The Effects of Attentional Focus and Expertise Level on Self-Selected Exercise Intensity

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THE EFFECTS OF ATTENTIONAL FOCUS AND EXPERTISE LEVEL ON
SELF-SELECTED EXERCISE INTENSITY

A Thesis
Presented to
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Master of Arts

By
Melissa M. Abo

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The Effects of Attentional Focus and Expertise Level on
Self-Selected Exercise Intensity

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The Effects of Attentional Focus and Expertise Level on Self-Selected Exercise Intensity

Melissa M. Abo December, 2007 56 pages

Directed by: Dr. Steven Wininger
Department of Psychology Western Kentucky University

The purpose of this study was to investigate the effects of being prompted to focus on self-talk versus bodily sensations on exercise intensity chosen by participants and level of enjoyment. One hundred and forty-two undergraduate psychology students ran on a treadmill for 20 minutes on two separate days, one week apart. One day they were asked to focus on their bodily sensations and on another day positive self-talk. The order of these assigned focuses was counterbalanced. Participant’s current level of exercise activity (Stage of Change) was used as an independent variable. The dependent variables of interest were self-selected exercise intensity and enjoyment. Results indicated there was not a significant difference in the percentage of maximum heart rate or enjoyment across trials nor did Stage of Change moderate this relationship. This could be the result of a weak adherence to the manipulation, or perhaps these two focuses (bodily sensations and self-talk) do not differentially influence the motivation to exercise at increased intensity.
Literature Review

There is currently a great need to study factors that affect exercise behavior. According to the Center for Disease Control, physical activity is the nation’s number one indicator of health, and obesity is the second leading health indicator. For adolescents, one in three high school students do not exercise regularly. One contributor to this problem is that only 29% of high school students attend daily physical education classes. For adults, 20% of American men are obese, and the percentage rises to 25% for American women (CDC, 2003). In addition, 50% of people who start an exercise program will quit in six months or less (Berger, Pargman, & Weinberg, 2003).

Kentucky, in particular, is in need of an intervention to increase exercise adherence. In 2000, for the age-adjusted percentage of respondents over 18 years old, Kentucky, as compared to the other 49 states, had the lowest percent of people who engaged in consistent physical activity so that they met the CDC’s recommendation of more than 30 minutes per day (17.7%), more than five days per week (CDC, 2003). Kentucky also had the lowest percent in 2001 (28.9%). For the age-adjusted percentage of respondents who reported no leisure time physical activity, Kentucky had the highest percent in 2000 (41.1%) and the fourth highest in 2001(33.3%). Therefore, it is important to study factors that may increase exercise benefits, particularly in Kentucky. The main question this study examines is, “Does what we think about when we exercise influence the intensity at which we decide to exercise?” In particular, is there a difference in the intensity chosen when the participant is focusing on positive self-talk versus their bodily sensations, and how does the participant’s current level of exercise
participation come into play? Perhaps people who exercise more often will be influenced differently than people who exercise less often.

Several variables have been consistently identified as predictors of physical activity. These include age, gender, education, income, self-efficacy, perceived barriers, enjoyment, self-schemata, lack of time, exercise history, social support, and season (Buckworth & Dishman, 2002). Enjoyment has been found to be one of the strongest predictors of physical activity (Carron, Hausenblas, & Estabrooks, 2003). Intensity is also an important variable, which is negatively associated with exercise adherence. Persons are more likely to adhere to low and moderate intensity activities than higher intensity activities (Buckworth & Dishman 2002). However, if intensity is too low, the exerciser will not get the benefits of exercise. The variables of interest in the present research are enjoyment and intensity.

*Attentional Focus*

One variable shown to affect enjoyment and intensity directly is attentional focus. Attentional focus for exercise is what an exerciser thinks about while he or she is engaging in exercise. In this study, I address the question of whether or not using different categories of attentional focus is related to the exercisers’ choice of intensity and self-reported enjoyment of the exercise. Traditionally, attentional focus has been broken down into two dimensions: association and dissociation (Morgan & Pollock, 1977). Association refers to attentional focus that is related to the exercise task. Dissociation is attentional focus that is not related to the exercise task. However, there have been two major concerns with the terminology of “association” and “dissociation.” First, the term “dissociation” has a pathological connotation (Stevinson & Biddle, 1999).
This is an obvious problem considering its purpose in describing a cognitive strategy that is unrelated to pathological dissociation. A second concern is that runners’ cognitions are too complex to dichotomize (Stevinson & Biddle, 1998).

A model proposed by Stevinson and Biddle (1999) breaks attentional focus down into four categories. External task-relevant thoughts include such items as distance markers and route. External task-irrelevant thoughts include items such as focusing on the environment, TV, or music. Internal task-relevant thoughts would include bodily sensations such as heart rate, breathing, and muscle fatigue. Finally, internal task-irrelevant thoughts would include daydreaming and making plans for the day.

Wininger, Gieske, & Abo (2007, October) expanded this model to include six categories of attentional focus during exercise. These categories include bodily sensations, task relevant thoughts (strategies, goals, pace, etc.), self-talk (psyching up or psyching down), task irrelevant thoughts (daydreaming, problem solving, planning, etc.), external distractions (music, TV, looking at other people, etc.), and task relevant external cues (split times, other competitors, distance markers, etc.). Past research has frequently compared the results of focusing on bodily sensations versus external distractions, but has largely ignored the other four categories, possibly because the other categories have not been defined as clearly (all internal task relevant-relevant thoughts were lumped together). This model further categorizes internal task-relevant thoughts into bodily sensations, self-talk, and task-relevant thoughts. It is also important to note that past research has shown that the attentional focus depends on expertise level. Elite athletes tend to focus on bodily sensations during competition and use all categories of focus
during training (Masters & Ogles, 1998). Recreational exercisers, on the other hand, tend
to focus on external distractions.

Past Research

Novice rowers, swimmers, and cyclists

Many studies of attentional focus have involved only novice exercisers. This is
an important group to study because they are the people who are in most need of
information on how to increase their exercise adherence and intensity. However, none of
the studies compares participants based on how often they exercise. This is also
important to study because the best way to improve intensity for novice verses expert
exercisers may be different. The following studies used rowing, swimming, and cycling.
These methods of exercise are good, but perhaps would not be the most common exercise
routines chosen by people who want to begin a new exercise program.

Baghurst, Thierry, and Holder (2004) examined the effects of a manipulation of
attentional focus on intensity (distance rowed in 15 minutes) of internalizing and
externalizing novice rowers. The sample size was low, with only twelve males and two
females. All participants were physically active but without professional sporting
experience, and there were an equal number of internalisers and externalisers.
Internalisers and externalisers were grouped based on their responses to the attentional
subcomponents of the Test of Attentional and Interpersonal Style (Nideffer, 1976). Their
scores were compared against norms, and only those participants who had a Z score
greater than 0 on the Broad External Test (BET) or Broad Internal Test (BIT) subscales
and had either a BIT or BET that was higher than its contrast (Overload External Test and
Overload Internal Test) were included. Participants rowed under two different conditions. They were assigned to use an external task-irrelevant attentional style and an internal task-relevant attentional style (counter-balanced), one of which was theorized to fit their natural attentional style (whether they usually focus on external task-irrelevant or internal task-relevant thoughts when they exercise). In the external task-irrelevant condition, participants answered multiplication flash cards at a pace that was comfortable to them. The internal task-relevant condition had participants read aloud every 15 seconds (a pace that could be different from the pace in the external task-irrelevant condition) from a display showing the distance rowed, time passed, stroke rate, and split rate. The rowing bout was conducted on a rowing ergometer with a resistance setting of four (the difficulty of which is not reported) for all participants. It lasted 15 minutes, and the distance rowed was measured every five minutes. The order of the trials was counterbalanced and separated by at least a week. There was a significant interaction between assigned attentional focus and whether or not the person was usually an internaliser or an externaliser (interpersonal style). Internalisers rowed farther when they were assigned to the internal task-relevant group and externalisers rowed farther when they were assigned to the external task-irrelevant group. Another interaction was between assigned attentional focus, interpersonal style, and rowing time. The rowing time variable was the difference between how far the participants had rowed after 5 minutes, 5 to 10 minutes, and 10 to 15 minutes. Externalisers in the external task-irrelevant group rowed the farthest over the entire 15 minutes, meaning that they had a faster pace. The manipulation check used was to ask the participants how easy it was to adhere to the assigned attentional focus and how difficult it was to concentrate on the set
task as time progressed. Results of the manipulation check showed that participants found it more difficult to adhere to the attentional focus that was not their usual method and found it progressively more difficult over time.

