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# The Influence of Preferred Attentional Focus Strategies on Exercise Induced Changes in Affect

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# THE INFLUENCE OF PREFERRED ATTENTIONAL FOCUS STRATEGIES ON EXERCISE INDUCED CHANGES IN AFFECT

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THE INFLUENCE OF PREFERRED ATTENTIONAL FOCUS STRATEGIES ON EXERCISE INDUCED CHANGES IN AFFECT

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Along with the numerous physical benefits of exercise, past research has shown that physical activity can alleviate symptoms of anxiety and depression in both clinical and non-clinical populations. Yet, it has been suggested less than half of American adults exercise at public health recommended levels. Therefore, it is important to identify factors that may lead to an increase in physical activity and, subsequently, improvements in mental health. Previous research, for the most part, has neglected to investigate how preference for attentional focus strategy during exercise influences mood. In addition, previous studies that involved attentional focus and exercise have focused more on participant's resulting performance than affect. Therefore, the purpose of this study was to determine whether or not preference for attentional focus strategy would moderate the amount of affective change and enjoyment experienced during and after exercise.

Participants (N=100) were recruited from psychology courses at Western Kentucky University. They were asked to run on a treadmill for 20 minutes on two separate days, one week apart. On one of the days they were asked to engage in their most preferred attentional focus strategy and another day their least preferred attentional focus strategy. The order of these sessions was counterbalanced. Participant's preference for attentional focus strategies was used as an independent variable. The first dependent variable of interest was changes in affect, measured by the Activation-Deactivation Adjective

Checklist (AD-ACL). The second dependent variable of interest was enjoyment, measured by the interest/enjoyment subscale of the Intrinsic Motivation Inventory (IMI).

A 2 (Preference Condition) X 4 (Time) ANOVA was conducted for affect. There were no significant main effects and no significant interactions for preference. Yet, there was a significant change in affect across time. A one way ANOVA was conducted on enjoyment and autonomy levels. There were no significant main effects for preference.

Results of the study indicated preference for attentional focus strategy does not influence the level of affective benefits typically associated with exercise, nor does it influence perceived enjoyment and autonomy. In addition, the study indicated individuals acquire affective benefits from engaging in moderate intensity exercise regardless of attentional focus strategy. Following from the findings of the current study, it is suggested that researchers continue to identify factors of the exercise experience that may lead to an increase in physical activity and, subsequently, improvements in mental health.

# Introduction

Mental illness has become a serious health concern in the United States. A recent survey revealed that approximately half of Americans will meet the requirements for a Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) diagnosis during their lives. More specifically, lifetime prevalence rates for mood disorders were estimated to be as high as 20.8% (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). In addition, it has been suggested that anxiety disorders affect approximately 40 million American adults a year (U.S. Department of Health and Human Services, 2007).

Along with the numerous physical benefits of exercise, physical activity has been shown to alleviate symptoms of anxiety and depression in both clinical and non-clinical populations (Berger & Motl, 2000; Long & van Stavel, 1995; Yeung, 1996). However, despite the well-established benefits of engaging in physical activity, the Center for Disease Control and Prevention reported that "over half of US adults do not engage in physical activity at levels consistent with public health recommendations" (CDC, 2007).

Therefore, it is important to identify factors that may lead to an increase in physical activity and, subsequently, improvements in mental health. A significant amount of research has examined the relationship between attentional focus and exercise (Baghurst, Thierry, & Holder, 2004; Masters & Ogles, 1998; Morgan & Pollock, 1977; Stevinson & Biddle, 1998). Initially, researchers examined "associative" and "dissociative" cognitive strategies in runners, likening dissociative strategies to focusing on non-running related thoughts and associative strategies to focusing on bodily sensations (Morgan & Pollock, 1977). More recently, Stevinson and Biddle (1998) proposed a new classification system, arguing that the previous allocation of runner's cognitions was oversimplified. However, it remains unclear whether or not what we attend to during exercise moderates the affective change typically associated with physical activity.

Furthermore, researchers have yet to examine the influence of autonomy over what is attended to while exercising on the affective benefits of physical activity. In accordance with Self-Determination Theory (Deci & Ryan, 1985), it is reasonable to assume that greater affective benefits will occur when individuals are able to control what they attend to while exercising than when they are not.

*Attentional Focus*

Research investigating attentional focus in runners began approximately three decades ago. Based on their previous work with recreational runners, Morgan and Pollock (1977) hypothesized that world class runners would "dissociate," or focus on non-running related thoughts, while running as a way to manage their bodily discomfort. However, their findings did not support this hypothesis. Instead, results from clinical interviews with 19 runners revealed they were focusing on bodily sensations, or using "associative" strategies. Additionally, they reported attending to their pace, choosing to stay with other runners, and using self-talk. For the next twenty years, a vast amount of research examining the differences between the two cognitive strategies was conducted.

After publishing a review of the research investigating the strategies, Masters and Ogles (1998) argued that the use of the term dissociation creates a certain amount of confusion, since it is a clinical disorder. They maintained that future researchers should replace the term with less confusing words such as cognitive strategies, distraction, or internal and external distraction. In addition, they suggested that the association-dissociation conceptualization was too simple to convey the full range of runners' cognitions.

Masters and Ogles also offered several conclusions regarding the relationship between attentional focus strategies and outcomes. They asserted that association tends to be associated with faster running times and is used more during races than dissociation. In contrast, dissociation is related to lower rates of perceived exertion and is used more in training than association. They then suggested that, when investigating this issue in the future, researchers include manipulation checks for induced attentional focus and some measure of related constructs. Last, they advised against using the "think-a-loud" protocol to measure attentional focus, since it may alter cognitive processes.

In 1998 a more comprehensive system for classifying runners' cognitions was proposed and tested by Stevinson and Biddle. Their system included two dimensions, referred to as task relevance and direction of attention, that results in four types of attentional focus. The first two types, inward and outward monitoring, are used to describe focusing on how one's body feels and attending to things critical to performing the task, respectively. The third type, inward distraction, refers to attending to thoughts irrelevant to the task while the last type, outward distraction, refers to focusing on external stimuli unrelated to performance. The researchers defined and provided examples of each type to sixty-six marathon runners who were then asked to rate them. Findings revealed that ratings of inward monitoring were significantly higher and the mean for inward distraction significantly lower than the other three types of attentional focus. These results led Stevinson and Biddle to conclude that their subdivision of attentional focus was supported.

The current study used new dimension labels for these categories (see Table 1) resulting in the following four types of attentional focus: task-relevant internal, task-relevant external, task-irrelevant internal, and task-irrelevant external. In addition, the task-relevant internal category was divided into three subcategories: bodily sensations, task-relevant thoughts, and self-talk. These new labels and divisions were created by Wininger, Gieske, and Abo (2007) because they were considered to be more intuitive than the than those proposed by Stevinson and Biddle.

Table 1

*Attentional Focus Model*

| | Internal | | | External |
|---|---|---|---|---|
| Task-relevant | Bodily sensations | Task-relevant thoughts | Self-talk | Task-relevant external cues |
| Task-irrelevant | Task-irrelevant thoughts | | | External distractions |

*Self-Determination Theory*

The Self-Determination Theory (SDT) focuses on the social-contextual conditions that enhance versus undermine intrinsic motivation, self-regulation, and well-being (Deci & Ryan, 2002, chap. 1). The SDT proposes that there are three innate psychological needs- -competence, autonomy, and relatedness- -when the three needs are satisfied intrinsic motivation, self-regulation, and well-being are enhanced and when the three needs are thwarted intrinsic motivation, self-regulation and well-being are decreased.

The first need, competence, refers to how effective individuals feel in their ongoing environmental interactions. This need drives people to seek challenges through which they can best exercise, maintain, and enhance their preexisting abilities. The second need, relatedness, refers to how connected a person feels to other individuals in a given context. Relatedness also encompasses the need to care for others and to be cared for by those others. The last need, autonomy, refers to perceiving oneself as the cause or source of one's behavior. However, SDT's concept of autonomy should not be confused with that of independence, as it does allow for external influences, so long as they are endorsed by the individual. Together, three specific qualities identified as perceived locus of causality, perceived choice, and volition explain the subjective experience of autonomy.

Perceived locus of causality (PLOC) refers to individuals' perceptions of what is causing their behavior. PLOC is conceptualized as a bipolar continuum, with one end reflecting internal PLOC and the other reflecting external PLOC. Thus, the continuum is used to represent whether individuals perceive their actions to be personally or environmentally initiated. Perceived choice refers to the sense of decision-making flexibility individuals experience when they are given many opportunities to choose. Although choices are typically thought to promote autonomy, not all choices involve this basic need. The last of the qualities, volition, refers to a free, unforced willingness to engage in an activity. It concentrates on the differences that emerge between free versus coerced individuals while doing what they want to do and while avoiding what they do not want to do.

SDT is a macro-theory that is composed of four mini-theories. These mini-theories consolidate to form the SDT framework in that they share holistic and rational assumptions and involve the concept of basic psychological needs. The mini-theories are the cognitive evaluation theory, organismic integration theory, causality orientations theory, and the basic needs theory.

Cognitive evaluation theory (CET) was originally developed to explain reward effects on intrinsic motivation. Within the context of CET, an intrinsically motivated individual would engage in an activity freely, their behavior maintained by an interest in and enjoyment from that activity. Prior research had demonstrated that both concrete and symbolic rewards decreased intrinsic motivation as long as individuals were required to engage in the activity in order to receive the reward and the reward was expected (Deci, 1971, 1972a, 1972b; Kruglanski, Friedman, & Zeevi, 1971; Lepper, Greene, & Nisbett, 1973). In contrast, positive feedback in the form of verbal rewards or praise has been shown to enhance intrinsic motivation. The theory suggests that two of the basic psychological needs, competence and autonomy, are extremely involved in intrinsic motivation. It goes on to propose that contextual events, whether in the form of rewards or positive feedback, also typically affect intrinsic motivation by either supporting or thwarting the satisfaction of these two needs.

