported that the event(s) occurred before the first run, and therefore may have affected their moods during the first run. Also, approximately 38% ($n = 11$) of subjects reported that the event(s) occurred between the first and second run, and therefore may have affected their moods during the second run only. Finally, 43% ($\underline{n} = 13$) of subjects indicated that the event(s) occurred throughout their participation in the study, and therefore may have affected their moods during both runs.

Because of the vagueness of the question, however, these results may lack reliability. First, because some subjects completed the runs as much as two or three weeks apart, they were bound to have gone through some experience which affected their mood. In addition, the generally low pre-run POMS scores suggested that, despite what subjects may have indicated in response to the item, they did not feel particularly negative.

Results of items 4-6, which dealt with menstruation, indicated that 30% ($\underline{n}$ = 9) of subjects experienced their menstrual periods at some time during the course of their participation in the study. Of these nine, only four thought that their moods were affected, and of these four, three reported that their menstrual periods had a negative effect on their moods. In general, then, subjects' menstrual periods had little effect on their moods during the study, because only 10% ($\underline{n} = 3$) of the subjects indicated that menstruation may have negatively affected their moods.

Results of the Run Time and Run Effort Data

The mean running times for the park and urban runs were 34:21 ($\underline{SD}$ = 4:27) and 33:51 ($\underline{SD}$ = 3:59), respectively. The times ranged from 28:20 to 47:25 in the park setting, and from 26:30 to 45:15 in the urban setting. Correlational analyses were run to investigate any possible relationships between run time and mood change. Correlational coefficients were computed between both run times and the POMS and EFI scores. Results indicated that finishing times in the park and urban settings were moderately correlated with fatigue ($\underline{r}$ = .41 and .42, respectively), which was expected, as running faster would presumably be related to increased feelings of fatigue in nonelite runners. No other correlations above .40 were found, however, suggesting that running pace was not related to mood change.

Similar correlational analyses were also performed on the run time and TDRS data. Results indicated that there were no correlations ($\underline{r} \geq .40$) between either of the mean run times and TDRS data, suggesting that running performance was not specifically related to either associative or dissociative thinking. This finding contradicts the findings of Morgan

(1978) and Morgan and Pollock (1977), which suggested that associative thinking was related to improved performance. However, it must be noted that subjects in the present study were neither elite, as they were in the Morgan and Pollock (1977) study, nor were they engaged in competition. Furthermore, subjects in the present study were instructed that pace was unimportant. Thus, subjects may have been unconcerned about using certain cognitive strategies to improve performance. Finally, weekly mileage was negatively correlated with fatigue ($r = -.40$) in the urban setting, but not in the park setting. This indicated that the more miles subjects ran per week, the less fatigue they experienced in the urban setting.

In general, subjects' mileage and run times were not related to mood change or cognitive strategies in either of the run settings. One exception was that fatigue increased as subjects ran faster, and that fatigue was inversely related to subjects' weekly mileage. Also, subjects averaged approximately 30 seconds faster for the urban run, and the fastest and slowest runs in the urban run were faster than the fastest and slowest runs in the park run.

CHAPTER 5

Discussion and Conclusions

This chapter discusses how the results of the present study relate to the null hypotheses outlined in Chapter 1, as well as the previous research conducted on environmental affect and the moods and cognitions of distance runners. Furthermore, this chapter presents suggestions for future research involving the moods and cognitions of distance runners in different environmental settings. The purpose of the present study was to investigate the moods and cognitions of women distance runners in natural and urban settings.

The first null hypothesis stated that there would be no changes in mood states following either of the runs. Results indicated that there were significant post-run improvements in TMD scores, as well as positive changes in positive engagement, revitalization, and tranquillity. The first hypothesis was therefore rejected, because mood was enhanced following the 4-mile runs. This finding concurred with the previous research which found positive mood changes following a single distance run (Dyer & Crouch, 1987; Harte & Eifert, 1995). In addition, there were no correlations between run time and mood change in either of the run settings, which indicated that mood enhancement was not contingent on a certain pace. This finding also agreed with previous research which has suggested that skill level is not significantly related to mood enhancement (Dyer & Crouch, 1987; Morgan, et al., 1987).

Null hypothesis 2 stated that there no differences in mood states would exist between the two run settings. In this case, the null was confirmed, because while there were significant positive mood changes following the runs, there were no significant differences between the park and urban runs. This finding was interesting, considering the body of environmental psychology research which has suggested that more positive mood states are associated with natural, highly vegetated settings, rather that urban settings. Furthermore,

while there were no differences in mood change between the two run settings, results indicated that the park run was overwhelmingly preferred over the urban run.