Couture, Jerome, and Tihanyi (1999) studied 69 college students enrolled in an aquatics class on a swimming task, comparing the assigned attentional focus on the performance time, Perceived Fatigue Questionnaire (PFQ), and Rating of Perceived Exertion (RPE). Participants first completed a baseline swim and a week later completed another swim in one of the following conditions: task-relevant thoughts, task-irrelevant thoughts, external distractions, or no assigned attentional focus (control) condition. The method for assigning task-relevant thoughts was asking the participants to think of nothing else but the word “air” on every inhalation. Task-irrelevant thoughts participants were to imagine themselves doing something pleasant but unrelated to strenuous exercise. External distractions participants were told to focus on the ends of the pool and add the number of circles, squares, and triangles presented throughout the swim. This task, however, could also be interpreted as external task-relevant because the shapes were always presented at the end of the pool, and therefore, signaled the end of another lap. After the swim, participants were asked whether they had used their assigned attentional focus throughout the entire swim, most of the swim, part of the swim, or not at all. The participants’ answers showed that 30.4% of the participants had used their assigned strategy the entire time, 24.6% most of the time, 21.7% part of the time, and only 1.4% did not use the assigned focus at all. Results showed only one group had a significant change between the baseline swim and the experimental swim. The task-relevant thoughts group swam faster than their baseline, but there were no differences in fatigue or
RPE. A unique weakness to this study was that eight participants were swimming at the same time. While steps were taken to avoid the participants competing with each other (they were reminded that the task was not a race and their start times were staggered), the possibility of the swimmers using each other for pacing cannot be ruled out. However, this doesn’t change the speed outcome because all conditions had eight swimmers swimming at one time.

Johnson and Siegel (1992) utilized a cycling ergometer paradigm in a small, temperature-controlled room, using assigned attentional focus as an independent variable and the dependent variables were heart rate, and RPE. Forty-four college females engaged in a 15-minute cycling bout at 60% VO₂ max. Participants were assigned to a control, bodily sensations, task irrelevant thoughts, or external distractions condition. The bodily sensations group was told to focus on various physiological symptoms, such as rate and depth of breathing, perspiration, and muscular tension, and report their RPE every three minutes. The task irrelevant thoughts group was told that after the exercise session, they would be required to write the names of every teacher that they had had since kindergarten. Therefore, they were to recall mentally the names while exercising to prepare to write them down after the exercise. The external distractions group carried on conversations with technicians in the room. The technicians were trained to encourage the participants to talk as much as possible and therefore asked questions such as “What is your favorite course this semester?” and “What dorm do you live in?” Unfortunately, there was no manipulation check to support the assumption that the participants did adhere to their assigned attentional strategy. Results showed no difference for heart rate (HR), but the bodily sensations group had a higher response for RPE and the Physical
Activity Questionnaire (PAQ), which measured physical fatigue, than the task irrelevant thoughts group.

**Novice Participant Running/Jogging Studies**

Most other studies of attentional focus during exercise have utilized a running/jogging paradigm. This paradigm is a good choice because when a person decides to start a new exercise routine, it will likely involve running, jogging, or speed walking. As these forms of exercise are also more frequent in the literature, it is beneficial to focus on them so to be better able to make comparisons between studies.

Fillingim and Fine (1986) had 15 introductory psychology students run for one mile on an indoor running track under three conditions. Dependent variables were time and ratings of 17 symptoms. These symptoms were classified as exercise-relevant, exercise-irrelevant, or pertaining to a positive mood. Assigned attentional styles were control, bodily sensations, and external distractions. All participants were given the instructions “I want you to jog 10 laps. Stay in the outer lane at all times. Jog as fast as you can without experiencing any discomfort.” All participants ran one time in each of these three conditions, and there was at least one day between runs. During the external distractions condition, participants listened to word-cues presented through headphones at the rate of one every 10 seconds, and counted the number of times they heard the word “dog.” During the bodily sensations condition, participants also wore headphones, but no words or sounds were emitted from the headphones. The only instructions given to this group were given before the exercise; participants were told to focus on what their bodies were doing, especially concentrating on the pattern of breathing and the feelings from the heart. The only apparent manipulation check was asking the participants in the
external distractions condition how many times they heard the word “dog.” Participants correctly answered this question after jogging. The external distractions trial resulted in significantly fewer symptoms than the bodily sensations trial. There were no significant differences for time required to jog the mile for the three different trials.

Okwumabua, et al. (1983) had 31 college students from three jogging classes run one mile in a between subjects study to examine how assigned attentional focus affected performance time. All experimental sessions were conducted on a standard 440-yard oval track. Class one had 13 participants, and classes two and three had nine each. Participants received extensive training for their assigned conditions, which were bodily sensations, task irrelevant thoughts, or relaxation. In all conditions, instructions were read to the participants, but no prompts were given during the run. All groups were given instructional packages detailing their assigned strategy. The bodily sensations group was told to monitor body signals, such as breathing, temperature, and fatigue. The task irrelevant thoughts group was told to focus on a non-running-related object and repeat a mantra. The relaxation group was given a set of relaxation exercises. However, despite extensive training that took place for five weeks, participants did not generally report being able to adhere to their assigned strategies because all participants began to use bodily sensations more as the five weeks progressed. When taking into account which strategy the participant used, and not which strategy they were assigned, participants who focused on task irrelevant thoughts showed greater improvement in time (compared to baseline which was conducted on the first class day before attentional focus assignments were made) as compared to participants who focused on bodily sensations. However, one weakness of this study is that students were not randomly assigned to a condition.
All of the students in one class, meeting at a certain time of the day, were assigned to one condition. A possible concern is that the time of day could have affected the results. For example, some people run faster in the morning because they have more energy at that time.

Pennebaker and Lightner (1980) conducted two experiments with psychology students. In the first experiment, participants either listened to their own breathing or distracting sounds while exercising and reported their symptoms. Participants in the distracting sounds condition reported fewer symptoms than participants who listened to their own breathing. In the second experiment, which had eight male and five female Introduction to Psychology students, participants ran either on a cross-country course or a track, which may imply an attentional focus difference because the cross-country course has more natural scenery to observe. Running time, symptoms, pulse and blood pressure were measured. Those on the cross-country course ran faster than those on the track, however, there were no differences for symptoms, pulse, or blood pressure.

Wrisberg, Franks, Birdwell and High (1988) also used participants from a physical education class, comparing gender and assigned attentional focus in regards to RPE, heart rate, and endurance time. There were 20 participants: 10 males and 10 females. Students ran on a treadmill two days in a row. One day they watched themselves in a mirror while listening to their breathing (self-focus), and the other day they watched and listened to a movie (external distractions). Half the participants were assigned to the self-focus condition on the first day, and half were assigned external distractions focus on the first day. The second day assignments were the conditions that the participants had not yet experienced. The participants ran a graded exercise test to
exhaustion. The intensity of the run began at five times the resting metabolism and was increased every two minutes until exhaustion. A manipulation check indicated that they did in fact adhere to their assigned attentional focus. Men had higher ratings of RPE with an external distractions focus than with a self-focus, while the reverse was true for women. There was no significant sex or focus difference for endurance time. The authors suggested that the gender difference was due to inherent differences in the quality and quantity of movement experiences of novice men and women. However, the authors used nonsignificant trends to explain their specific views on why the gender differences occurred. Due to the small number of participants in each group, more research needs to be conducted to assess if there truly is a gender difference.

Saintsing, Richman, and Bergey (1988) required 31 male and 19 female undergraduates to run on a cross-country course in a between-subjects study investigating the effects of attentional focus on performance time. Participants were assigned to one of four conditions. The task relevant thoughts group participants were told to focus on the technique of running, such as the arm drive, stride, breathing rate, and foot placement, throughout the run. The task irrelevant thoughts group was told to repeat the word “down” once for every stride and focus on thoughts that were task non-specific. A psyching up group was told to psych themselves up in any way that they could. There was also a control group in which participants were given a two-minute lecture on the benefits of running, which the other groups did not receive. After running, participants indicated the percentage of time they used their assigned focus. The manipulation check revealed 62% for the task relevant thoughts group, 43% for the task irrelevant thoughts group, and 56% for the psyching-up group. It is unclear what the control group focused
Results showed that the task relevant thoughts group ran faster than the control group. The task irrelevant thoughts group did not run faster than the control group. This method of inducing task irrelevant thoughts does not seem logical. Repeating the word "down" may have invoked task relevant thoughts for participants by making them think about their stride/cadence.