Additionally, CET suggests that there are two specific cognitive processes through which these factors or events affect intrinsic motivation. The first process is referred to change in perceived locus of causality. That is, a contextual event may enhance or decrease intrinsic motivation depending upon whether it prompts a change in perceptions toward a more internal versus external locus. When an event prompts a change toward a more internal locus, intrinsic motivation is enhanced. However, if the change is toward a more external locus then it is predicted that intrinsic motivation will be undermined. The second process is termed change in perceived competence. Thus, an event that increases perceived competence will also enhance intrinsic motivation. In contrast, an event that decreases perceived competence will undermine intrinsic motivation.

CET goes on to specify different aspects of contextual events that determine their effects on intrinsic motivation. All contextual events are thought to have both a controlling aspect and an informational aspect. It is actually the salience of these two aspects that determines the effect a contextual event will have on an individuals' perception of causality and competence, subsequently affecting intrinsic motivation. Controlling aspects, or pressure toward a specific outcome, undermine intrinsic motivation through a shift to a more external perceived locus of causality. Informational aspects, such as positive feedback, are expected to enhance intrinsic motivation. These aspects support individuals' sense of competence in their actions.

Although little research has focused on events that enhance intrinsic motivation through a shift towards a more internal locus of causality, providing choice about what to do or how to do it has been shown to increase intrinsic motivation. Empathy and noncontrollingness have also been suggested as effective ways to maintain intrinsic motivation.

During the 1980's, CET was elaborated in two ways. First, the interpersonal climate within which events are administered was suggested to have a great influence on their functional significance. Therefore, Ryan (1982) demonstrated that an event such as positive feedback, typically experienced as informational, might be experienced as controlling when administered within a pressuring climate, such as a climate that emphasizes that people "should do well." Secondly, Ryan suggested that individuals initiate and control their actions in different ways that may be independent of the social context. For example, people may become either ego-involved in an activity or task-involved in it. When individuals are ego-involved, their self-worth becomes dependent upon their performance of the activity. In contrast, when individuals are task-involved, they are more involved with the task itself. Furthermore, when the initiation and control of behavior is ego-involved, the controlling aspect will be more salient than the informational aspect compared to when the initiation and control is task-involved.

The last basic psychological need, that of relatedness, is not thought to play as much of a role in the promotion of intrinsic motivation as do competence and autonomy. Yet, there are some interpersonal activities during which the satisfaction of relatedness is necessary for the maintenance of intrinsic motivation. For example, one study conducted by Anderson, Manoogian, and Reznick (as cited in Deci & Ryan, 2002) found that when children worked on an interesting activity in the presence of an unknown adult experimenter who paid no attention to them, they displayed an extremely low level of intrinsic motivation.

The other three mini-theories that form the SDT framework are less applicable to the present study than the first. However, because they contribute to the overall macro-theory, it is important that they be briefly overviewed here. The second mini-theory, Organismic Integration Theory (OIT), assumes that people are innately disposed to integrate their ongoing experiences, as long as they have the necessary nutriments (i.e. needs met) in order to do so. The third mini-theory, Causality Orientations Theory, attempts to index personality aspects that are important to the regulation of behavior and experience and specifies three orientations that differ in their degrees of self-determination. It is assumed that individuals have each of the orientations, just to differing degrees. The last mini-theory, the Basic Needs Theory, was developed in order to clarify what is meant by a basic psychological need and to explain their relation to mental health.

In agreement with both CET and the Basic Needs Theory, it is reasonable to assume that by providing exercisers with choice concerning an aspect of the exercise experience, their enjoyment and subsequently their motivation to exercise will increase. A significant amount of research has investigated the influence of perceived choice during exercise on affective benefits associated with physical activity. Specifically, researchers have examined the effects of engaging in preferred versus non-preferred modes, environments, and intensities while exercising.

*Preferred mode*

Parfitt and Gledhill (2004) conducted a study in which they hypothesized that participants would report more positive psychological responses from engagement in a preferred exercise mode compared to less preferred. Participants in this study were 10 male and 10 female college and community volunteers classified as low-active via self-report. The study consisted of three sessions, each occurring three days apart. The first session was a familiarization session during which participants experienced three modes of aerobic exercise consisting of a cycle ergometer, Concept II rower, and a treadmill. Participants were asked to rank the three modes of exercise in order of preference.

During sessions two and three, participants completed twenty minutes of exercise on either their high or low-preference mode of exercise (order counterbalanced) at a standardized intensity of 70% maximum heart rate (HR). For each exercise session, the

Subjective Exercise Experiences Scale (SEES) was given six times: before, at five-minute intervals during, and five minutes following exercise.

Results revealed that Psychological Well-Being (PWB) was significantly higher and Psychological Distress (PD), Fatigue, and RPE lower in the high-preference condition than in the low-preference condition, suggesting that preference for mode of exercise may influence psychological responses to exercise. A limitation of the study was the lack of a control condition.

Daley and Maynard (2003) examined the effect of choice of exercise mode on psychological affect in physically active adults. Participants consisted of 26 students or employees (14 males, 12 females) of a university sport, leisure, and exercise department who reported engaging in exercise, on average, at least three times a week. Each participant attended four sessions. The first session was a fitness assessment during which maximum oxygen uptake was predicted. Next, were three counterbalanced conditions, each lasting thirty minutes and separated by a five to seven day interval. Participants completed the Positive and Negative Affect Schedule (PANAS) before, fifteen minutes during, and five minutes after completion of each the conditions.

One of the three sessions served as a control condition during which participants were shown prerecorded British Broadcasting Corporation (BBC) television highlights from the 2000 Olympics. The remaining two sessions consisted of a preferred and prescribed exercise condition where participants exercised between 75 and 80% of their age-adjusted heart rate maximum. In the preferred condition, participants chose their preferred mode of exercise from cycle ergometry, treadmill running, gradient walking, rowing ergometry, stair climbing, or a ski simulator. In the prescribed condition, participants exercised on a cycle ergometer.

Results of this study indicated that participants reported significantly lower Positive Affect in the no-choice condition than in the choice and control conditions. Similarly, participants reported significantly higher Negative Affect scores in the no-choice condition than in the choice and control condition. A methodological flaw of this study was in the exercise conditions since cycle ergometry was included in both the preferred and prescribed conditions. In other words, those who chose the cycle ergometer in the preference condition (i.e., three participants) engaged in their preferred mode of exercise in the no-choice condition as well.

Miller, Bartholomew, and Springer (2005) investigated the “impact of exercise preference on post-exercise affective states” (p. 265). They hypothesized that most and least preferred exercise modes would differ in both the resulting affective state and subjective ratings of enjoyment. The participants included 34 female undergraduates recruited from university aerobics classes. The study consisted of six sessions. The first session was an orientation session during which participants completed 10 minutes of exercise on five different pieces of equipment: stair stepper, treadmill, rower, stationary cycle ergometer, and simulated cross-country skiing. Participants also rank ordered the exercise modes from most to least favorite.

The next five experimental sessions, their two most favorite exercise modes, their two least favorite exercise modes, and a no-exercise control, lasted 20 minutes and were each separated by a week. For the exercise conditions, affect was measured using the Positive Affect Negative Affect Schedule (PANAS) prior to, and 5, 20, and 40 minutes following exercise and RPE was assessed at 5-minute intervals. In addition, participants rated their enjoyment, performance, and effort. For the no-exercise condition, participants sat quietly in a private cubicle and then completed the PANAS at the same time points as the exercise conditions.

Results revealed that for high-preference exercise, positive affect was significantly higher and negative affect significantly lower than baseline at all post-exercise measurements. For low-preference exercise, negative affect was significantly lower than baseline at 20 and 40 minutes post-exercise. The effects of exercise on positive and negative affect also appeared to be mediated by enjoyment of exercise mode.

*Preferred environment*

Butryn and Furst (2003) examined the effects of running in a natural park setting and an urban setting on the cognitions, moods, and feeling states of female distance runners. The participants included 30 non-elite runners, ages 18-55, recruited from a campus fitness facility and local running clubs. The study consisted of two counterbalanced sessions where participants ran four miles in either a public park or an industrialized area. Prior to running, participants completed the short form of the Profile of Mood States (POMS) and the Exercise-Induced Feeling Inventory (EFI) and were told to run at a comfortable training pace. After running, participants completed the POMS and the EFI again, as well as the Thoughts During Running Scale (TDRS) and were asked to verbally rate their perceived effort. After their second run, participants completed a post-experimental questionnaire that investigated which setting they preferred running in. Results of this study revealed no significant differences in Total Mood Disturbance (TMD), positive engagement, or revitalization change scores between the park and urban settings despite the fact 93% of participants preferred running in the park setting compared to the urban setting.

Baghurst, Thierry, and Holder (2004) examined whether placing an individual in an environment consistent with their predicted attentional style would enhance performance. Participants in this study were 12 male and 2 female physically active Sports Science university students. Based on scores from the Test of Attentional and Interpersonal Style, seven participants were classified as externalisers and seven were classified as internalisers. The study consisted of two counterbalanced sessions conducted at least one week apart. During both sessions, participants completed 15 minutes of exercise on a rowing ergometer with a resistance setting of 4. Distance completed was assessed every five minutes during exercise. In the dissociation condition, participants were not allowed to view the digital display and were instructed to answer "simple flash card multiplication questions" (p. 6). They were, however, informed of their time at 5, 10, 12, and 14 minutes. In the association condition, participants were instructed to pay attention to the digital display and to read aloud the distance they had covered every 15 seconds. To ensure the conditions were as similar as possible, participants in this condition were also informed of their time after 5, 10, 12, and 14 minutes. Results revealed that externalisers rowed significantly further in the dissociative than in the associative condition whereas the internalisers rowed significantly further in the associative than the dissociative condition.