There are several possible explanations for this contradictory finding. First, much of the research done on the psychological benefits of natural settings involved what Ulrich (1983) and others labeled "restorative" properties. In other words, viewing or coming in contact with natural settings was hypothesized to elicit positive changes in already depressed, or slightly depressed, moods. In the Ulrich et al. (1991) study, for example, subjects first viewed a videotape depicting graphic scenes of accidents at the workplace, and then viewed slides of nature and urban scenes. In the present study, however, subjects' moods were already fairly positive, perhaps due to the chronic mood benefits of regular running, or perhaps due to anticipation of the run (Dyer & Crouch, 1987). Therefore there may have been less potential for moods to improve, particularly in terms of the instruments used to measure mood change.

Also, much of the research which has examined environmental affect has been conducted in a laboratory setting, in which subjects responded to slides or videos depicting natural and urban scenes. As previously discussed, it is uncertain whether simulations of environments elicit the same responses as real environments (Ulrich, 1993). While a few studies employed field setting designs, they contained several relevant methodological weaknesses. In the Hartig, et al. (1991) study, for example, a between-subjects design was employed, making direct comparisons of subjects mood changes in the park and urban settings impossible. Furthermore, subjects were escorted on walks in both settings, and therefore may have been influenced by the researcher's presence. Therefore, the findings of previous research involving the psychological effects of park and urban settings may not have given a true indication of environmental affect.

This point in particularly important, because several subjects expressed concern about safety in the park setting. While the park setting was overwhelmingly preferred over the

urban setting, analysis of subjects' additional cognitions while running indicated that several subjects were worried about potential attackers lurking behind trees and around corners. Subjects additional comments on the TDRS also concurred with their responses to the TDRS item pertaining to thoughts of environmental hazards. While one might have expected subjects to think about crime, etc. in the urban setting, results revealed that subjects thought about hazards almost as often in the park setting. Therefore, safety concerns may have prevented subjects from fully reaping the psychological benefits from the park setting, particularly since subjects ran alone, often in the morning hours. Previous research by Nasar and Jones (1997) has also suggested that concerns over safety in natural settings may diminish the preference ratings and positive affect usually associated with park environments.

In retrospect, this finding is not suprising, considering the fairly recent highly publicized incidents of sexual assaults on women on several area running trails. These incidences, while very rare, appeared to have tarnished the images of running trails to a degree. While an assistant was on the course at all times, and in many cases followed behind just out of sight, the concerns were certainly not without justification.

Another possible reason why no significant differences were found in mood changes between the run settings is that the settings were perceived differently. On the follow-up questionnaire, 97% of subjects indicated that they perceived the urban setting as urban, while 77% of subjects indicated that they perceived the park setting as a nature setting. Therefore, the park setting may not have elicited the anticipated positive mood changes because it was not perceived to be a natural setting. While the park route was certainly highly vegetated, it also contained several sections during which subjects could view housing developments and the highway. These types of man-made structures according to research by Ulrich et al. (1991), and Sheets and Manzer (1991), may actually negate the benefits of natural settings. Ulrich (1993), however, has suggested that even natural

scenes containing built structures are often preferred over all but a small percentage of well-maintained urban scenes, and that nature appears to be a broad concept for inhabitants of industrialized societies.

While the similarities in mood change between run settings did not agree with the previous research on environmental affect, the results should nevertheless be encouraging on a practical level, particularly to those runners or exercisers who cannot access park settings on a regular basis, because results of the present study indicated that the run itself provided mood enhancement and overall psychological benefits, regardless of whether the run traveled through a park or urban area. As both Kaplan and Kaplan (1989) and Ulrich (1993) have noted, people living in urban areas may view the sparse, manicured vegetation and artificial water sources of many urban areas as natural elements. This concept may help explain why subjects thought about nature in the urban setting, even when there was very little present.

Null hypotheses 3 stated that no cognitive strategy would be more prevalent during either of the run settings, while null hypothesis 4 stated that none of the dissociative sub-categories would be most prevalent. While results indicated that associative thoughts were more prevalent than any of the four dissociative sub-categories, the total of all dissociative sub-category mean scores is far greater than the mean associative scores. Therefore, dissociative thoughts may have actually been more prevalent than associative thoughts. Thus, while association appears to have been the predominant cognitive strategy used by subjects in both the park and urban run settings, the results may have been due more to the makeup of the TDRS than to actual differences in cognitive strategies.