**Elite Exercisers**

Very few studies have looked at experienced exercisers; those that have utilized a rowing or cycling paradigm. It is unfortunate that there is not more literature involving elite exercisers in a running/jogging paradigm. Most of these studies compared bodily sensations with an attentional focus that would distract the participant from the exercise. Rowing studies include Connolly and Janelle (2003) and Scott, Scott, Bedic, and Dowd (1999). A cycling study was conducted by Russell and Weeks (1994).

Russell and Weeks (1994) studied seven trained cyclists training at 75% maximum heart rate for 60 minutes in a within-subjects design. They compared heart rate and RPE under two different assigned attentional focuses. First, they performed a graded exercise test to establish workload corresponding to maximal heart rate. Each participant rode a bicycle ergometer 3 times, each time on separate days. In an external distractions trial, participants watched a videotape about birds and pushed a button on the bicycle handle every time the word "duck" was heard. In a bodily sensations trial, participants watched their heart rate on a monitor mounted on the handlebar of the ergometer. There was also a control condition in which the participants rode the bike for 60 minutes at 75% maximum heart rate, with no assigned attentional focus. After completing all three rides (not after each individual ride), the participants were asked if
they spent more time focusing on external distractions or bodily sensations. Five participants claimed to have spent more time focusing on external distractions, while two claimed to have spent more time focusing on bodily sensations. However, it is unclear during which ride they were focusing on external distractions or bodily sensations. Results showed no significant differences between any of the trials for heart rate or RPE. Perhaps this was due to the high intensity of the exercise. One criticism of this study is that the manipulation check could have been more thorough.

Connolly and Janelle (2003) conducted two within-subjects studies with rowers comparing assigned attentional focus on RPE, heart rate, and performance. The first study had 8 female collegiate varsity rowers with an average of 3.4 years of rowing experience. The task utilized was a 20-minute bout of rowing on a rowing ergometer. One condition was external distractions, with participants answering questions about collages every 15 to 20 seconds. The other condition was bodily sensations/task relevant thoughts, with participants being told prior to exercising to focus on their bodies and strategies. After the session, the participants in the bodily sensations/task relevant thoughts condition were asked to report on what they focused on. All participants were asked to rate their RPE every four minutes. A week after the first session, participants were assigned to the strategy that they had not used before and the research was conducted in the same manner as the first session. Results showed that during the bodily sensations/task relevant thoughts trial, participants rowed farther than during the external distractions trial. There was no significant difference for RPE.

The second study had 12 female and 10 male varsity collegiate rowers, and the dependent variables were heart rate, RPE, and speed of rowing. The men had an average
of 4.9 years of rowing experience ($SD = 2.4$), and the women had an average of 4.1 years of experience ($SD = 2.02$). Participants used a rowing ergometer, and after a five minute warm up, rowed for 2000 meters. Independent variables were gender, four different assigned attentional styles, and the participants' natural attentional focus, which was determined from the Attentional Focusing Questionnaire (AFQ). First, a baseline measurement of a 2000 meters rowing bout was taken, and then the experimental manipulations were used one week apart. During a bodily sensations/task relevant thoughts trial participants were instructed to monitor their body, breathing, and technique. At the end of the session, participants described what they thought about during the session. A task irrelevant thoughts trial solved math problems in their minds. The math problems were presented to them verbally at each 500-meter mark, and at the end of the session the answers to the problems were asked for. A task relevant external cues trial strategized against two other participants, who were also exercising at the same time, by monitoring their progress every 500 meters. At the end of the session, these participants were asked about the order of the other rowers at each 500m interval as a manipulation check. Finally, an external distraction trial group watched a Smithsonian video on perception and was later asked questions about the video. After each session, participants were asked to indicate the amount of time spent focusing in the prescribed manner. Participants reported using the assigned attentional focus strategies during 60% to 90% of the rowing bout. A gender difference was found for the task irrelevant thoughts condition, in which 91.6% of women reported using the assigned focus, which was significantly more than men did (70%). All participants were able to view their HR on a wristwatch. There was no interaction for gender and assigned attentional style.
However, there were main effects for gender and condition. Males rowed faster than females across all conditions. Also, participants rowed faster when in the bodily sensations/task relevant thoughts or task relevant external cues condition compared to baseline. Neither of the other groups differed from baseline. In addition, both the bodily sensations/task relevant thoughts and the task relevant external cues groups rowed faster than the task irrelevant thoughts group, but not the external distractions group. A higher RPE was found in both bodily sensations/task relevant thoughts and task relevant external cues groups as compared to baseline.

Scott et al. (1999) only had nine university varsity rowers, resulting in just three participants per condition, and compared the effects of the assigned attentional focus on the distance rowed in 40 minutes. This was a between-subjects study with a multiple-baseline design. The multiple-baseline design was used because it demonstrates that following a period of performance stability, enhanced performance only occurs when intervention is introduced. Although the participants were all in the rowing club, all had less than six months of experience with rowing. An attentional strategy was assigned and the distance rowed in 40 minutes was observed. There were two external distraction groups, one that watched a rowing video of the 1992 World Rowing Championships (which could have been a confound because focusing on rowing may have made this attentional focus more on task relevant than task irrelevant thoughts), and one that listened to a music tape of the current top 40 pop music. A task relevant thoughts group listened to an audiotape that made statements such as “feel the burn” and “listen to your breathing.” Each participant completed a 40-minute ergometer workout once a week for 10 weeks. The goal was to row as many meters as possible. In order to ensure that
differences between the participants were due to intervention and not practice effects, a multiple-baseline design was used. The first week, one participant received an assigned strategy, and the other participants continued baseline. The second week, another participant received an assigned strategy, and the remaining eight participants continued baseline. Each week another participant received an attentional strategy, until all participants had an assigned strategy. No manipulation check was used. All participants did improve their distance from baseline. Participants in the task relevant thoughts condition improved significantly more than any other group.

Summary

Tables 1 and 2 below are a summary of the previous research. It seems that elite runners have better performance outcomes when focusing on bodily sensations or task relevant thoughts, while novices tend to have better performance outcomes when using external distractions (in three of the five studies). For RPE or symptoms, elite athletes do not seem to be effected by attentional focus, whereas novice athletes report fewer symptoms and a lower RPE when using external distractions.
Table 1

*Summary of Most Efficient Attentional Focus Strategies on Performance Outcomes by Study*

<table>
<thead>
<tr>
<th>Study</th>
<th>Activity</th>
<th>Participants</th>
<th>Condition with Superior Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baghurst</td>
<td>Rowing</td>
<td>14 novice</td>
<td>External task irrelevant</td>
</tr>
<tr>
<td>Couture</td>
<td>Swimming</td>
<td>69 novice</td>
<td>Internal task relevant</td>
</tr>
<tr>
<td>Okwumabua</td>
<td>Running</td>
<td>31 novice</td>
<td>Task irrelevant thoughts</td>
</tr>
<tr>
<td>Pennebaker 2</td>
<td>Running</td>
<td>13 novice</td>
<td>External distractions</td>
</tr>
<tr>
<td>Saintsing</td>
<td>Running</td>
<td>50 novice</td>
<td>Task relevant thoughts</td>
</tr>
<tr>
<td>Connolly 1</td>
<td>Rowing</td>
<td>8 elite</td>
<td>Bodily sensations</td>
</tr>
<tr>
<td>Connolly 2</td>
<td>Rowing</td>
<td>22 elite</td>
<td>Bodily sensations/task relevant thoughts</td>
</tr>
<tr>
<td>Scott</td>
<td>Rowing</td>
<td>9 elite</td>
<td>Task relevant thoughts</td>
</tr>
</tbody>
</table>

Table 2

*Summary of Most Efficient Attentional Focus Strategies on RPE/Symptom Outcomes by Study*

<table>
<thead>
<tr>
<th>Study</th>
<th>Activity</th>
<th>Participants</th>
<th>Condition With Lower RPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson</td>
<td>Cycling</td>
<td>44 novice</td>
<td>Task irrelevant thoughts</td>
</tr>
<tr>
<td>Fillingim</td>
<td>Running</td>
<td>15 novice</td>
<td>External distractions</td>
</tr>
<tr>
<td>Pennebaker 1</td>
<td>Running</td>
<td>57 novice</td>
<td>External distractions</td>
</tr>
<tr>
<td>Wrisberg</td>
<td>Running</td>
<td>20 novice</td>
<td>Men = self-focus, Women = task irrelevant thoughts</td>
</tr>
<tr>
<td>Russell</td>
<td>Cycling</td>
<td>7 elite</td>
<td>No difference</td>
</tr>
</tbody>
</table>
Stages of Change (TTM)

Although no one has developed a model of expertise for exercise, the best approximation is the Stages of Change, part of the Transtheoretical Model (TTM), created by Prochaska & DiClemente (1983). Stages of Change indicate how often a participant exercises or his or her readiness for exercise. The TTM is a useful way to distinguish participants based on expertise level, and is used in the current studies’ methods. Using it for this purpose is a relatively new practice; previous experimenters used simpler terms to define expertise.