*Preferred intensity*

Parfitt, Rose, and Markland (2000) conducted a study in order to "compare the effects of prescribed and preferred intensity exercise on affect and interest-enjoyment in active individuals" (p. 233). Participants consisted of 26 undergraduates (12 males, 14 females) classified as active via self-report. The study consisted of three sessions. The first session was a familiarization session during which participants practiced using a treadmill and were instructed how to rate their perceived exertion (RPE) and to use the Subjective Exercise Experiences Scale (SEES) Participants estimated VO2 max was also assessed by a submaximal exercise test.

The next two sessions, separated by seven days, were counterbalanced exercise sessions at either the participant's preferred or a prescribed intensity. In the preferred intensity session, participants were instructed to exercise on a treadmill "at their own preferred work rate for 20 minutes" and were allowed to change the intensity every five minutes if they wished. Participants completed the SEES prior to beginning exercise, at five-minute intervals during the exercise, and after a five-minute cool down. Borg's RPE scale was used to measure RPE every five minutes. After exercising, participants completed the Intrinsic Motivation Inventory (IMI) in order to assess their enjoyment. With the exception of intensity, the prescribed intensity session followed the same protocol. In this session, participants completed 20 minutes of exercise on a treadmill at 65% of their estimated VO2 max. Results revealed no significant differences in Psychological Well Being (PWB), Psychological Distress (PD) or fatigue between preferred and prescribed intensity sessions.

Dishman, Farquhar, and Cureton (1994) investigated affective changes in 23 men at differing activity levels. Participants were classified as low- or high-active via self-report. The study consisted of two sessions. During the first, participants' peak oxygen uptake was calculated. In the second session, participants exercised for 20 minutes on a stationary bike at their preferred intensity. Spielberger's State Anxiety Inventory was given 1 minute before, every 5 minutes during, and 1 minute following exercise.

Results revealed that high-active men reported a significant reduction in state anxiety following cycling. Overall, no differences in selected intensity emerged between the low and high-active participants. A methodological flaw of this study was that no comparable prescribed intensity condition was included.

In a more recent study, Dyrlund and Wininger (2008) investigated the effects of music preference and exercise intensity on exercise enjoyment and perceived exertion. Participants consisted of 200 undergraduate students (126 females, 74 males) who began by filling out pre-exercise questionnaires that included: demographics, a music preference questionnaire, and a measure of attentional focus. Next, participants were randomly assigned to either their most preferred, least preferred, or a no music condition. Following this, participants were asked to exercise on a treadmill at one of three randomly assigned intensities (low, moderate, or high) for 20 minutes. While exercising, they were asked to estimate their RPE at the 10- and 20- minute marks. After completion of exercise, each participant completed an exercise enjoyment scale, music satisfaction scale, and a measure of attentional focus.

Results revealed that, as long as the participants paid attention to the music being played, they enjoyed exercising significantly more while listening to music they liked compared to while listening to music they did not like. However, music preference did not affect participant's perceived effort during exercise. A methodological flaw of this study was that the music selected might not have been an accurate representation of the participant's most preferred or least preferred type since they were limited to choosing from a list of only six types. In addition, how often the participants listened to music was not assessed.

In conclusion, the relationship between choice during exercise and affective change remains unclear. A considerable amount of research suggests that perceived control over an aspect of the exercise experience, whether it is mode, intensity, or setting, may moderate the psychological benefits typically associated with exercise. Yet, methodological limitations leave the issue unresolved, suggesting a need for further examination.

The purpose of the present study is to determine whether preference for attentional focus strategy moderates the amount of affective change and enjoyment experienced after exercise. As previously mentioned, a significant amount of research suggests satisfaction of the three basic psychological needs facilitates healthy psychological functioning. Thus, in accordance with the Basic Needs Theory, it is reasonable to assume that higher degrees of perceived autonomy lead to increased feelings of well-being. Similarly, in accordance with Cognitive Evaluation Theory, it is reasonable to presume that, by prompting a change toward a more internal locus of control, intrinsic motivation will be enhanced. As a result, the need for autonomy would also be supported. Therefore, it is hypothesized that individuals will demonstrate greater affective benefits and enjoyment after exercise employing their most preferred type of attentional focus compared to after exercise employing their least preferred type of attentional focus.

## Method

*Participants*

Initially, there were 117 participants. However, 17 were eliminated from the analyses due to the following reasons: incomplete data, failure to follow questionnaire instructions, and blatant inattention to the manipulation measure. Therefore, the final analyses included 100 participants (57 female, 43 male) with a mean age of 19.52 (SD = 2.25). Participants were recruited from psychology courses at Western Kentucky University. They participated for extra credit or as a course requirement and signed up using the Psychology Department's study board system.

All participants completed the American College of Sports Medicine (ACSM) risk stratification questionnaire to determine whether they are eligible for the study. Only "low risk" participants were allowed to participate. The Stages of Change model, a routine demographic provided on participants in exercise research, was used to divide participants by level of experience into one of the following five stages: pre-contemplation, contemplation, preparation, action, and maintenance.

The Stages of Change (i.e., Transtheoretical Model; Prochaska & DiClemente, 1983) refers to one's readiness for sustained participation in a given behavior and is a function of current engagement in that behavior. It takes into account an individual's current exercise status and the individual's intentions for future behavior. The model is often used to explain the exercise behavior change process with regard to the acquisition and maintenance of exercise behavior. Individuals are classified as being in one of five stages. Persons in the precontemplation stage do not exercise and are not thinking about starting an exercise program in the near future (in the next six months). Those in the contemplation stage do not currently exercise, but they are thinking about starting an exercise program in near future (in the next six months). Persons in the preparation stage plan on exercising and already exercise some, but not regularly. Individuals in the action stage have started to exercise regularly (three exercise sessions per week for at least 30 min per session), but have been doing so for less than 6 months. Those who have been exercising regularly for 6 months or more are classified as being in the maintenance stage. The model is cyclical as opposed to linear; persons can regress back to a previous stage at anytime. There was one participant in the pre-contemplation stage, 8 in contemplation, 52 in preparation, 17 in action, and 22 in maintenance.

*Tasks and Materials*

The Stages of Change measure developed by Marcus, Selby, Niaura, and Rossi (1992) was employed in this study. Development of this measure was based upon a similar measure for smoking cessation (Prochaska & DiClemente, 1983). The measure consists of five statements from which the participants choose the statement which best describes them. Each statement corresponds with one of the five stages. The test-retest reliability for the measure was .78. Concurrent validity of the measure has been demonstrated by Marcus and Simkin (1993). They compared results on the Stages of Change measure with the Seven Day Physical Activity Recall Questionnaire (Blair, 1984). Results revealed that scores on the recall instrument significantly differentiated among the Stages of Change, demonstrating concurrent validity.

Participants were asked to report how many days per week they exercised and the average duration of their exercise bouts in order to examine patterns in exercise behavior. Participants were also asked what their primary purpose for engaging in exercise was. All exercise was performed on a Landice L7 Club treadmill. Exercise intensity was monitored using ©BIOPAC Systems, Inc. physiological equipment that recorded an electrocardiogram during every bout of exercise. This required three electrodes to be attached to the torso in order to measure constantly participant's heart rate for the percentage of heart rate maximum.

Most-preferred and least preferred attentional focus strategies were manipulated using a variety of Digital Video Disc's (DVD's). To begin, external task-irrelevance was manipulated by allowing participants to choose a Saturday Night Live DVD to watch while exercising. External task-relevance was manipulated by having participants choose a DVD about running to watch while exercising. Internal task-irrelevance was manipulated by having participants watch a DVD containing a visual and auditory cue that occurred every 30 seconds to prompt participants to think about things unrelated to exercise but internal to them (e.g. "What are your plans for today?"). Last, internal task-relevance was also manipulated by having participants watch a DVD containing a visual and auditory cue occurring every 30 seconds. However, the DVD cycled between one of three specific prompts. The first prompt encouraged participants to focus on their bodily sensations such as their heart rate, breathing, or muscles. The second prompt encouraged them to focus on task-relevant thoughts such as strategies, goals, or pace. The last prompt encouraged participants to engage in positive self-talk such as telling themselves "I can do it."

*Independent Variables*

Participants were asked to rank the four different attentional focus strategies in order of most preferred (1) to least preferred (4) to determine which strategy they preferred using the most and which they prefer using the least while exercising. Using a percentage scale, they were also asked to rate how much they preferred using each of the four strategies while exercising. Participant ranking information was then used to assign most and least preferred strategies for the two trials, the order of which were counterbalanced.

*Dependent Variables*

The Activation-Deactivation Adjective Checklist (AD-ACL) was used to measure affect prior to, during, and following exercise bouts. The AD-ACL is made up of two dimensions, each including two bipolar factors. The factors included in the first dimension, referred to as Energetic Arousal, are Energy and Tiredness. The factors included in the second dimension, referred to as Tense Arousal, are Tension and Calmness (Ekkekakis, Hall, & Petruzzello, 2005).

The AD-ACL consists of 20 activation-descriptive adjectives. Using a four-point scale, individuals completing the measure rate how well each adjective describes their immediate feelings. Use of the scale requires individuals to circle symbols demonstrating that they definitely feel, feel slightly, cannot decide, or definitely do not feel a certain way (Thayer, 1986). With reference to this study, participants were asked to circle a number ranging from one to four, with lower scores representing more energy, tiredness, tension, or calmness and vice versa.

In a recent meta-analysis investigating the influence of acute aerobic exercise on positive activated affect, the AD-ACL was cited as being used 137 times, second only to the Subjective Exercise Experiences Scale (SEES) (Reed & Ones, 2006). However, the SEES is an exercise specific affect measure that researchers are now cautioning against using (Ekkekakis & Petruzzello, 2000; Ekkekakis & Petruzzello, 2001; Ekkekakis & Petruzzello, 2002).

Support for validity of the AD-ACL was demonstrated in a classic study conducted by Thayer (1967). Results revealed significant correlations between heart rate and Energy, .49, between heart rate and Calmness, .43, and between skin conductance and Tension, .49.