Within the dissociative subscales, however, the results are clearer. Thoughts pertaining to daily events were most prevalent, followed by thoughts of interpersonal relationships and external surroundings, and finally thoughts of spiritual reflection. This trend in

dissociative thoughts concurs with the results of research by Goode and Roth (1993), who found similar patterns in runners' cognitive strategies using the TDRS.

An interesting finding in the present study was the similarity between thoughts of external surroundings in the park and urban settings. When the somewhat dichotomous individual items pertaining to thoughts of nature and environmental hazards were analyzed, however, the reason why no differences were found became evident. While thoughts of nature in the park setting were quite common ($\underline{M} = 3.20$), they were less prevalent in the urban setting ($\underline{M} = 2.00$). Conversely, thoughts of environmental hazards were more common in the urban setting ($\underline{M} = 2.57$) than in the park setting ($\underline{M} = 1.63$). Therefore, it appears that while the TDRS subscale of External Surroundings provided an adequate measure of subjects' thoughts about their surroundings, it did not account for differences between positive and negative external surroundings.

Null hypothesis 5 stated that there would be minimal relationships between mood states and cognitive strategies. While thoughts of interpersonal relationships were moderately correlated with increases in revitalization and tranquillity in the park setting, the results overall revealed little relationship between cognitive strategies and mood change in the park setting. Thus, null hypothesis 5 was confirmed in the park setting. In the urban setting, however, null hypothesis 5 was rejected, because there were numerous correlations between three of the dissociative TDRS subscales, Interpersonal Relationships, Daily Events, and Spiritual Reflection, and mood enhancement. Additionally, thoughts pertaining to environmental hazards were related to negative mood change in both run settings.

Therefore, dissociation may represent a valuable tool in negating the potentially harmful effects of a less preferred urban run setting. The additional comments provided by subjects on the TDRS reflect this. One subject, for example, stated that she became anxious when an "angry" man approached her, while several subjects expressed irritation at the often

vulgar verbal harassment by passing motorists. Also, several subjects stated that they thought about the pollution and generally unhealthy environment of the urban run setting. That subjects sought to distract themselves with thoughts of daily events or relationships is logical. This would also explain why subjects experienced similar mood changes in both settings, while approximately 93% of subjects preferred running in the park setting. Thus, while there were no differences in the amount of dissociative thoughts between the two run settings, dissociative thoughts may have been more important in the urban setting in eliciting positive mood change.

Null hypothesis 6 stated that minimal relationships would exist between subjects' skill level or run time, and mood states or cognitive strategies between the run settings. In this case, the null was confirmed, because results indicated that there were no notable relationships between either skill level or run time and mood change or cognitive strategies. The one exception was that faster run times were related to increases in fatigue in both run settings, which was an expected result of the increased effort required to run faster.

In conclusion, the results of the present study indicated that subjects experienced positive mood changes following the completion of a 4-mile training run, regardless of the setting in which it took place. However, subjects' thoughts and fears over potential dangers may have decreased the psychological benefits of the park setting, while subjects used dissociative thoughts pertaining to relationships, daily events, and spiritual events in the urban setting to distract themselves from the negative aspects of the setting, as well as to compensate for the lack of a preferred setting. Furthermore, while there were no differences in mood change between the park and urban settings, subjects overwhelmingly preferred running in the natural park settings over the urban setting, regardless of where they were raised or trained.

Recommendations for Future Research

From the results of the present study, several recommendations may be made for future research investigating the mood states and cognitive strategies of distance runners in different run environments. First, future research should include male and female subjects. This method will allow for a direct comparison of environmental affect across gender, and help determine whether or not fears about potential attackers influence mood change in a park setting, as well as whether males and females perceive settings differently. It is possible that male runners are less concerned about environmental hazards while running on park trails, and therefore do not experience the fears expressed by several of the female subjects in the present study. If this proves to be true, and male runners show significantly more positive mood change in park settings than urban settings, then policies should be implemented to provide safe running trails through parks, thereby allowing equal access to the restorative benefits of running in park settings.

Future research should also further examine potential differences in environmental preference and affect between runners of different age and skill level. Because of the broad age and skill level ranges of subjects in the present study, it was not possible to determine with any degree of confidence that no differences exist.

In addition, future research should also continue to employ a variety of methodologies in examining runners' moods and cognitions in different settings. Specifically, field research should certainly be utilized, because actual park and urban settings contain elements not present in slides or videos, such as weather variations and potential dangers, and therefore may elicit different responses (Ulrich, 1993). While research using slides relies solely on subjects' responses to visual stimuli, field setting research allows subjects to use all of their senses when responding to the setting. This is an important because subjects indicated that they were affected by sounds and smells around them.