In the Stages of Change Model, participants are separated into five categories, those who do not exercise and do not intend to start (precontemplative), those who do not exercise but are considering starting a program (contemplative), those who exercise less than 30 minutes three times a week (preparation), those who exercise regularly (action), and those who have been exercising regularly for six months or longer (maintenance). This model has been shown to have high test-retest reliability ($r=.78$) and concurrent validity with the Seven Day Physical Activity Recall Questionnaire (Marcus & Simkin, 1993; Blair, 1994).

The Present Study

The present study looks at the effects of attentional focus on exercise performance (intensity). The purpose is to compare participants at various Stages of Change on self-selected intensity of a bout of exercise on a treadmill under two different attentional focus strategies; bodily sensations versus self-talk.

Bodily sensations include items such as heart rate, breathing, and muscle fatigue. Self-talk can be positive thoughts, such as “I can do it” or negative thoughts, such as “I
wish this was over.” However, only positive self-talk will be used in this study, as it is more motivating.

Another purpose of this study is to resolve methodological problems used in past research. For example, many studies have used questionable methods for assigning attentional focus. For example, methods such as having the participants speak out loud during the exercise bout can confound the results because verbalizing may make the participant tire more easily. In addition, the media used to assign the two chosen forms of attentional focus should be the same. For example, if assigning a focus to bodily sensations by means of an audio player with headphones, the assignment to a focus on external distractions should also be administered with an audio player with headphones. A large percent of the literature also did not include manipulation checks to assess the degree to which the participants were adhering to the assigned focus. Yet other studies had problems such as having few participants, subsequently lowering statistical power, or not collecting an optimal dependent variable.

In addition, few studies have compared the results for participants at different levels of expertise or Stages of Change. It has been shown that expert exercisers tend to focus on task relevant thoughts during a competition and use all forms of attentional focus during training (Masters & Lambert 1989). Recreational exercisers, however, tend to prefer to use external distractions at all times (Pennebaker & Lightner 1980). Therefore, the method of attentional focus that is most useful for these groups could be different.
Hypotheses

The first hypothesis was that participants at lower Stages of Change would perform at a higher intensity when focusing on positive self-talk. However, participants at higher Stages of Change were predicted to perform at a higher intensity when focusing on their bodily sensations. The second hypothesis was that participants were expected to enjoy the ST (self-talk) bout of exercise more if they were in lower Stages of Change, but prefer the BS (bodily sensations) bout if they were in the higher Stages of Change.

Rationale

It was predicted that participants at lower Stages of Change would perform better during the self-talk condition because they would be in need of positive encouragement. Because they do not exercise often, they would be more likely to interpret their bodily sensations in a negative way. However, participants who exercise more regularly will be more used to feeling these bodily sensations and therefore more likely to use them as a guide as to how well they are doing. For example, an elite exerciser may take notice of fatigue and interpret that feeling as confirmation that they are having a good workout. A novice exerciser may take notice of fatigue and feel like giving up.

Practical importance

Runners may benefit from different types of attentional focus, depending on their level of expertise. Optimal cognitive strategy cannot only enhance performance, but it can also serve to decrease perceptions of pain that result from running, as well as enhance enjoyment of the exercise itself. This is incredibly important for novice runners because the proper cognitive strategy may increase the possibility that they will adhere to an
exercise routine once they have begun. This is also particularly important in Kentucky, because of the low rate of exercise adherence.

Methods

Participants

Participants were students from Introductory Psychology courses at Western Kentucky University. They participated as a course requirement or for extra credit and were recruited through the Psychology Department’s study board system. There were 154 students who participated, but 12 were dropped because they did not attend the second day of the study, leaving a total of 142. There were 64 males and 78 females with an average age of 19.6 ($SD = 2.50$). However, since skewness was 4.02, the median was also computed, which was 19.00. There were three participants in the precontemplative condition, 11 contemplative, 60 preparation, 34 action, and 34 maintenance. The average BMI (body mass index) for all participants was 23.75 ($SD = 4.05$). The BMI broken down by stages of change was 22.57 ($SD = 2.72$) for precontemplative and contemplative, 24.76 ($SD = 4.71$) for preparation, 23.53 ($SD = 4.07$) for action and 22.69 ($SD = 2.69$) for maintenance. All participants completed the ACSM risk stratification questionnaire to determine whether they were eligible to participate in the study.

Table 3 shows the choices that the participants were given on the demographics sheet concerning their purpose for exercising and how many participants chose each one (they were instructed to choose only one). Fun, appearance and health were all common reasons for exercise, with health being particularly important to the maintenance level participants.
Table 11

*Frequencies for Purpose of Exercise Across Stages of Change*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Fun</th>
<th>Appearance</th>
<th>Social</th>
<th>Health</th>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>16</td>
<td>20</td>
<td>2</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Action</td>
<td>11</td>
<td>5</td>
<td>0</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7</td>
<td>9</td>
<td>0</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>34</td>
<td>2</td>
<td>51</td>
<td>7</td>
</tr>
</tbody>
</table>

Note. Participants in the precontemplation/contemplation stages did not respond to the purpose question.

Before beginning the exercise bout in the lab, participants were given a version of the manipulation check to assess what percentage of the time they focus on each of the six categories of attentional focus during their usual exercise routine (since they do not have an exercise routine, those in the pre/contemplative condition were told to think of any past exercise to decide what they would probably focus on if they were to exercise).

Table 4 shows these results for each Stage of Change.

Table 4

*Mean Percentages and SD’s for Usual Attentional Focus Across Stages of Change*

<table>
<thead>
<tr>
<th>Stage</th>
<th>BS</th>
<th>TRT</th>
<th>ST</th>
<th>TREC</th>
<th>TIT</th>
<th>ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>20.71</td>
<td>12.14</td>
<td>16.43</td>
<td>10.00</td>
<td>22.86</td>
<td>17.86</td>
</tr>
<tr>
<td></td>
<td>(17.74)</td>
<td>(10.51)</td>
<td>(10.08)</td>
<td>(11.09)</td>
<td>(14.90)</td>
<td>(8.93)</td>
</tr>
<tr>
<td>Preparation</td>
<td>16.84</td>
<td>13.02</td>
<td>16.67</td>
<td>14.57</td>
<td>23.07</td>
<td>15.78</td>
</tr>
<tr>
<td></td>
<td>(11.36)</td>
<td>(9.91)</td>
<td>(10.33)</td>
<td>(9.56)</td>
<td>(16.27)</td>
<td>(10.67)</td>
</tr>
<tr>
<td>Action</td>
<td>15.00</td>
<td>22.42</td>
<td>17.12</td>
<td>10.15</td>
<td>21.36</td>
<td>14.24</td>
</tr>
<tr>
<td></td>
<td>(11.04)</td>
<td>(19.21)</td>
<td>(12.44)</td>
<td>(9.39)</td>
<td>(16.45)</td>
<td>(12.00)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>16.18</td>
<td>13.24</td>
<td>15.88</td>
<td>15.88</td>
<td>19.41</td>
<td>19.41</td>
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<tr>
<td></td>
<td>(13.49)</td>
<td>(8.06)</td>
<td>(9.57)</td>
<td>(13.28)</td>
<td>(16.87)</td>
<td>(19.53)</td>
</tr>
<tr>
<td>Total</td>
<td>16.63</td>
<td>15.22</td>
<td>16.56</td>
<td>13.38</td>
<td>21.75</td>
<td>16.51</td>
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<td></td>
<td>(12.54)</td>
<td>(12.98)</td>
<td>(10.57)</td>
<td>(10.86)</td>
<td>(16.23)</td>
<td>(13.52)</td>
</tr>
</tbody>
</table>

Note. Abbreviations in top row stand for bodily sensations, task-relevant thoughts, self-talk, task-relevant external cues, task-irrelevant thoughts, and external distractions.
Tasks and Materials

Demographic information was collected to identify in what Stage of Change each participant was. They were also asked about their best performance times from the past three months, whether they routinely receive performance feedback (e.g., from a coach, themselves, or fellow athletes), exercise frequency, and purpose for exercising.