Multiple factor analyses have confirmed the factor structure of the measure (Thayer, 1967; Thayer, 1978). In addition, the factor structure has been found to remain essentially the same, regardless of the type of rating scale used (Thayer, 1986). Test-retest reliability coefficients for the measure were as follows: Energy, .89; Tension, .93; Calmness, .79; and Tiredness, .89 (Thayer, 1978). AD-ACL subscale reliability coefficients from the current study are reported in Table 2.

Table 2

*AD-ACL Subscale Reliability Coefficients*

| *Subscale* | *Most-Preferred* | | | | *Least-Preferred* | | | |
|---|---|---|---|---|---|---|---|---|
| | *Pre* | *During* | *Post* | *Post-15* | *Pre* | *During* | *Post* | *Post-15* |
| Tired | .863 | .665 | .754 | .849 | .897 | .687 | .819 | .860 |
| Energetic | .782 | .713 | .777 | .812 | .839 | .757 | .778 | .785 |
| Calmness | .592 | .561 | .708 | .583 | .645 | .525 | .591 | .679 |
| Tension | .624 | .529 | .631 | .683 | .716 | .519 | .599 | .639 |

Items from the revised version of the Intrinsic Motivation Inventory (IMI) (McAuley, Wraith, & Duncan, 1991) were administered following each exercise bout to assess participants' exercise enjoyment and autonomy.  Participants were asked to indicate how strongly they agreed with each item on a Likert scale from 1 (Strongly disagree) to 7 (Strongly agree). The enjoyment subscale consisted of items 1 to 4 with a possible range of 4 to 28. Higher scores on the subscale indicated greater enjoyment. An example enjoyment item is "I enjoyed walking/running on the treadmill." The autonomy subscale consisted of items 5 to 11 with a possible range of 7 to 49. Higher scores on the subscale indicated greater autonomy. An example autonomy item is "I did this activity because I wanted to." The IMI has been found to have strong construct validity and the enjoyment subscale has the greatest internal consistency ($\alpha$=.92) (McAuley, Wraith, & Duncan, 1991). Enjoyment and autonomy reliability coefficients from the current study are reported in Table 3.

Table 3

*Reliability Coefficients for Perceived Enjoyment and Autonomy*

| *Subscale* | *Most-Preferred* | *Least-Preferred* |
|---|---|---|
| Enjoyment | .919 | .899 |
| Autonomy | .868 | .865 |

A pain scale and Borg's Rating of Perceived Exertion (RPE) was administered following each exercise bout. The RPE scale ranges from 6 to 20, with higher scores representing greater ratings of exertion. A strong correlation between RPE and heart rate ($r$=.80-.90) has been found, and the measure is considered to be reliable and valid (Borg, 1982). The pain scale ranges from 0 to 11, with higher numbers indicating greater levels of pain.

*Manipulation Check*

Directly following the exercise bouts, participants were asked to report whether or not they used each of the six possible attentional focus strategies. They were asked to rate the percentage of time that they used each strategy and instructed that all six category percentages must add up to 100%.

*Procedures*

Students signed up for the study using the Psychology Department's Sona system, which is a web based human subject pool management program. They were allowed to sign up for an hour slot anytime Monday through Friday from 7:00am until 5:00pm. The second part of the study occurred at the same time exactly one week after the first part. Participants were asked to drink plenty of fluids, avoid drinking alcohol or caffeine, and to avoid taking medication for 24 hours prior to the experiment. They were also asked not to consume heavy foods three hours prior to the experiment and to come to the experiment well rested and in comfortable rubber soled shoes. Upon arriving to the lab, participants were given an ACSM screening, an informed consent form (see Appendixes A and B for complete forms) to read and sign, and were given a chance to ask any questions they had about the experiment.

Next, participants were familiarized with the ©BIOPAC Systems, Inc. physiological equipment and three electrodes were placed on their torso. Before the electrodes are attached, their skin was first rubbed with an abrading pad and swabbed with alcohol to remove any loose skin. Then, one electrode was attached to both the left and right lower ribcage, and the third electrode was placed on the right collarbone.

Participants were then asked to complete a questionnaire assessing demographics and to rate and rank the six attentional focus strategies (see Appendixes C and D for complete forms). In addition, they were administered the AD-ACL (see Appendix E), which was followed by an assessment of the participants' height and weight.

After this, the electrode leads were attached and the equipment calibrated. Participants were familiarized with the treadmill and exercise began with a two-minute warm-up period. They then proceeded with a 20- minute exercise bout, during which the AD-ACL was administered again mid-bout (after 10 minutes) and RPE and participants reported pain was assessed one minute prior to the completion of exercise. Each participant exercised at 65% of their heart rate maximum (% $HR_{max}$ ; 220-age) since moderate intensity exercise has been linked to affective benefits (Berger & Owen, 1998; Steptoe, Kearsley, & Walters, 1993). In addition, high-intensity exercise has been linked to less beneficial affective changes (Berger & Owen, 1992). The classification of exercise intensity varies depending upon the source one consults. The ACSM (2006) designates moderate intensity as between 64-76% of maximum heart rate (p. 4). Yet, the CDC defines moderate intensity as 50 to 70% of maximum heart rate or a rating of 12-14 on Borg's RPE scale (retrieved from http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/index.htm on February 23rd, 2007). The exercise intensity that was employed in this study was selected by identifying the mid-point of the range recommended by each source (70% and 60%, respectively) and subsequently identifying the mid-point of these two percentages (65%). By using this percentage of heart rate maximum, it was possible for participants to exercise at an intensity that falls within the recommendations of both sources.

Following both sessions, participants also filled out an attentional focus questionnaire (see Appendix F) to determine the percentage of time spent focusing on each of the strategies while exercising. In addition, they completed post-exercise measures assessing perceived enjoyment and autonomy (see Appendix G). Then, they were asked to complete the AD-ACL immediately following the exercise bout and again fifteen minutes after the completion of exercise. Before the participants left the second session, they were debriefed regarding the purpose of the study and granted credit on the study board.

*Design*

A 2 (Preference Condition) X 4 (Affect) design was implemented for the study. There were two levels for preference (most preferred and least preferred) and four levels of affect. The four levels of affect were prior to exercise, mid-bout, immediately following exercise, and fifteen minutes following exercise. A repeated measures ANOVA was used to compare the conditions.

# Results

The results did not support the proposed hypothesis. There were no significant interactions between preference and affect nor were there any main effects for preference on affect. In addition, there were no significant differences between preference trials on perceived enjoyment or autonomy. However, there were changes in affect across time. In the interest of clarity, the results for each subscale will be addressed separately.

*Tiredness Subscale*

There was no significant interaction ($F(3,297) = .126$, $p = .945$, $\eta^2_{partial} = .001$) between preference and tired subscale responses. There was no main effect for preference ($F(1,99) = .624$, $p = .432$, $\eta^2_{partial} = .006$) on affect (i.e., tired subscale responses). As shown in Figure 1, there was a significant change in tired subscale responses ($F(3,297) = 49.467$, $p < .001$, $\eta^2_{partial} = .333$) across time. A quadratic analysis of variance was conducted on time. Results revealed a significant main effect ($F(1,99) = 121.455$, $p < .001$, $\eta^2_{partial} = .551$) on tired subscale responses. A comparison of the linear and quadratic analyses revealed the quadratic function better explained the relationship between tiredness and time.

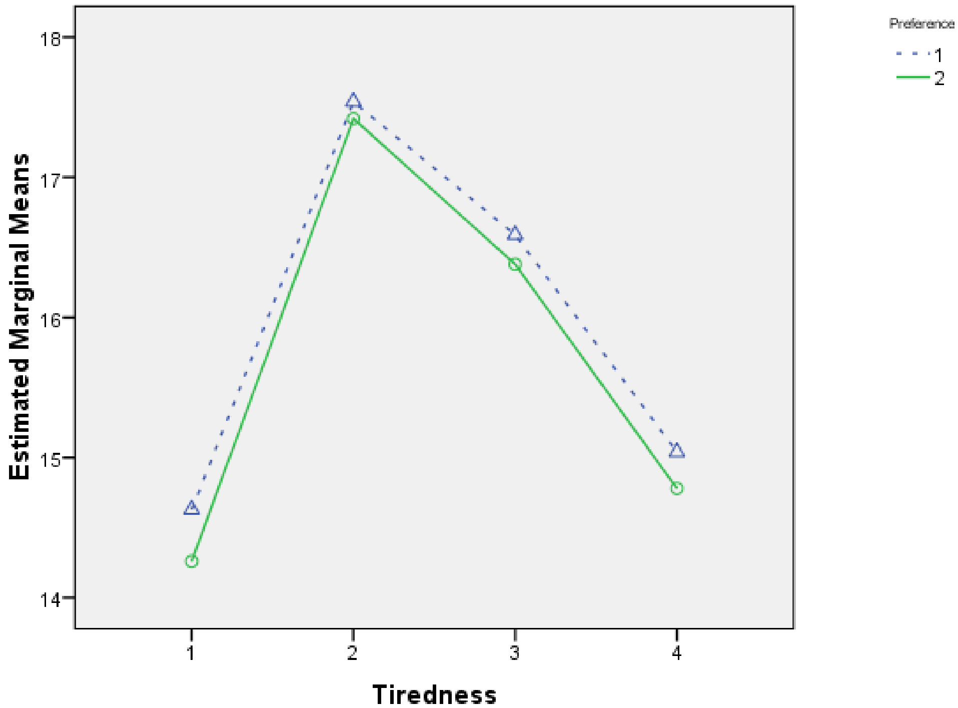


*Figure 1.* Tiredness subscale scores across time. Preference 1 represents the most preferred trials; preference 2 represents the least preferred trials.

Higher scores on the subscale represented lower levels of tiredness. Tiredness levels decreased significantly from pre to during exercise. Tiredness levels increased significantly from during to post-exercise and from post to 15 minutes following exercise. There were significant differences in tired subscale responses between administrations given pre-exercise and those given during and post-exercise across trials ($p < .001$). There were also significant differences between tired subscale responses to administrations given during exercise and those given post-exercise and 15 minutes following exercise across trials ($p < .001$). Last, there was a significant difference between tired subscale responses to administrations given post-exercise and those given

15 minutes following exercise across trials ($p < .001$). Means and standard deviations of the tired subscale are reported in Table 4.