However, laboratory settings using slides or videos depicting different settings may also be used to determine which aspects of a given setting are most likely to be attended to, and which run setting, if any, elicits the most positive mood change purely on a visual basis. This information may be helpful to modern fitness facilities which include cardiovascular exercise equipment such as stairmasters and treadmills. If viewing scenes of heavily vegetated park settings elicit positive psychological and/or physiological responses, then perhaps these facilities, or the manufacturers, can equip the machines with videoscreens playing these types of restorative scenes.

Also, as previously discussed, the TDRS may not have been able to adequately account for cognitions pertaining to positive and negative aspects of subjects' external surroundings, Indeed, it was not designed to do so. Therefore, the instrument may need to be slightly altered to include subscales for both positive and negative environmental stimuli, or another instrument developed. It may also be interesting to further develop the Spiritual Reflection subscale to include aspects of spirituality not related to religion. The other option would be to employ a think-aloud technique like that of Schomer (1986), and fit subjects with microcassette recorders and beepers to signal them when to verbally report their thoughts. This technique, however, may be too invasive, and possibly influence subjects moods and cognitions.

Finally, qualitative research, including intensive interviews, may be used to further investigate subjects' feelings about running in park and urban settings, and obtain additional information pertaining to potential differences between people born and raised in different settings. For example, knowing whether or not runners who grew up in an urban area feel differently about park settings that those raised in the countryside would be interesting. While the present study found that subjects preferred the park setting over the urban setting, regardless of where they were raised or trained, the simple scale to obtain

these results may not have been adequate, because it did not ask subjects to explain why they preferred one environment over another.

In conclusion, the results of the present study indicated that negative mood decreased, while positive mood increased, following the completion of a 4-mile run, regardless of whether the run was completed in a park or urban setting. This finding confirms previous research which has found positive mood changes following a single run (Dyer & Crouch, 1987), and also has important practical implications for runners. First, the results of the present study suggest that, while it may be more pleasurable, it is not necessary to run in a natural setting to obtain the mood benefits of running.

Also, while there was only a slight relationship between mood change and cognitions in the park setting, there was a strong relationship between positive mood change and dissociative thinking in the urban setting. This finding suggests that subjects may have used dissociative cognitive strategies in the urban setting to distract themselves from negative external stimuli, such as verbal harassment and pollution, thereby facilitating positive mood change. This explanation may also explain why there were no relationships between thoughts of external surroundings and positive mood change.

Furthermore, while there were no differences in mood change between the two run settings, the park run was overwhelmingly preferred over the urban run. This finding suggests that, even though runners did not experience more positive mood changes in the park run, perhaps due to concerns over safety, they still preferred to run in a natural setting rather than an urban setting. The conclusions of the present study must be interpreted carefully, however, since they were derived largely by post-hoc analysis of the results. Also, the precise roles of running and the environment in mood change and cognitive strategies are still uncertain. It may be, for example, that there were no differences between run settings because running actually supercedes the effects of the external environment. While this would conflict with a great deal of research, the possibility certainly exists.

Therefore, further research is needed to examine the relationship between natural and urban settings and the moods and cognitive strategies of distance runners.

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List of Appendicies

Appendix A: Sample Script read to subjects

I. Introduction of self and assistants

II. "Welcome, and thanks again for your willingness to participate in this study. Prior to and following the run, you will be asked to fill out several questionnaires dealing with background information, thoughts and moods, and other information related to the run. Please fill out the questionnaires carefully, taking time to answer each one completely. You can stretch out while you're filling them out if you want. If you have any questions about the procedures or questionnaires, please feel free to ask either myself, or one of the assistants."

"You will be running a simple 4-mile out-and-back course. The turn around point is designated by an orange cone, and a research assistant will be standing there to turn you back around. Please remember to run at your normal training pace, as time is not important."

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AGREEMENT TO PARTICIPATE IN RESEARCH

Responsible Investigator: Ted M. Butryn

I have been asked to participate in a research study investigating the thoughts and moods that distance runners have when they train. I understand that I will be asked to complete one 4-mile run in South San Jose, and another 4-mile run on the Coyote Creek Trail in San Jose. Furthermore, I understand that I will be asked to fill out a one page background questionnaire involving my running experience, one questionnaire focusing on my thoughts while running, two questionnaires concerning my mood while running. and one questionnaire concerning my preferred run environment. If I agree to participate I will fill out the surveys after both runs.