Independent Variables

Instructions prior to exercise and audio CD’s were used to manipulate attentional focus. For the first 84 participants, the instructions gave examples of the attentional focus they were asked to use. They were asked to provide another example to be sure that they understood the assigned focus. They were told that there would be a CD playing a tone every 30 seconds and that when they heard this tone they should make sure they were using the assigned attentional focus. Due to a low adherence to the assigned focus, the instructions were modified for the next 57 participants. They were told that using the assigned focus was the most important aspect of their exercise and a 8 ½ by 11 inch sheet was placed on the treadmill in front of the participants depicting four examples of their assigned focus. In addition, they were told to use their assigned focus as much as possible and the tone was presented to remind them to do this in case they started drifting from the assigned attentional focus. Participants then engaged in a 20-minute session of exercise on a treadmill. The two conditions, bodily sensations and self-talk, were counterbalanced.

Dependent Variables

©BIOPAC Systems, Inc. physiological equipment was used to record an electrocardiogram during every bout of exercise. This requires three electrodes to be
attached to the torso. This constantly measures the heart rate for the percentage of heart rate maximum variable.

After each exercise bout, the questionnaire used in Wininger, Gieske, & Abo (2007, October) was used as a manipulation check. The questionnaire asks about six categories of attentional focus. Internal task-relevance is broken down into three sub-categories: bodily sensations (e.g. heart rate, breathing), task relevant thoughts (e.g., strategies, goals), and self-talk. Self-talk is considered a distinct category because it is related to exercise, but is separate from both bodily sensations and internal task-relevant stimuli. Self-talk can be positive (“I can do it!”), or it can be negative (“I wish this was over”). Task-relevant external cues include items that are related to the exercise (e.g., time elapsed, listening to the treadmill). Task-irrelevant thoughts include items that are internal to the person, but are unrelated to the exercise (e.g., daydreaming, planning). Finally, external distractions include items such the environment or scenery.

Immediately following the exercise bouts on each day, participants were required to answer whether or not they used each of the six possible attentional focuses. They were asked to rate the percentage of time that they used each focus, with the instructions that all six category percentages must add up to 100%. For example, the question for bodily sensations read, “What percentage of the time did you focus on your bodily sensations?” followed by a scale ranging from 0 to 100 in intervals of 10. Along with the percentage scale, a 3-point Likert scale (1 = negative, 2 = neutral, 3 = positive) assessing valence of thoughts was also included. The purpose of the valence scale is for participants to report whether their thoughts (for each of the six types of focus) were positive or negative. For example, the question read, “Please rate your thoughts about
your bodily sensations using the following scale.” Next, participants were asked to
indicate how many differing bodily sensations they focused on and to cite some
examples. They were also asked to rate their enjoyment, pain, and RPE.

Procedure

Students signed up for the study via the Psychology Department’s SONA system
(a Study Board program), for an hour Monday through Friday from 7:00am until 5:00pm.
Day two of the study was at the same time one week later. Participants were asked to
drink plenty of fluids, avoid taking alcohol, medication, or caffeine for 24 hours prior to
the experiment, 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 to read and sign, and they were given a chance to ask any questions.

Then, participants were familiarized with the ©BIOPAC Systems, Inc.
physiological equipment, and the placement of three electrodes to the participants’ torso
followed. It is important that the electrodes be attached to the skin for at least five
minutes prior to beginning the recording because it aids in reducing noise in the
measurement. One electrode each was attached to both the left and right lower ribcage,
and the third electrode was placed on the right collarbone. Before each electrode was
attached, the skin was prepared by rubbing the skin with an abrading pad and swabbing a
cotton ball of alcohol to remove any loose skin. This also reduced the amount of
unwanted noise in the data recording. A questionnaire assessing demographics was then
administered, followed by an assessment of the participants’ height and weight.
Once the participants completed the three initial questionnaires, the electrode leads were attached and the equipment was calibrated. Participants were familiarized with the treadmill and the exercise began with a two-minute warm-up period, during which time they were read a set of instructions on what to focus on during the exercise bout, followed by 20 minutes of exercise. Each participant was free to adjust the speed as much as he or she wished.

On the first day of research, the participants were assigned to either a bodily sensations or self-talk focus. The order of these assignments was counterbalanced. The speed at which the participant chose to exercise, the RPE reported at the end of each exercise bout, the reported enjoyment and the percentage of the participant’s HRM (heart rate maximum) were all used as dependent variables.

Data collected from 84 participants revealed that they were not adhering to the manipulation at the desired frequency. Therefore, the manipulation was revised. The wording of the instructions was changed to stress the importance of adhering to the manipulation (e.g. “The most important aspect of today’s task is to focus on …”) and an 8 ½ by 11 inch sheet was placed on the treadmill in front of the participants displaying four examples of the assigned focus. These posters were there for the entire session.

Following both sessions, participant filled out an attentional focus questionnaire. Before the participants left at the end of the second session, they were granted credit on the study board. The amount of time to complete each session was between 45 to 60 minutes.
Design

A 2 (assigned attentional focus) X 4 (expertise level) design was implemented for the study. The four levels of exercise were those who do not exercise at all (the two groups of participants who do not exercise at all were combined for the analysis of data because of a low N and the similarities of the groups), those who exercise some but not regularly, those who exercise regularly, and those who have been exercising regularly for the past six months or longer. A repeated measures ANOVA was used to compare the groups.

Results

Manipulation Change

No significant differences were shown between the 84 participants with the original manipulation and the 58 in the revised manipulation. When assigned to focus on self-talk (ST), the percent of ST adherence was $M = 22.88, SD = 17.62$ for the original manipulation and $M = 25.00, SD = 21.21$ for the revised manipulation. When assigned to focus on bodily sensations (BS), the mean adherence percentage was $M = 30.35, SD = 19.42$ for the original manipulation and $M = 33.07, SD = 20.87$ for the revised. Comparing the adherence percentages between manipulations reveals an $F (2, 139) = 0.60$ and a $p = 0.55$, $\eta^2 = .009$. Although adherence did improve slightly with the revised manipulation, it was not a significant difference. Because there were no differences between the groups of students depending on which manipulation we used, the data for each manipulation were analyzed together.

The following tables show whether the participants indicated that they had focused on self-talk and bodily sensations during the self-talk or bodily sensations conditions.
Table 5

Frequency of Focus During Bodily Sensations Trial Across Stages of Change

<table>
<thead>
<tr>
<th>Stage</th>
<th>Self Talk No</th>
<th>Yes</th>
<th>Bodily Sensation No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>2</td>
<td>12</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Preparation</td>
<td>19</td>
<td>41</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>Action</td>
<td>12</td>
<td>22</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Maintenance</td>
<td>8</td>
<td>26</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>101</td>
<td>9</td>
<td>133</td>
</tr>
</tbody>
</table>

Table 6

Frequency of Focus During Self-Talk Trial Across Stages of Change

<table>
<thead>
<tr>
<th>Stage</th>
<th>Self Talk No</th>
<th>Yes</th>
<th>Bodily Sensation No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>1</td>
<td>13</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Preparation</td>
<td>5</td>
<td>55</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td>Action</td>
<td>4</td>
<td>30</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7</td>
<td>27</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>125</td>
<td>76</td>
<td>66</td>
</tr>
</tbody>
</table>

The manipulation check also asked about the valence for BS and ST. These results are reported in Tables 7 and 8. For the different Stages of Change, the average percentage of time spent focusing on each category during ST and BS conditions are reported in Tables 9 and 10.