Table 4

*Means and Standard Deviations for the Tired Subscale*

| *Trial* | | | *Time* | |
|---|---|---|---|---|
| | *Pre* | *During* | *Post* | *Post-15* |
| MP | 14.63(4.10) | 17.54(2.43) | 16.59(3.06) | 15.04(3.90) |
| LP | 14.26(4.44) | 17.42(2.49) | 16.38(3.41) | 14.78(4.05) |

*Note.* MP = most preferred; LP = least preferred.

*Energetic Subscale*

There was no significant interaction ($F(3,297) = .020$, $p = .996$, $\eta^2_{partial} = .000$) between preference and energetic subscale responses. There was no main effect for preference ($F(1,99) = .039$, $p = .843$, $\eta^2_{partial} = .000$) on affect (i.e., energetic subscale responses). As shown in Figure 2, there was a significant change in energetic subscale responses ($F(3,297) = 52.097$, $p < .001$, $\eta^2_{partial} = .345$) across time. A quadratic analysis of variance was conducted on time. Results revealed a significant main effect ($F(1,99) = 95.641$, $p < .001$, $\eta^2_{partial} = .491$) on energetic subscale responses. A comparison of the linear and quadratic analyses revealed the quadratic function better explained the relationship between energy and time.

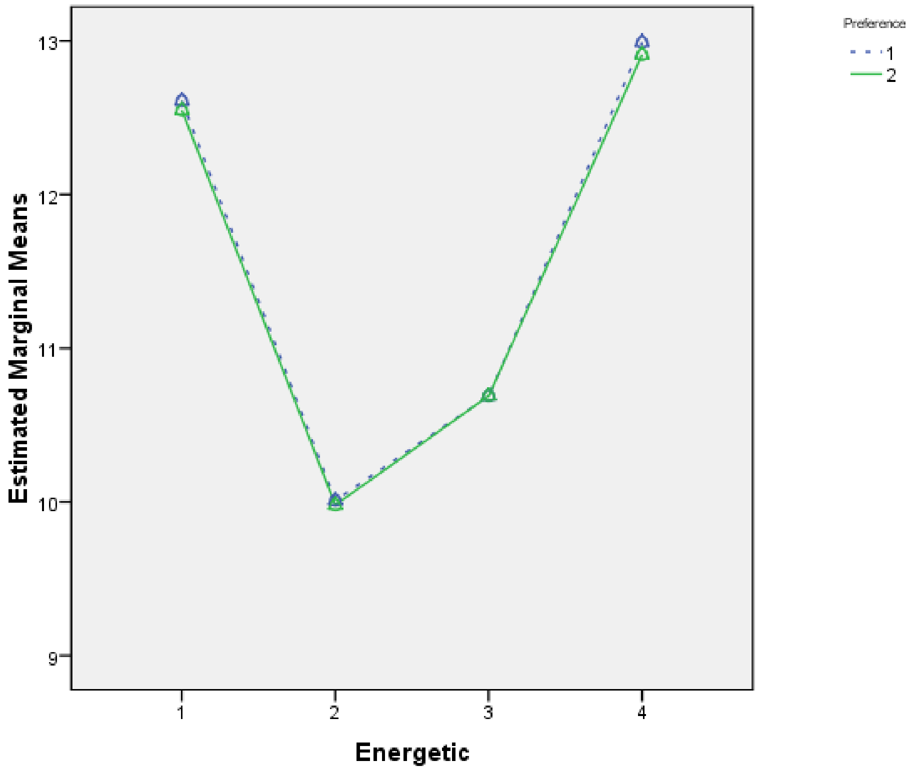


*Figure 2.* Energetic subscale scores across time. Preference 1 represents the most preferred trials; preference 2 represents the least preferred trials.

Higher scores on the subscale represented lower levels of energy. Energetic levels increased significantly from pre to during exercise. Energetic levels decreased significantly from during to post-exercise and from post to 15 minutes following exercise. There were significant differences in energetic subscale responses between administrations given pre-exercise and those given during and post-exercise across trials ($p < .001$). There were also significant differences between energetic subscale responses to administrations given during exercise and those given post ($p = .001$) and 15 minutes following exercise ($p < .001$) across trials. Last, there was a significant difference between energetic subscale responses to administrations given post-exercise and 15 minutes following exercise across trials ($p < .001$). Means and standard deviations of the energetic subscale are reported in Table 5.

Table 5

*Means and Standard Deviations for the Energetic Subscale*

| *Trial* | Time | | | |
|---|---|---|---|---|
| | *Pre* | *During* | *Post* | *Post-15* |
| MP | 12.61(3.22) | 10.01(2.85) | 10.69(3.16) | 12.99(3.36) |
| LP | 12.55(3.58) | 9.98(2.76) | 10.69(3.13) | 12.91(3.29) |

*Note.* MP = most preferred; LP = least preferred.

*Tension Subscale*

There was no significant interaction (F(3,297) = .051, $p = .985$, $\eta^2_{partial} = .001$) between preference and tension subscale responses. There was no main effect for preference (F,(1,99) = .012, $p = .912$, $\eta^2_{partial} = .000$) on affect (i.e., tension subscale responses). As shown in Figure 3, there was a significant change in tension subscale responses (F(3,297) = 16.517, $p < .001$, $\eta^2_{partial} = .143$) across time. A quadratic analysis of variance was conducted on time. Results revealed a significant main effect (F(1,99) = 12.95, $p = .001$, $\eta^2_{partial} = .116$) on tension subscale responses. A comparison of the linear and quadratic analyses revealed the linear function better explained the relationship between tension and time yet accounted for a smaller percentage of the variance compared to the other three subscales.

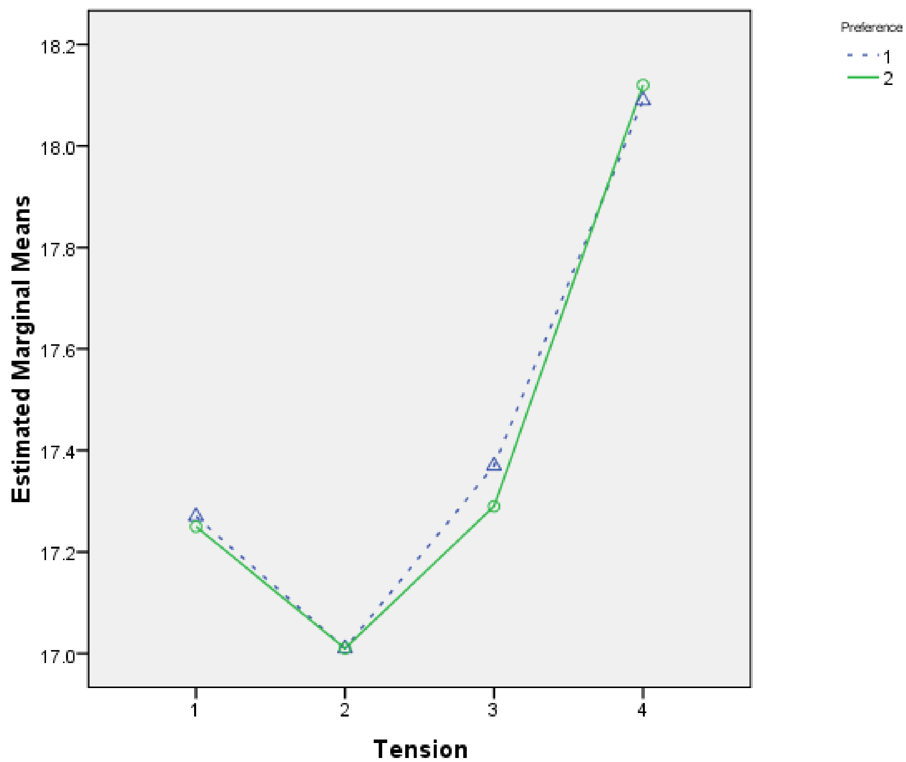


*Figure 3.* Tension subscale scores across time. Preference 1 represents the most preferred trials; preference 2 represents the least preferred trials.

Higher scores on the subscale represented lower levels of tension. Tension levels decreased significantly from during to post-exercise and from post to 15 minutes following exercise. There was a significant difference in tension subscale responses between administrations given pre-exercise and those given 15 minutes following exercise across trials ($p < .001$). There were also significant differences between tension subscale responses to administrations given during exercise and those given post ($p = .048$) and 15 minutes following exercise ($p < .001$) across trials. Last, there was a significant difference between tension subscale responses to administrations given post-exercise and those given 15 minutes following exercise across trials ($p < .001$). Means and standard deviations of the tension subscale are reported in Table 6.

Table 6

*Means and Standard Deviations for the Tension Subscale*

| *Trial* | *Time* | | | |
|---|---|---|---|---|
| | *Pre* | *During* | *Post* | *Post-15* |
| MP | 17.27(2.59) | 17.01(2.33) | 17.37(2.43) | 18.09(2.30) |
| LP | 17.25(2.70) | 17.01(2.20) | 17.29(2.33) | 18.12(2.10) |

*Note.* MP = most preferred; LP = least preferred.

*Calmness Subscale*

There was no significant interaction (F(3,297) = 1.607, $p = .188$, $\eta^2_{partial} = .016$) between preference and calmness subscale responses. There was no main effect for preference (F,(1,99) = .626, $p = .431$, $\eta^2_{partial} = .006$) on affect (i.e., calmness subscale responses). As shown in Figure 4, there was a significant change in calmness subscale responses (F(3,297) = 121.954, $p < .001$,. $\eta^2_{partial} = .552$) across time. A quadratic analysis of variance was conducted on time. Results revealed a significant main effect (F(1,99) = 212.056, $p < .001$, $\eta^2_{partial} =.682$) on calmness subscale responses. A comparison of the linear and quadratic analyses revealed the quadratic function better explained the relationship between calmness and time.