I understand that there are no known risks to me, but that I may benefit from this study by attaining a better understanding of my thoughts and moods while I run in different environments. I further know that there is no material compensation for my participation.

I understand that the results of this study may be published but that no information as to my identity will be available or released to anyone.

Questions about the research and/or research procedures may be addressed to the principal investigator Ted M. Butryn (408) 924-3025, or thesis advisor Dr. David Furst (408) 924-3039. Complaints about the research may be addressed to Dr. James Bryant, Chair of the Department of Human Performance (408) 924-3012. Questions or complaints about research, subjects' rights, or research related injury may be presented to Serena Stanford, PhD, Associate Vice President for Graduate Studies and Research, at (408)924-2480.

My consent has been given voluntarily. I understand that I am free to withdraw my participation at any time for any reason, and that no services of any kind, to which I am entitled from the University, will be lost or jeopardized if I choose not to participate or to withdraw.

I have received a signed and dated copy of this form.

The signature of the subject on this document indicates agreement to participate in this study.

The signature of a researcher on this document indicates agreement to include the above named subject in the research and attestation that the subject has been fully informed of his or her rights.

Subject: _____ date: _____

Researcher: _____ date: _____

Appendix C: Demographic Questionnaire

1. Name:

2. Age:

3. Ethnicity:

4. Highest level of education:

5. Current occupation:

6. Average miles per week in the last year:

7. Best 5-kilometer and/or 10-kilometer time in the last year: 5k_____ 10k_____

8. How many days per week have you normally run in the following settings during the past three months?:

Urban Setting: _____

Suburban setting: _____

Rural/Park setting: _____

Indoors Track: _____

Outdoor Track: _____

8. Would you describe the area in which you currently live as urban, suburban, or rural?:

9. Would you describe the area in which you were raised as urban, suburban, or rural?:

10. When you run:

The weather is usually: hot____, mild____, cold____

The terrain is usually: flat____, hilly____, both____

The time of day is usually: morning____, afternoon____, evening____, other (please specify)_____

Please Note

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Appendix G: Follow-Up Questionnaire

1. Given a choice, which setting would you prefer to run in? (Please check one)

South campus route _____
Park route _____

2. Please rate your perception of each run from 1 to 5 using the following scale: (circle one)

1 = nature setting 5 = urban setting

	nature				urban
South campus run:	1	2	3	4	5
Park run:	1	2	3	4	5

3. Has there been any event(s) during the course of your participation in this study which you believed may have affected your mood? Yes: _____ No: _____

If yes, please indicate the nature of the event(s), and whether it (they) occurred before the first run, between the first and second runs, or before and during your participation in the study.

Before 1st run: _____ Between 1st and 2nd run: _____ Before and during:_____

Please explain (optional):

4. Have you had your menstrual period just before or during either of the two runs?

Yes: _____ No: _____

5. If yes, do you believe that it affected your mood?

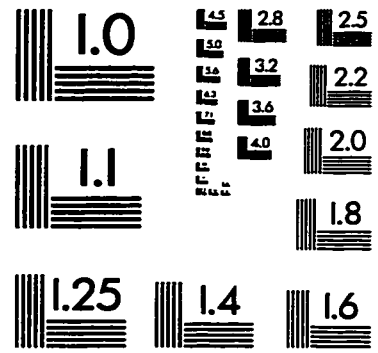
Yes: _____ No: _____

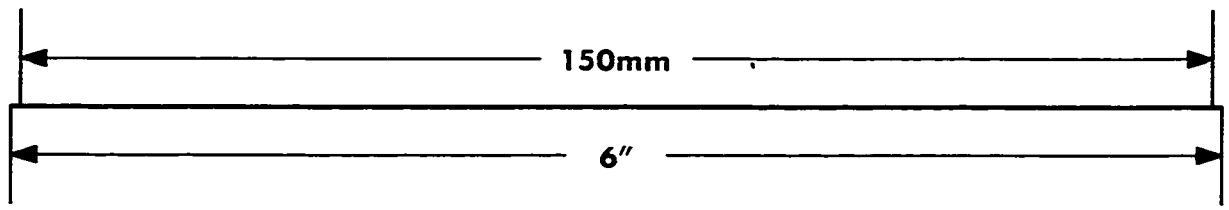
6. If yes, did it affect your mood in a more positive or negative way?

Positive: _____ Negative: _____

Please explain (optional):

TEST TARGET (QA-3)





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