Table 7

Frequency for Bodily Sensations Valence for Each Trial Across Stages of Change

<table>
<thead>
<tr>
<th>Stage</th>
<th>Negative</th>
<th>Neutral</th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Preparation</td>
<td>5</td>
<td>28</td>
<td>8</td>
<td>8</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>Action</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>4</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Maintenance</td>
<td>6</td>
<td>13</td>
<td>8</td>
<td>4</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>57</td>
<td>24</td>
<td>19</td>
<td>71</td>
<td>43</td>
</tr>
</tbody>
</table>
Table 8

<table>
<thead>
<tr>
<th>Stage</th>
<th>Self-Talk Trial</th>
<th>Bodily Sensations Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative</td>
<td>Neutral</td>
</tr>
<tr>
<td>Pre/Contemp</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Preparation</td>
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<td>10</td>
</tr>
<tr>
<td>Action</td>
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<td>7</td>
</tr>
<tr>
<td>Maintenance</td>
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<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 9

<table>
<thead>
<tr>
<th>Stage</th>
<th>BS</th>
<th>TRT</th>
<th>ST</th>
<th>TREC</th>
<th>TIT</th>
<th>ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>15.71</td>
<td>11.43</td>
<td>20.71</td>
<td>22.14</td>
<td>18.57</td>
<td>11.43</td>
</tr>
<tr>
<td></td>
<td>(10.16)</td>
<td>(11.67)</td>
<td>(12.07)</td>
<td>(19.23)</td>
<td>(17.03)</td>
<td>(11.67)</td>
</tr>
<tr>
<td>Preparation</td>
<td>13.25</td>
<td>12.50</td>
<td>26.75</td>
<td>17.83</td>
<td>22.95</td>
<td>6.72</td>
</tr>
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<td>(11.67)</td>
<td>(11.66)</td>
<td>(19.93)</td>
<td>(13.38)</td>
<td>(21.53)</td>
<td>(10.00)</td>
</tr>
<tr>
<td>Action</td>
<td>16.77</td>
<td>14.71</td>
<td>20.44</td>
<td>22.35</td>
<td>21.77</td>
<td>3.97</td>
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<td></td>
<td>(16.46)</td>
<td>(13.92)</td>
<td>(17.68)</td>
<td>(13.72)</td>
<td>(19.30)</td>
<td>(6.49)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>14.27</td>
<td>11.18</td>
<td>22.94</td>
<td>18.97</td>
<td>23.97</td>
<td>8.68</td>
</tr>
<tr>
<td></td>
<td>(14.04)</td>
<td>(12.44)</td>
<td>(21.11)</td>
<td>(13.80)</td>
<td>(23.73)</td>
<td>(12.02)</td>
</tr>
<tr>
<td>Total</td>
<td>14.58</td>
<td>12.61</td>
<td>23.73</td>
<td>19.61</td>
<td>22.48</td>
<td>6.99</td>
</tr>
</tbody>
</table>

Note: Abbreviations stand for bodily sensations, task-relevant thoughts, self-talk, task-relevant external cues, task-irrelevant thoughts, and external distractions.

Table 10

<table>
<thead>
<tr>
<th>Stage</th>
<th>BS</th>
<th>TRT</th>
<th>ST</th>
<th>TREC</th>
<th>TIT</th>
<th>ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemp</td>
<td>26.43</td>
<td>12.14</td>
<td>10.00</td>
<td>20.00</td>
<td>22.14</td>
<td>9.29</td>
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<td></td>
<td>(20.98)</td>
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<td>(8.77)</td>
<td>(13.01)</td>
<td>(21.55)</td>
<td>(11.41)</td>
</tr>
<tr>
<td>Preparation</td>
<td>32.17</td>
<td>13.75</td>
<td>7.83</td>
<td>18.58</td>
<td>19.58</td>
<td>8.08</td>
</tr>
<tr>
<td>Action</td>
<td>35.59</td>
<td>10.74</td>
<td>8.68</td>
<td>17.94</td>
<td>22.06</td>
<td>5.29</td>
</tr>
<tr>
<td></td>
<td>(21.49)</td>
<td>(10.31)</td>
<td>(12.27)</td>
<td>(15.53)</td>
<td>(21.00)</td>
<td>(7.88)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>28.09</td>
<td>10.29</td>
<td>7.21</td>
<td>21.77</td>
<td>26.47</td>
<td>6.18</td>
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<td>(9.31)</td>
<td>(12.90)</td>
<td>(21.59)</td>
<td>(7.39)</td>
</tr>
<tr>
<td>Total</td>
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<td>12.04</td>
<td>8.10</td>
<td>19.33</td>
<td>22.08</td>
<td>7.08</td>
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<td>(10.11)</td>
<td>(9.58)</td>
<td>(13.44)</td>
<td>(20.00)</td>
<td>(9.04)</td>
</tr>
</tbody>
</table>

Note: Abbreviations stand for bodily sensations, task-relevant thoughts, self-talk, task-relevant external cues, task-irrelevant thoughts, and external distractions.
Hypothesis One: Percent of Maximum Heart Rate

The first hypothesis was that participants at lower stages of change would have a higher percentage of Heart Rate Maximum (HRM) when in the self-talk condition as compared to the bodily sensations condition while the opposite would hold for participants in higher stages of change. However, this hypothesis was not supported.

The following results are for HRM data, which yielded no significant differences. Table 11 shows the means and standard deviations for the percentage of maximum heart rate for condition by Stage of Change. Results for an interaction (Stages of Change by Attentional Focus Category) revealed $F(3, 137) = 0.46, p = 0.71, \eta^2 = 0.01$, observed power = 0.14. Comparing the ST and BS focuses (repeated measure) was $F(1, 137) = 0.37, p = .54, \eta^2 = 0.003$, observed power = 0.09. TTM was not a significant between groups factor, $F(3, 137) = 1.18, p = 0.32, \eta^2 = 0.03$, observed power = 0.31. No differences were significant, and therefore this hypothesis was not supported. It should be noted that the participants at the lowest Stages of Change had the highest percentage of HRM; their hearts worked harder even though they were going slower (as shown by distance data) than persons at higher Stages. However, the lower Stage persons went a smaller distance than those at higher Stages.
Table 11

Means and SD's for Percentage of HRM for Condition Across Stage of Change

<table>
<thead>
<tr>
<th>Stage Of Change</th>
<th>Bodily Sensation</th>
<th>Self-Talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemplative</td>
<td>69.31 (9.44)</td>
<td>67.79 (9.31)</td>
</tr>
<tr>
<td>Preparation</td>
<td>66.78 (10.03)</td>
<td>68.06 (10.70)</td>
</tr>
<tr>
<td>Action</td>
<td>63.58 (9.83)</td>
<td>64.84 (9.18)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>64.64 (12.38)</td>
<td>65.38 (12.76)</td>
</tr>
<tr>
<td>Totals</td>
<td>66.08 (10.42)</td>
<td>66.52 (10.48)</td>
</tr>
</tbody>
</table>

The following results are for distance achieved on the treadmill, which also yielded no significant differences. Table 12 shows the means and standard deviations for distance for condition by Stage of Change. The interaction results (Stages of Change x AF category) were $F(1,138) = 0.25, p = 0.86, \eta^2 = 0.01$. Results for the repeated measure (AF category) were $F(1,138) = 3.45, p = 0.07, \eta^2 = 0.02$. Between group results (Stages of Change) were $F(1,138) = 2.12, p = 0.10, \eta^2 = 0.04$. 
Hypothesis Two: Ratings of Enjoyment

Those at lower Stages of Change were expected to have higher ratings of enjoyment while focusing on ST. However, there was no interaction between enjoyment and Stages of Change, $F(3,128) = 0.47, p = 0.71, \eta^2 = 0.01$. There was also no main effect for AF, $F(1,128) = 1.12, p = 0.29, \eta^2 = 0.01$. Between groups results (Stages of Change) were also non-significant, $F(1,128) = 1.63, p = 0.19, \eta^2 = 0.04$. Therefore this hypothesis was not supported. Table 13 shows the means and standard deviations for enjoyment for condition by Stage of Change.
Table 13