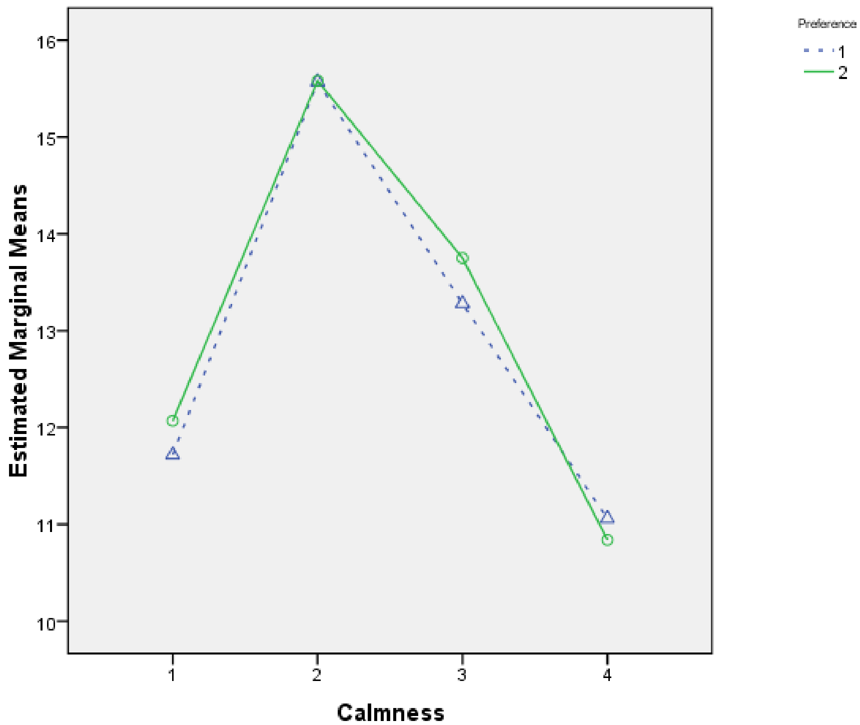


*Figure 4.* Calmness subscale scores across time. Preference 1 represents the most preferred trials; preference 2 represents the least preferred trials.

Higher scores on the subscale represented lower levels of calmness. Calmness levels decreased significantly from pre to during exercise. Calmness levels increased significantly from during to post-exercise and from post to 15 minutes following exercise. There were significant differences in calmness subscale responses between administrations given pre-exercise and those given during and post-exercise ($p < .001$), and 15 minutes following exercise ($p = .001$) across trials. There were also significant differences between calmness subscale responses to administrations given during exercise and those given post-exercise and 15 minutes following exercise ($p < .001$) across trials. Last, there was a significant difference between calmness subscale responses to administrations given post-exercise and those given 15 minutes following exercise across trials ($p < .001$). Means and standard deviations of the calmness subscale are reported in Table 7.

Table 7

*Means and Standard Deviations for the Calmness Subscale*

| *Trial* | | | *Time* | |
|---|---|---|---|---|
| | *Pre* | *During* | *Post* | *Post-15* |
| MP | 11.72(2.74) | 15.57(2.76) | 13.28(3.40) | 11.06(2.70) |
| LP | 12.07(3.07) | 15.58(2.72) | 13.75(3.07) | 10.84(2.77) |

*Note.* MP = most preferred; LP = least preferred.

*Enjoyment and Autonomy*

There were no significant differences between preference trials ($F(1,99) = .007$, $p = .935$, $\eta^2_{partial} = .000$) on perceived enjoyment. Nor were there any significant differences between preference trials ($F(1,99) = .059$, $p = .809$, $\eta^2_{partial} = .001$) on perceived autonomy. Means and standard deviations of perceived enjoyment and autonomy are reported in Tables 8.

Table 8

*Means and Standard Deviations for Perceived Enjoyment and Autonomy*

| *Subscale* | *Most-Preferred* | *Least-Preferred* |
|---|---|---|
| Enjoyment | 18.98(5.42) | 18.93(5.77) |
| Autonomy | 38.01(8.87) | 37.84(8.53) |

## Discussion

It was hypothesized that participants would demonstrate greater affective benefits and enjoyment after exercise employing their most preferred type of attentional focus strategy compared to after exercise employing their least preferred type of attentional focus strategy. The results of the study did not support the proposed hypothesis. There was no difference in affective benefits regardless of whether participants exercised while employing their most or least preferred attentional focus strategy. In other words, participants did not report feeling more calm and energetic during or after exercise using their most preferred approach than when they exercised using their least preferred approach. Nor did they feel less tired and tense. Similarly, there was no difference in perceived enjoyment or autonomy when participants engaged in their most preferred compared to their least preferred attentional focus strategy. Thus, participants did not report experiencing more feelings of enjoyment or autonomy while exercising using their most preferred than while using their least preferred strategy.

In the current study, participant's moods did change over time, independent of their preference condition. With reference to the first factor of the AD-ACL, tiredness, a comparison of the linear ($\eta^2_{partial} = .333$) and quadratic ($\eta^2_{partial} = .551$) analyses revealed the quadratic function better explained the relationship between tiredness and time. To begin, participants reported feeling significantly less tired during and immediately following than prior to exercise. Participants also reported feeling significantly more tired immediately after and 15 minutes following the completion of the exercise bout than during exercise. Last, participants reported feeling significantly more tired 15 minutes after the completion of exercise than immediately following exercise.

With reference to the energetic factor of the AD-ACL, a comparison of the linear ($\eta^2_{partial}$ = .345) and quadratic ($\eta^2_{partial}$ = .491) analyses revealed the quadratic function better explained the relationship between energy and time. To begin, participants reported feeling significantly more energetic during and immediately after than prior to exercise. Participants also reported feeling significantly less energetic immediately after and 15 minutes following the completion of the exercise bout than during exercise. Last, participants reported feeling significantly less energetic 15 minutes following the completion of the exercise bout than immediately after exercise.

With reference to the tension factor of the AD-ACL, a comparison of the linear ($\eta^2_{partial}$ = .143) and quadratic ($\eta^2_{partial}$ =.116) analyses revealed the linear function better explained the relationship between tension and time. To begin, reported feelings of tension were significantly less 15 minutes following the completion of the exercise bout than prior to exercise. Participants also reported feeling significantly less tense immediately after and 15 minutes following the completion of exercise the exercise bout than during exercise. Last, participants reported feeling significantly less tense 15 minutes following the completion of the exercise bout than immediately after exercise.

With reference to the calmness factor of the AD-ACL, a comparison of the linear ($\eta^2_{partial}$ = .552) and quadratic ($\eta^2_{partial}$ =.682) analyses revealed the quadratic function better explained the relationship between calmness and time. To begin, participants reported feeling significantly less calm during and immediately after than prior to the exercise bout. Participants reported feeling significantly more calm 15 minutes following the completion of the exercise bout than prior to exercise. They also reported feeling significantly more calm immediately after and 15 minutes following the completion of the exercise bout than during exercise. Last, participants reported feeling more calm 15 minutes following the completion of the exercise bout than immediately after exercise.

The results of the study were not in agreement with the Self-Determination Theory. The theory proposes that conditions satisfying our innate need for competence, autonomy, and relatedness should lead to an increase in intrinsic motivation, self-regulation, and well-being (Deci & Ryan, 2002). However, in the present study, allowing participants to employ their most preferred versus their least preferred attentional focus strategy during exercise did not result in a greater increase in well-being.

The results of the present study were also inconsistent with previous research that has suggested individuals report greater affective benefits from exercising in conditions where they are allowed to engage in their preferred mode compared to conditions where the mode is prescribed. For example, Parfitt and Gledhill (2004) found that Psychological Well-Being was significantly higher ($\eta^2 = 0.45$) and Psychological Distress and fatigue lower ($\eta^2 = 0.37$; $\eta^2 = 0.32$) when participants exercised in a preferred mode compared to a less preferred. Similarly, results from a study conducted by Daley and Maynard (2003) revealed that participants reported significantly lower Positive Affect and significantly higher Negative Affect scores when they exercised in a prescribed exercise mode condition compared to the choice and control conditions.

In addition, Miller, Bartholomew, and Springer (2005) found that positive affect was significantly higher and negative affect significantly lower than baseline at all post-exercise measurements when participants engaged in high-preference exercise, with Cohen's d effect sizes ranging from .34 to.61 and -.34 to -.60, respectively. However, negative affect was only significantly lower than baseline at 20 ($d = -.45$) and 40 minutes (*d* = -.36) post-exercise when participants engaged in low-preference modes, with both types of affect mediated by enjoyment.

The results of the present study are also inconsistent with research that has examined other issues related to this topic. For instance, results from a study conducted by Baghurst, Terry, and Holder (2004) determined that participant performance was significantly enhanced when they exercised in an environment consistent with their predicted attentional style compared to when they exercised in one that was inconsistent. In addition, Dyrlund and Wininger (2004) found that, as long as participants paid attention to the music being played, they enjoyed exercising significantly more while listening to music they preferred the most compared to while listening to music they preferred the least.

However, the findings from the present study provided support for two prior studies suggesting that providing individuals with a sense of control over an aspect of the exercise experience has no effect on affective change. Results from the first study, conducted by Butryn and Furst (2003), revealed no significant differences in Total Mood Disturbance and positive engagement when participants ran in a park compared to an urban setting, despite the fact that 93% preferred running in the park setting. Results from the second study, conducted by Parfitt, Rose, and Markland (2000), determined that there were no significant differences in Psychological Well-Being, Psychological Distress, or fatigue when participants exercised at their preferred or a prescribed intensity level.

These findings are also consistent with previous research suggesting that exercise may alleviate symptoms of anxiety and depression in both clinical and non-clinical populations (Berger & Motl, 2000; Long & van Stavel, 1995; Yeung, 1996). The present study addressed anxiety via the tension and calmness subscales of the AD-ACL. Although depression was not specifically addressed, it was clear exercising led to affective benefits. Results revealed that, on average, participants reported feeling more calm, more energetic, less tense, and less tired post-exercise than before beginning the bout. Additionally, increased feelings of calmness and decreased feelings of tension remained 15 minutes following the completion of exercise. This delayed improvement minutes after the exercise bout was completed is consistent with what Cox, Thomas, and Davis (2000) have referred to as the “delayed anxiolytic effect.”

In retrospect, the current study contained several limitations that may have masked the true effects of preference for attentional focus strategy on affective change during exercise. One potential explanation for the surprising results could have been the relatively low participant adherence rates. Regardless of the condition they were in, a substantial number of participants reported spending an inadequate amount of time attending to the manipulation DVD. However, the actual scarcity of participant adherence may be best understood by examining each trial independently. With reference to the most preferred condition, mean adherence rates ranged from approximately 30 to 59 percent (see Table 9). Furthermore, only 10 of 20 participants who chose the internal task-relevant category and 2 of 21 who chose the internal task-irrelevant category reported adhering to the manipulation DVD over 50 percent of the time. Out of those who chose the external task-relevant and the external task-irrelevant categories, merely 8 of 24 and 16 of 31 participants adhered over 50 percent of the time, respectively.

Table 9

*Mean Adherence Rates to Attentional Focus Strategies*

| *Trial* | *Strategy* | | | |
|---|---|---|---|---|
| | Internal TR | Internal TI | External TR | External TI |
| MP | 58.50 | 30.48 | 43.33 | 52.10 |
| LP | 41.33 | 19.18 | 42.08 | 39.00 |

*Note.* MP = most preferred; LP = least preferred; TR = task-relevant; TI = task-irrelevant.

With reference to the least preferred condition, mean adherence rates ranged from 19 to 42 percent. Only 7 of 30 participants who chose the internal task-relevant category and 2 of 22 who chose the internal task-irrelevant category reported adhering to the manipulation DVD over 50 percent of the time. Out of those who chose the external task-relevant and the external task-irrelevant categories, just 9 of 24 and 6 of 20 participants adhered over 50 percent of the time.

Additionally, participants were not explicitly requested to attend to the manipulation DVD. It is reasonable to assume that participants knew they were supposed to pay attention to the television screen. However, it is possible participant adherence rates would have been higher if experimenters had made them aware of how closely they should pay attention prior to beginning the exercise bout. It is also probable that the novel environment of the research lab, and the stimuli within it, contributed to the low adherence rates.

Another explanation for the findings could have been the fact that the independent variable was not successfully manipulated. It was originally proposed that the need for autonomy would only be satisfied when participants exercised while employing their most preferred attentional focus strategy. However, results revealed there was no difference in perceived autonomy when participants engaged in their most preferred compared to their least preferred attentional focus strategy. Mean autonomy scores for the most preferred and least preferred trials were 38.01 and 37.84, respectively, with possible scores on the autonomy subscale ranging from 7 to 49. Therefore, it appears participant's need for autonomy was satisfied in both preference trials.

Furthermore, poor adherence to the manipulation DVD may have contributed to the lack of difference between mean autonomy scores in the most preferred and least preferred conditions. Overall mean adherence rates for the most preferred and least preferred conditions were 42.34 and 35.96, respectively. Thus, it is possible that participants were able to maintain feelings of autonomy in the least preferred condition by not adhering to DVD, suggesting that it may be impossible to successfully manipulate or force attentional focus.

It is also possible that some participants experienced feelings of ambiguity regarding the exact nature of the attentional focus categories. In the present study, participants were first asked to rate how much they preferred using each of the attentional focus strategies during exercise by using a percentage scale which included several examples of each strategy (see Appendix D). Following this, they were asked to rank four different attentional focus strategies in order of most preferred (1) to least preferred (4) to determine which strategy they preferred using the most and which they prefer using the least while exercising. Although the attentional focus strategies to be rated and ranked were identical, it is possible participants did not refer to the percentage scale to clarify the terms used in the rank-ordering process. Therefore, a number of participants may not have provided an accurate representation of their most and least preferred attentional focus strategies.

Another explanation for the findings could have been that conditions satisfying our innate need for both autonomy and competence are required in order to enhance intrinsic motivation, self-regulation, and well-being. This notion is consistent with the Cognitive Evaluation Theory (Deci & Ryan, 2002, chap. 1) which suggests the basic needs of competence and autonomy are extremely involved in intrinsic motivation. The theory also proposes that contextual events affect intrinsic motivation by either supporting or thwarting the satisfaction of these two needs. Thus, it is possible that participants in the most preferred condition may have demonstrated greater affective benefits than those in the least preferred condition if their need for competence as well as autonomy had been satisfied.

Moreover, participants' levels of trait autonomy and competence were not examined. In other words, it is possible that a significant number of participants had high levels of trait autonomy and competence, thereby making it difficult to decrease feelings of autonomy in the least preferred condition. Therefore, individual differences such as these could have contributed to the fact participants felt autonomous during both trials.

It is also possible that it is actually the physical aspects of exercise that account for the majority of the affective change associated with it. Previous research has implied exercise intensity is a strong determinant of the degree of affective benefits experienced after exercise and the time period during which it occurs. For example, moderate intensity exercise (exercise at or below the lactic/ ventilatory threshold) has been linked to the greatest affective benefits, low intensity to mild affective benefits, and high intensity (exercise above the lactic/ventilatory threshold) to delayed benefits (Ekkekakis, Hall, & Petruzzello, 2004; Hall, Ekkekakis, & Petruzzello, 2002). Therefore, the affective change that occurred in the present study may have simply been a result of moderate intensity exercise.

In light of the results of the present study, future research should take a closer look at the effects of satisfying both competence and autonomy on feelings of well-being. The current study has indicated that preference for attentional focus strategy has no effect on the affective benefits associated with exercise. However, the current study has only focused on one of the two basic needs thought to be extremely involved in intrinsic motivation, self-regulation, and well-being. Perhaps this approach contributed to masking the true effects of basic need satisfaction on affective change during and following exercise.

Furthermore, future research should take a closer look at ways to increase participant adherence rates to assigned attentional focus strategies without jeopardizing ecological validity. Researchers should also focus on ways to decrease feelings of control in no-choice conditions thereby creating a significant difference between autonomy experienced during this condition and choice conditions. In addition, future research should investigate participant levels of trait autonomy and competence in order to assess their influence on the affective benefits associated with exercise.

Last, future researchers should control for potential confusion surrounding the titles of the attentional focus categories. Either participants should be provided with examples of the categories during the ranking process or a manipulation check should be employed to ensure understanding. Either of these approaches would serve to increase the representativeness of the participant's most and least preferred attentional focus strategies.

The present study is important for two reasons. First, it fills a void in the current body of literature. Past research, for the most part, has neglected to investigate how preference for attentional focus strategy influences mood. In addition, previous studies that involved attentional focus and exercise have focused more on participant's resulting performance than affect. Therefore, this study filled a void in the literature by combining two previously researched aspects of the exercise experience to examine how preference of attentional focus strategy during exercise affects mood. The present study also lends support to a significant body of research suggesting that engagement in exercise leads to affective benefits.

In sum, preference for attentional focus strategy does not influence the level of affective benefits typically associated with exercise nor does it influence enjoyment and autonomy. Yet, the study indicated individuals acquire affective benefits from engaging in moderate intensity exercise regardless of attentional focus strategy. Despite the finding that preference for attentional focus during exercise did not affect mood, it is possible that low adherence rates and the unsuccessful manipulation of the independent variable may have masked any effects of the preference condition. Following from the findings of the current study, it is suggested that researchers continue to identify factors of the exercise experience that may lead to an increase in physical activity and, subsequently, improvements in mental health.

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Appendices

# APPENDIX A

## ACSM Risk Stratification Questionnaire

## *ACSM Risk Stratification (ACSM, 2000)*

Name Date: / / Gender: Female or Male Age:

Do you have any of the following conditions?

__________ 1. Family history of Heart disease: Heart attack, heart surgery, or sudden death before age 55 (father/brother/son) or 65 (mother/sister/daughter)

__________ 2. Cigarette Smoker: current or have quit within the past 6 months

__________ 3. High Blood Pressure: SBP $\geq$ 140 or DBP $\geq$ 90 (confirmed on 2 occasions or on Blood Pressure medication)

__________ 4. High cholesterol: total >200 (or HDL < 35, or > 130, or on medication for high cholesterol)

__________ 5. Diabetes (adult or juvenile) or Glucose Intolerance

__________ 6. Obesity (Body Mass Index $\geq$ 30, or waist circumference > 39 inches)

__________ 7. Sedentary Lifestyle (less than 30 minutes total "physical activity" most days)

***Total risk factors =***

Do you have any of the following?

__________ Pain, discomfort, tightness, or heaviness in the chest, neck, jaw, arms, or other areas
__________ Shortness of breath at rest or with mild exertion
__________ Dizziness or loss of consciousness
__________ Difficulty breathing when lying down or any difficulty breathing during physical exertion
__________ Swelling at the ankles
__________ Irregular or fast heart rate
__________ Intermittent leg pain or limping especially upon exertion
__________ Known heart murmur
__________ Unusual fatigue or shortness of breath with usual activities

***Total signs/symptoms =***

*Stratification (only persons considered as* ***low risk*** *may participate in this study)*

| | |
|---|---|
| **Low Risk** | Younger individuals (males: younger than 45, females: younger than 55) who have no signs/symptoms and no more than 1 risk factor. |
| **Moderate Risk** | Older individuals (males: 45 and older, females: 55 and older) or those who have 2 or more risk factors. |
| **High Risk** | Individuals with 1 or more signs/symptoms or known cardiovascular, pulmonary or metabolic disease. |

# APPENDIX B

## Informed Consent Form

**Informed Consent Form**

Project Title: Exercise and Affect
Investigator: Erin Heltsley, Psychology Department, (270) 978-0481

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1. The purpose of this study is to examine the effects of exercise on affective change.