Means and Standard Deviations for Enjoyment for Condition Across Stage of Change

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Bodily Sensations</th>
<th>Self-Talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Contemplative</td>
<td>15.79 (5.71)</td>
<td>16.71 (6.24)</td>
</tr>
<tr>
<td>Preparation</td>
<td>17.70 (4.65)</td>
<td>18.59 (4.59)</td>
</tr>
<tr>
<td>Action</td>
<td>19.23 (4.48)</td>
<td>19.51 (4.96)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>19.13 (5.94)</td>
<td>18.90 (6.72)</td>
</tr>
<tr>
<td>Totals</td>
<td>18.19 (5.12)</td>
<td>18.68 (5.41)</td>
</tr>
</tbody>
</table>

Discussion

Current Results

Although it was hypothesized that focusing on ST or BS could impact the distance completed (intensity) of the exercise bout or the enjoyment of the exercise, neither of the hypotheses were supported. ST did not enhance the intensity chosen or enjoyment and TTM was not a significant between groups factor. These results are inconsistent with other studies, which showed that what the person was thinking about while exercising did impact the intensity of the exercise completed. For example, Coutour, Jerome, & Tihanyi (1999), Connolly & Janelle (2003), Saitsing, Richman, & Bergey (1988), and Scott et al. (1999) all found that some type of task relevant thoughts were associated with better performance. Baghurst, Thierry, & Holder (2004), Okwumabua et al. (1983), and Pennebaker & Lightner (1980), however, found that some type of task irrelevant thoughts were associated with better performance. Also, increased enjoyment (or decrease in RPE) was also found to be associated with attentional focus in
that task irrelevant thoughts, mostly external distractions, were better (Johnson & Siegel, 1992; Fillingim & Fine, 1986; Pennebaker & Lightner, 1980). However, no studies have directly compared participants of various Stages of Change or teased apart different types of task relevant thoughts before. Also, no other study has had a manipulation check as complete as the current study.

*Implications of Results*

It is unclear at this point why there were no significant differences in this study. Perhaps the results could be due to limitations of the study (discussed below) or it could be that focusing on ST or BS does not make a difference in the motivation of participants to go at a faster pace on a treadmill. More research is necessary to find out which (if any) attentional focus will be most likely to increase intensity and enjoyment.

It is also important to note that most studies have collapsed ST and BS into one category and this was the first study to try to tease these apart. When completing the manipulation check, participants did not seem to have any difficulty in understanding the differences between all of the categories. However, it may be that the function of ST and BS focuses are very similar and that is why there were no significant differences found in this study.

It is interesting to note that during the BS trial, BS was the dominant attentional focus across all Stages of Change (see Table 9), but ST was not during the ST trial (see Table 10), except for those in the preparation stage. Perhaps it is harder to focus on ST for the duration of an exercise bout because ST is a strategy that is used only at key times during an exercise bout.
Some insignificant trends were observed. One was that participants in the lowest Stages of Change did report the lowest ratings of enjoyment for the BS trial (see Table 13). Another was that ST trials yielded higher distances (see Table 12) for every Stage of Change compared to the BS trials. Perhaps a higher N and better adherence rates to the assigned attentional focus could indicate whether or not there truly is a difference across Stages of Change for various attentional focuses.

**Limitations of Current Study**

One possible limitation of this study was a low number of participants in the lowest Stages of Change. Perhaps this was due to the method used to categorize participants into Stages of Change (discussed in the following section) or perhaps our participants really did not span the Stages of Change well.

Another limitation was what seemed to be low adherence rates to the assigned attentional focuses. During the BS trial BS was the dominant attentional focus across all stages, but still low ($M = 31\%$). During the ST trial ST was dominant for only one stage (Preparation) and the overall mean for ST ($M = 24\%$) was lower than the BS mean. It may be a function issue, in that both of these attentional focus strategies are used at key times and to force someone to focus on them all the time is impractical and unnatural.

**Suggestions for Future Research**

Future research with stronger adherence to the assigned focuses could help to determine if focusing on ST or BS can alter the intensity chosen by the participant. Perhaps a different method of eliciting the attentional focus, or more detail of the importance of the attentional focus in the instructions could be used. Further exploration of when each type of attentional focus is used under normal exercise or racing conditions
could help to tailor future inductions of attentional focus in terms of how often to induce each type of attentional focus strategy.

Future research should also modify the demographic information pertaining to the TTM. In the present study, participants were asked about how often they exercise, but exercise was not defined to them. Perhaps this is why there were such a low number of participants who said that they do not exercise at all. If the definition of exercise included that exercise is defined as purposeful activity, which excludes walking to classes, perhaps the TTM data would have been different.

Another idea for future research is to start the exercise bout at a target intensity (e.g., high intensity as defined by the ACSM) and then give the participants a choice of maintaining or altering that intensity after a predetermined window of time. This may motivate participants to exercise at a higher intensity by helping them to understand how fast they should be going in order to gain maximum health benefits.

Of course, future research should also compare others of the six attentional focus categories. Gieske and Wininger (unpublished) conducted a within subjects study in which participants were assigned to a moderate intensity for exercise on a treadmill on their first session and a high intensity on their second session (sessions were one week apart). The main DV in this study was to find out what percentage of the time the participants chose to focus on each of the six categories of attentional focus and whether or not what they focused on was related to their ratings of enjoyment. It was found that precontemplative/contemplative participants who primarily focused on external distractions reported higher enjoyment and lower RPE’s than those who focused on bodily sensations. Future research could assign external distractions and bodily
sensations attentional focuses to participants in a with-in subjects study to further explore this relationship.

To summarize, external distractions may be better related to high intensity and enjoyment than bodily sensations, and self-talk may not differ from bodily sensations. However, task relevant thoughts, task relevant external cues, and task irrelevant thoughts have not been as deeply explored. Perhaps the first step is to find a successful methodology for assigning the attentional focus, and the second step is to compare many different attentional focuses with each other.

In conclusion, although this study did not find a method to improve the exercise intensity chosen by our participants, it does serve as a guide to direct future research. We see that it is difficult to get participants to adhere to the assigned attentional focus, so steps should be taken to explore ways of increasing adherence. We also found that the manipulation check used in this study is very informative and can be used in future studies.
References


Appendix A
1. Gender: female or male

2. Age: [___]

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 currently 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 six months or longer.

*If you chose “a” or “b”, skip to #13*

4. Current primary activity/sport (circle one):
   Walking  Running  Swimming  Cycling  Other [___________]

5. Continuous years participating in activity/sport circled above: [______]

6. How many times per week do you currently participate in the activity/sport? [______]

7. Select your main purpose for participating in the activity (check 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)

8. Do you compete in races? Yes or No

9. Current characteristics of endurance/continuous training:
   Frequency (times per week) [______]
   Duration (average of amount of time per session) [______]
   Intensity (see scale to the right) [______]

10. Do you engage in interval training (defined as multiple high intensity exercise bouts with brief rest periods or low intensity exercise between each bout)?
    Yes or No (if “No”, skip to #11)

   a) What are the current characteristics of interval training?
      Frequency (times per week) [______]
      Duration (average of amount of time per session) [______]
      Intensity (see scale to the right) [______]

11. The following questions are about performance feedback.
a) What is the source of your performance feedback? (check all that apply)
   ___ Yourself  ___ A Coach  ___ A Trainer  ___ A fellow athlete/friend

b) Which performance aspects do you receive feedback on? (check all that apply)
   ___ Times  ___ Form/Technique  ___ Strategy  ___ Training methods

12. Best performances within the past 3 months if known:
   Running: 1 mile ______ minutes  5k ______ minutes  10k ______ minutes

13. Are you currently suffering from any injuries?  Yes or No
14. Have you experienced any injury within the last 6 months (new or recurring)? Yes or No
15. Have you experienced any highly stressful life events within the last 24 hours? Yes or No

STOP

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

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

STOP, for experimenter use only.

Height ______
Weight ______
PAR ______

Resting HR ______
RPE at 19 min ______
Pain estimate ______
Distance ______
HR 5 min ______  HR 10 min ______  HR 15 min ______  HR 20 min ______
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
5) Task irrelevant thoughts
6) External distractions

1) Did you focus on bodily sensations (for example, heart rate, breathing rate, muscles, fatigue, pain, sweating, cramps)?
   ___Yes ___No (if “No”, skip to #2)
   a) Rate the majority of your thoughts about your bodily sensations using the following scale:
      1  2  3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you focus on bodily sensations (check all that apply):
      First third ____ Middle third ____ Last third ____
   c) Indicate the number of different bodily sensations you focused on _____.
   d) What are some examples of the bodily sensations you focused on?

2) Did you focus on task relevant thoughts (for example, strategies, goals, pace, injury concerns, thoughts about time)?
   ___Yes ___No (if “No”, skip to #3)
   a) Rate the majority of your task relevant thoughts using the following scale:
      1  2  3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you focus on task relevant thoughts (check all that apply):
      First third ____ Middle third ____ Last third ____
   c) Indicate the number of different task relevant thoughts you focused on _____.
   d) What are some examples of the task relevant thoughts you focused on?
3) Did you use self-talk (psyching up, for example, “I can do it”; OR psyching down, for example, “I wish this was over”)?

   ___ Yes ___ No (if “No”, skip to #4)

   a) Rate the majority of your self-talk using the following scale:

      1  2  3
      negative neutral positive

   b) Imagine your run/walk being divided into three equal parts. During which parts did you use self-talk (check all that apply):

      First third ___ Middle third ___ Last third ___

   c) Indicate the number of different self-talk statements you used ____

   d) What are some examples of the self-talk you used?

4) Did you focus on task relevant external cues (for example, time elapsed, a time display, a speed display, listening to the treadmill, the electrode cords)?

   ___ Yes ___ No (if “No”, skip to #5)

   a) Rate the majority of your thoughts about task relevant external cues using the following scale:

      1  2  3
      negative neutral positive

   b) Imagine your run/walk being divided into three equal parts. During which parts did you focus on task relevant external cues (check all that apply):

      First third ___ Middle third ___ Last third ___

   c) Indicate the number of different task relevant external cues you focused on ____

   d) What are some examples of the task relevant external cues you focused on?
5) Did you focus on task irrelevant thoughts (for example, daydreaming, problem solving, planning, recalling memories, meditating)?
   ___ Yes  ___ No (if “No”, skip to #6)

   a) Rate the majority of your task irrelevant thoughts using the following scale:
      1  2  3
      negative   neutral   positive

   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on task irrelevant thoughts (check all that apply):
      First third _____  Middle third _____  Last third _____

   c) Indicate the number of different task irrelevant thoughts you focused on _____.

   d) What are some examples of the task irrelevant thoughts you focused on?

6) Did you focus on external distractions (for example, the environment/scenery)?
   ___ Yes  ___ No (if “No”, skip 6a-d)

   a) Rate the majority of your thoughts about external distractions using the following scale:
      1  2  3
      negative   neutral   positive

   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on external distractions (check all that apply):
      First third _____  Middle third _____  Last third _____

   c) Indicate the number of different external distractions you focused on _____.

   d) What are some examples of the external distractions you focused on?
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)?

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

3) Self-talk (psyching up, for example, “I can do it”; OR psyching down, for example, “I wish this was over”)?

4) Task relevant external cues (time elapsed, a time display, a speed display, listening to the treadmill, the electrode cords)?

5) Task irrelevant thoughts (daydreaming, problem solving, planning, recalling memories, meditating)?

6) External distractions (the environment/scenery)?

Please make sure percentages chosen for the 6 categories add up to 100%; **Total**
Session #2

1. Are you currently suffering from any injuries?  Yes or No
2. Have you experienced any highly stressful life events within the last 24 hours? Yes or No

STOP

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

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

5. I enjoyed walking/running on the treadmill.  1  2  3  4  5  6  7
6. Walking/Running on the treadmill was fun.  1  2  3  4  5  6  7
7. I think walking/running on the treadmill was boring.  1  2  3  4  5  6  7
8. I think walking/running on the treadmill was quite enjoyable.  1  2  3  4  5  6  7

Please note any additional feelings or comments you have about the exercise bout below.
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

For experimenter use only:

Resting HR
RPE at 19 min
Pain estimate
Distance
HR 5 min  HR 10 min  HR 15 min  HR 20 min
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  
5) Task irrelevant thoughts  
6) External distractions

1) Did you focus on **bodily sensations** (for example, **heart rate, breathing rate, muscles, fatigue, pain, sweating, cramps**)?
   
   ___Yes  ___No (if “No”, skip to #2)
   
   a) Rate the majority of your thoughts about your bodily sensations using the following scale:
      
      1  2  3  
      negative neutral positive
   
   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on bodily sensations (check all that apply):
      
      First third _____  Middle third _____  Last third _____
   
   c) Indicate the number of different bodily sensations you focused on _____.
   
   d) What are some examples of the bodily sensations you focused on?

2) Did you focus on **task relevant thoughts** (for example, **strategies, goals, pace, injury concerns, thoughts about time**)?
   
   ___Yes  ___No (if “No”, skip to #3)
   
   a) Rate the majority of your task relevant thoughts using the following scale:
      
      1  2  3  
      negative neutral positive
   
   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on task relevant thoughts (check all that apply):
      
      First third _____  Middle third _____  Last third _____
   
   c) Indicate the number of different task relevant thoughts you focused on _____.
   
   d) What are some examples of the task relevant thoughts you focused on?
3) Did you use self-talk (psyching up, for example, “I can do it”; OR psyching down, for example, “I wish this was over”)?
   ___Yes ___ No (if “No”, skip to #4)
   a) Rate the majority of your self-talk using the following scale:
      1 2 3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you use
      self-talk (check all that apply):
      First third ___ Middle third ___ Last third ___
   c) Indicate the number of different self-talk statements you used _____.
   d) What are some examples of the self-talk you used?

4) Did you focus on task relevant external cues (for example, time elapsed, a time display, a speed display, listening to the treadmill, the electrode cords)?
   ___Yes ___ No (if “No”, skip to #5)
   a) Rate the majority of your thoughts about task relevant external cues using the following scale:
      1 2 3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on task relevant external cues (check all that apply):
      First third ___ Middle third ___ Last third ___
   c) Indicate the number of different task relevant external cues you focused on _____.
   d) What are some examples of the task relevant external cues you focused on?
5) Did you focus on task irrelevant thoughts (for example, daydreaming, problem solving, planning, recalling memories, meditating)?
   ___Yes     ___No (if “No”, skip to #6)
   a) Rate the majority of your task irrelevant thoughts using the following scale:
      1  2  3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on task irrelevant thoughts (check all that apply):
      First third _____ Middle third _____ Last third _____
   c) Indicate the number of different task irrelevant thoughts you focused on _____.
   d) What are some examples of the task irrelevant thoughts you focused on?

6) Did you focus on external distractions (for example, the environment/scenery)?
   ___Yes     ___No (if “No”, skip 6a-d)
   a) Rate the majority of your thoughts about external distractions using the following scale:
      1  2  3
      negative neutral positive
   b) Imagine your run/walk being divided into three equal parts. During which parts did you
      focus on external distractions (check all that apply):
      First third _____ Middle third _____ Last third _____
   c) Indicate the number of different external distractions you focused on _____.
   d) What are some examples of the external distractions you focused on?
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”; OR psyching down, for example, “I wish this was over”)?

0 10 20 30 40 50 60 70 80 90 100

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

0 10 20 30 40 50 60 70 80 90 100

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

0 10 20 30 40 50 60 70 80 90 100

6) External distractions *(the environment/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*
Appendix B
**ACSM Risk Stratification (ACSM, 2000)**

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

*Do you have any of the following conditions?*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Family history of Heart disease: Heart attack, heart surgery, or sudden death before age 55 (father/brother/son) or 65 (mother/sister/daughter)</td>
</tr>
<tr>
<td></td>
<td>2. Cigarette Smoker: current or have quit within the past 6 months</td>
</tr>
<tr>
<td></td>
<td>3. High Blood Pressure: SBP ≥ 140 or DBP ≥ 90 (confirmed on 2 occasions or on Blood Pressure medication)</td>
</tr>
<tr>
<td></td>
<td>4. High cholesterol: total &gt;200 (or HDL &lt; 35, or &gt; 130, or on medication for high cholesterol)</td>
</tr>
<tr>
<td></td>
<td>5. Diabetes (adult or juvenile) or Glucose Intolerance</td>
</tr>
<tr>
<td></td>
<td>6. Obesity (Body Mass Index ≥ 30, or waist circumference &gt; 39 inches)</td>
</tr>
<tr>
<td></td>
<td>7. Sedentary Lifestyle (less than 30 minutes total “physical activity” most days)</td>
</tr>
</tbody>
</table>

**Total risk factors =**

*Do you have any of the following?*

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

**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.