2. As a volunteer in this research project you will be asked to: a) engage in two 25 minute bouts of exercise at a moderate intensity while viewing a video, b) provide demographic information, c) have your heart rate monitored through the use of physiological equipment (electrodes), and d) complete a series of questionnaires.

3. Potential risks to your health and well-being because of your participation include 1) cardiovascular injury (heart attack or stroke), 2) severe acute fatigue, 3) light headedness, dizziness, nausea, 4) all other possible risks associated with engaging in low to high intensity exercise.

-The American College of Sport Medicine (2000) suggests the following regarding the potential risk/injury as the result of participating in *maximum intensity testing or testing in which intensity is contingent upon pre-existing health conditions*:

1. Risk of Death during or immediately after is less than 0.01% (1 in 10,000)
2. Risk of heart attack during or immediately after is less than 0.04% (4 in 10,000)
3. Risk of hospitalization as a result of testing is less than 0.2% (2 in 1,000)

- The ACSM goes on to state that the risk associated with **sub-maximal** physical fitness testing appear to be <u>even lower</u>. These statements are made for the general population. We will take every precaution to ensure your safety; an individual with CPR certification will perform testing. It is very important that you fully disclose anything that would increase your risk for participating in low to high intensity exercise.

- IF YOU FEEL ILL AT ANY TIME DURING, BEFORE, OR AFTER THIS STUDY LET THE INVESTIGATORS KNOW IMMEDIATELY! IF YOU MIGHT BE PREGNANT OR IF YOU ARE TRYING TO CONCEIVE CHILDREN, YOU SHOULD <u>NOT</u> PARTICIPATE IN THE STUDY!!

4. For your participation, you may be awarded extra-credit, which may be applied to your psychology course grade with your instructor's approval. You understand that there are no other direct benefits to you and that you will receive no monetary compensation for participation in this study.

5. You understand that your responses will be confidential. No identifying information, including your name, will be on any of the forms. The entire experiment should take approximately 45-60 minutes.

6. Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

---

If you fully understand what will be asked of you (should you participate), please read and sign the following:

I freely and voluntarily and without undue inducement or any element of force, fraud, or deceit, or any form of coercion, consent to be a participant in this research project. I have read and understood the screening questionnaires (PAR-Q & ACSM stratification) used to classify me as a low risk participant. I have been given the right to ask and have answered any questions that I may have regarding this research. I have read and understand all of the above.

*I understand also that it is not possible to identify all potential risks in an experimental procedure, and I believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.*

__________________________________ __________________
Signature of Participant Date

__________________________________ __________________
Witness Date

Questions regarding Human Subjects Review Board issues should be directed to Dr. Phillip Myers at (270) 745-4652.

APPENDIX C

Demographic Form

**Demographics**

1. **Gender**: Female or Male
2. **Age**: ______

***Exercise*** *is planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness.*

3. Which of the following statements best describes you? Please read all 5 statements and then circle your response.
   a. I currently do **not** exercise and do not intend to start exercising in the next 6 months.
   b. I current do **not** exercise, but I am thinking about starting to exercise in the next 6 months.
   c. I currently exercise some, but not **regularly** (*regularly* is defined as exercising 3 or more times per week for at least 30 minutes per session).
   d. I currently exercise **regularly**.
   e. I have been exercising **regularly** for the past 6 months or longer.

If you selected **c, d,** or **e** please answer #4, if **a** or **b** proceed to #5. *Refer to chart on the right to determine intensity rating or rate of perceived exertion (RPE)*

**Use to rate intensity**

6 No exertion at all
7 Extremely light (7.5)
8
9 Very light
10
11 Light
12
13 Somewhat hard
14
15 Hard (heavy)
16
17 Very hard
18
19 Extremely hard
20 Maximal exertion

4. What mode (s) of exercise do you normally engage in? Frequency? Duration? Intensity?

(per week) (per session) (RPE)

1) ____________________________________ ______ ________ ______

2) ____________________________________ ______ ________ ______

3) ____________________________________ ______ ________ ______

Considering a 7-day period (a week) how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?

a. Strenuous exercise (heart beats rapidly; e.g., vigorous running, swimming, cycling) per week: ____

b. Moderate exercise (not exhausting, light sweating; e.g., fast walking, easy swimming) per week: ____

c. Mild exercise (minimal effort, not sweating; e.g., yoga, bowling, easy walking) per week: ____

6. Select your **main** purpose for exercising (**check only one**):
___ Personal enjoyment (for fun)
___ Appearance/weight management
___ Social reasons (to be with friends, to socialize)
___ Fitness/health (to be physically fit)
___ Competition/challenge (to improve or maximize performance)

# APPENDIX D

## Attentional Focus Preference Questionnaire

SESSION #1

You will now be asked questions about what you *prefer to think about* while exercising.

**Note.** The sum of the percentages across all six categories *must equal* 100%.

1) Bodily sensations (**heart rate, breathing rate, muscles, fatigue, pain, sweating**)?

0 10 20 30 40 50 60 70 80 90 100 ______

2) Task relevant thoughts (**strategies, goals, form, pace/time**)?

0 10 20 30 40 50 60 70 80 90 100 ______

3) Self-talk (psyching up, for example, "**I can do it**")?

0 10 20 30 40 50 60 70 80 90 100 ______

4) Task relevant external cues (**terrain, mile-markers, running related videos, time elapsed, the time display**)?

0 10 20 30 40 50 60 70 80 90 100 ______

5) Task **ir**relevant thoughts (**daydreaming, problem solving, planning, recalling memories, meditating**)?

0 10 20 30 40 50 60 70 80 90 100 ______

6) External distractions (**TV, music, talking with a partner, scenery**)?

0 10 20 30 40 50 60 70 80 90 100 ______

*Please make sure percentages chosen for the 6 categories add up to 100%;* ***Total %*** **=**

Please rank-order the following four categories with regards to your preference for thinking about them while exercising. Use "1" to indicate your most preferred and "4" your least preferred.

____A) Bodily sensations, task-relevant thoughts, and self-talk.
____B) Task-relevant external cues
____C) Task irrelevant thoughts
____D) External distractions

APPENDIX E

AD-ACL Questionnaire

***AD-ACL***

Each of the words below describes feelings or mood. Please use the rating scale to describe your feelings **at this moment**.

Work rapidly, but please circle a rating for all the words. Your first reaction is best. This should take only a minute or two.

| | Definitely feel | Feel slightly | Cannot Decide | Definitely do **not** feel |
|---|---|---|---|---|
| 1. active | 1 | 2 | 3 | 4 |
| 2. placid | 1 | 2 | 3 | 4 |
| 3. sleepy | 1 | 2 | 3 | 4 |
| 4. jittery | 1 | 2 | 3 | 4 |
| 5. energetic | 1 | 2 | 3 | 4 |
| 6. intense | 1 | 2 | 3 | 4 |
| 7. calm | 1 | 2 | 3 | 4 |
| 8. tired | 1 | 2 | 3 | 4 |
| 9. vigorous | 1 | 2 | 3 | 4 |
| 10. at-rest | 1 | 2 | 3 | 4 |
| 11. drowsy | 1 | 2 | 3 | 4 |
| 12. fearful | 1 | 2 | 3 | 4 |
| 13. lively | 1 | 2 | 3 | 4 |
| 14. still | 1 | 2 | 3 | 4 |
| 15. wide-awake | 1 | 2 | 3 | 4 |
| 16. clutched-up | 1 | 2 | 3 | 4 |
| 17. quiet | 1 | 2 | 3 | 4 |
| 18. full-of-pep | 1 | 2 | 3 | 4 |
| 19. tense | 1 | 2 | 3 | 4 |
| 20. wakeful | 1 | 2 | 3 | 4 |

APPENDIX F

Adherence Questionnaire

***Subject #*** _____

You will now be asked questions about what you *thought about* while running/walking today. The questions are divided into six categories. The six categories are:

1) Bodily sensations
2) Task relevant thoughts
3) Self-talk
4) Task relevant external cues (Running video)
5) Task irrelevant thoughts
6) External distractions (SNL video)

What percentage of the time did you focus on each of the six categories?

**Note.** The sum of the percentages across all six categories *must equal* 100%. If you checked "No" for a category then you should select "0" for the % of that category.

1) Bodily sensations (**heart rate, breathing rate, muscles, fatigue, pain, sweating, cramps**)?

0 10 20 30 40 50 60 70 80 90 100 ________

2) Task relevant thoughts (**strategies, goals, pace, injury concerns, thoughts about time**)?

0 10 20 30 40 50 60 70 80 90 100 ________

3) Self-talk (psyching up, for example, "**I can do it**")?

0 10 20 30 40 50 60 70 80 90 100 ________

4) Task relevant external cues (**running video, time elapsed, the time display, listening to the treadmill, electrode cords**)?

0 10 20 30 40 50 60 70 80 90 100 ________

5) Task **ir**relevant thoughts (**daydreaming, problem solving, planning, recalling memories, meditating**)?

0 10 20 30 40 50 60 70 80 90 100 ________

6) External distractions (**SNL video, items in the environment**)?

0 10 20 30 40 50 60 70 80 90 100 ________

*Please make sure percentages chosen for the 6 categories add up to 100%;* ***Total %*** **=** ☐

APPENDIX G

Post-Exercise Questionnaire

***Post-Exercise Measures***

*Please choose the answer which best describes how you feel. Use the following scale to answer each question:*

| | | Strongly Disagree | | | | | | Strongly Agree |
|---|---|---|---|---|---|---|---|---|
| 1. | I enjoyed walking/running on the treadmill. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. | Walking/Running on the treadmill was fun. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. | I think walking/running on the treadmill was boring. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. | I think walking/running on the treadmill was quite enjoyable. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. | I believe I had some choice about doing this activity. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. | I felt like it was not my own choice to do this task. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. | I didn't really have a choice about doing this task. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. | I felt like I had to do this. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. | I did this activity because I had no choice. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. | I did this activity because I wanted to. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. | I did this activity because I had to. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |