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The Effect of Unexpected Exercise Duration on Rating of Perceived Exertion in an Untrained, Sedentary Population

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by

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ABSTRACT

The Borg Rating of Perceived Exertion (RPE) scale is a primary tool for researchers and practitioners in exercise science to describe the intensity level subjects are experiencing when participating in exercise sessions. It has recently been suggested that RPE is not simply the direct result of interpretation of physiological changes as originally postulated, but is also influenced by affect, past experience, and time to completion, a concept coined as teleoanticipation.

The purpose of this study was to determine the role of teleoanticipation in a sedentary population, by examining the effect unexpected increases in exercise duration on rating of perceived exertion and affect during low intensity treadmill walking. Based on the findings of prior studies, it is expected that the unexpected duration session will elicit higher RPE values and lower affect scores as measured by the feeling scale (FS) than the expected duration session.

Ten participants between the ages of 18 and 45 years participated in the study. All participants were sedentary or insufficiently active with respect to physical activity for at least six months prior to the beginning of the study. Only participants with low to moderate risk according to the American College of Sports Medicine (ACSM) guidelines were admitted.

All volunteers participated in one familiarization session followed by two trials of treadmill exercise. The familiarization trial was used to determine the treadmill speed in subsequent trials. All experimental trials were 30 minutes in length in partial accordance with ACSM guidelines, but the third trial in each group was presented as being 20 minutes and was extended to 30 minutes using a deception procedure employed in related research. Participants were informed at the 20-minute mark that the session would be extended to 30 minutes. Speed remained constant during both experimental trials.

RPE and heart rate were recorded every minute to preclude volunteers from noticing the difference an increased interest in RPE responses around the 20-minute mark. Affect was measured by way of the feeling scale (FS) every other minute during the experimental trials. Blood pressure was recorded every five minutes to ensure participant safety.

Results indicated a significant main effect for time for RPE ($p = 0.001$); however, there was no significant main effect for time and no interaction for RPE ($p > 0.05$) and no significant main effect and no interaction for FS. The primary finding from this investigation was that unexpected exercise durations have no affect on RPE or FS at low intensities in untrained, sedentary populations. Results suggest there may be a threshold of intensity required for a teleoanticipatory effect. More research is needed to further compare these effects with those of moderately and highly trained populations in medium or high intensity situations.

CHAPTER 1: INTRODUCTION

Rationale

The Borg Rating of Perceived Exertion (RPE) scale was first introduced in the 1950s and was believed to gauge overall level of perceived exertion at any one moment in time during an exercise bout, allowing the "costs" of exercise to be determined rather than just focusing on performance. Gunnar Borg claimed that measuring perceived exertion gathered information from the peripheral muscles and joints, cardiovascular and respiratory systems, and central nervous system, allowing functions for different workloads to be compared with physiological responses (Borg, 1990). He claimed that scaling the aspects of physical stress allowed researchers to measure information that could not be collected through physiological reactions such as measuring increases in heart rate or blood pressure. The Borg RPE scale has since been the main tool for measuring physical stress and has been combined with heart rate to describe an intensity level a subject or client is experiencing during any given exercise session. Borg claimed a high correlation existed between his 6-20 scale and heart rate, suggesting that a perceived RPE value, multiplied by 10, would equal an exerciser's actual heart rate at that moment (1998).

The idea of exertion being determined by peripheral muscles and joints along with the cardiovascular and respiratory systems was challenged when H.V. Ulmer proposed the concept of teleoanticipation (Ulmer, 1996). His model suggests that when performing a task, a central programmer within an athlete's brain dictates perceived exertion. Teleoanticipation suggests that a central programmer regulates the amount of effort that can be put forward by an athlete based on the amount of time the athlete will be active in order to decrease the chances of the body suffering irreversible damage. It has recently been suggested that RPE is not just the direct result of a subject's interpretation of physiological changes as once conceptualized by Borg, but is also influenced by affect (Baden, McLean, Tucker, Noakes, & St Clair Gibson, 2005), past experience (Edwards, Bentley, Mann, & Seaholme, 2010), and time to completion (Faulkner, Parfitt, & Eston, 2008).

According to St. Clair Gibson and Noakes (2004), teleoanticipation helps to ensure that the body is not pushed beyond its capacity, while allowing for alterations in the body's capability to increase potential fitness. The general public is in need of assistance for increasing participation in physical activity. If understanding teleoanticipation can help enhance an individual's potential for increased levels of exertion, it may also increase an individual's sense of mastery and self-efficacy for the type of exercise performed. According to the self-efficacy theory, how an individual perceives his or her capability, and the extent to which the individual feels he or she will be successful in completing a task, dictates self-confidence (Bandura, 1977). Bandura speculated that an individual's repeated attempts at an intimidating activity would increase that person's proficiency in the action and increase perceived capability and self-confidence, thereby furthering an individual's enjoyment and adherence to the activity (1977). As physical limits are challenged and conquered, those who partake in this type of training can decrease their level of perceived exertion for a previously threatening activity, allowing themselves to reach new potentials in their level of fitness while gaining a sense of mastery in exercise. Therefore, this investigation focused on the physical activity level of those who are most likely to be intimidated by exercise, sedentary populations.

Problem Statement/Purpose

There have been a number of research articles that confirm the concept of teleoanticipation, though it is only in trained populations, heavy exercise intensities, or a combination of the two that the idea has been considered. The purpose of this study was to determine the role of teleoanticipation in a sedentary population, by examining the effect unexpected increases in exercise duration on rating of perceived exertion and affect during low intensity treadmill walking.

Study Variables

The study included one independent variable, trial, which was dived into two levels, expected duration and unexpected duration. The two dependent variables included were RPE and affect (FS).

Hypotheses

Based on the findings of prior studies, it was anticipated that the unexpected duration session would elicit higher RPE values and decreased affect scores than the expected duration session for light intensity walking speeds.

Ho1: There is no difference in RPE between the unexpected duration trial and the expected duration trial.

Ho2: There is no difference in FS between the unexpected duration trial and the expected duration trial.

Conceptual Model

The model proposed by Ulmer (1996) demonstrates the human body's capacity to feedback the intensity of the muscular metabolic rate during heavy exercise to the motor control system, then through feed-forward mechanisms, adjust the number of motor units recruited in order to regulate exercise intensity and exertion. Similar to the somatosensory system which receives and processes senses such as touch, temperature, body position, and pain, the motor control system receives and processes metabolic rate during an activity and makes adjustments in the select level of exertion. The regulation center of the feedback system balances efferent signals from the motor system, metabolic reserves, and the actual metabolic rate with the time necessary to finish the exercise bout. This allows the body to adjust to its optimal level of exertion and avoid early exhaustion before the subject is able to reach the anticipated end point of an exercise bout, thus termed teleoanticipation (Ulmer, 1996).

Operational Definitions

Terms which are of importance within this study are rate of perceived exertion (RPE), affect, low intensity, and sedentary lifestyle.

- RPE Scale: Borg 6 – 20 scale (Appendix A) which describes the level of perceived exertion an individual feels at a specific moment in time during an exercise bout.
- Affect: The feeling scale measures an individual's overall feeling or emotion at a specific moment in time (Appendix E).
- Low Intensity: workload that elicits an RPE of 9 corresponding to "very light"
- Sedentary: participating in physical activity less than 30 minutes a day, no more than 3 times per week and a categorical score of "low" or "moderate" on the International Physical Activity Questionnaire (IPAQ) Long Form (Appendix C).

Assumptions

This study assumed all participants would respond to all questions honestly. A second assumption was that all participants would feel comfortable walking on the treadmill and responding to questions about exertion using the Borg RPE scale after a one session familiarization trial. The following trials were assumed to be scheduled in a manner allowing each subject to be well-rested for each session.

For equipment and instrumentation, it was assumed that the University of South Florida Health and Exercise Science Lab treadmill accurately reported the speed at which the automated belt was moving. It was also assumed that the Polar heart rate monitors accurately and reliably provide subjects' heart rates. Based on a study conducted at 14 centers in 12 different countries (Craig et al., 2003), it was assumed that the IPAQ Long Form is a valid form of assessment for this subject population.

Limitations

Some issues that could not be controlled for included volunteerism, timing of the study, and population size. As participants would have been selected based on their willingness to participate in the study, volunteerism was not able to be avoided. The investigation was conducted beyond the end of participating students' semester; possibly precluding some prospective participants from being tested. Population size and sampling were also considered to be limitations as a larger sample size would have increased the generalizability of the findings and sampling will have introduce some increases in error and bias.

Delimitations

The study only focused on men and women, between 18 and 45 years of age, who were categorized as "Low" or "Moderate" on the IPAQ Long Form (IPAQ Group, 2011). Only volunteers who were untrained and had an absence of health issues such as smoking and signs and symptoms of disease were admitted into the study. Research only focused on perceived exertion and affect and did not take into account associative or dissociative thoughts or other possible variables during the trial sessions.

Significance

The support for teleoanticipation has grown since Ulmer's model was published in 1996. Many of the studies supporting this concept created designs that utilized moderately to highly trained participants who were required to complete multiple highly intense or competitive trials. Given that there are now a number of research articles confirming the concept of teleoanticipation, it is only in these trained populations and intense situations that the idea has been considered. The time has arrived to examine this concept in the general and sedentary population.

Ulmer's model has significance for the general population because of the trainability and psychological aspects of teleoanticipation. Anticipation based on training and past experience increases one's awareness of physical limitations, keeping the body from any major harm. There will be some discomfort associated with taking on a new physical activity in the beginning, as individuals have no or few past experiences to draw from to regulate pacing, but the trainability of teleoanticipation may allow some to push past current physical limits just enough to increase tolerance. Repeated bouts of pushing exercise limitations can improve overall fitness and self-efficacy. Enhanced fitness and self-efficacy may even lead to an increase in enjoyment and adherence to the activity. Teleoanticipation also brings to light a psychological aspect of physical activity such as self-efficacy and positive self-talk. If this is true for the general population, increased use of positive self-talk and positively changing the way an activity is viewed or anticipated can help decrease RPE during the activity. How an exercise bout is represented and perceived from the beginning may have long term effects on this population's acceptance of exercise. Therefore, determining the effect of unexpected increases in exercise duration on RPE and affect in this population may have great value in increasing exercise adherence in the general public.

CHAPTER 2: REVIEW OF LITERATURE

Defining fatigue through RPE

Perceived exertion is part of a field, referred to as psychophysics, which explores the relationship between physical stimuli and the sensations it causes (Encyclopedia Britannica online, 2011). Scaling, one of four subfields in psychophysics, is considered to be the most important for the use of perceived exertion (Borg, 1998). The concept of perceived exertion is related to the concept of exercise intensity and sensations received from the muscles and joints, somatosensory receptors, cardiovascular and respiratory systems, and other bodily organs while performing highly intense exercise. Borg (1998) asserts that it is the "degree of heaviness and strain experienced in physical work as estimated according to a specific rating method" (p. 9). According to this concept, perceived exertion depends on many factors, but most commonly depends on physiologic mediators of exertion such as heart rate, blood lactate, muscle lactate, catecholamines, and tissue temperature, all signals which are outside of the central nervous system (Buckworth & Dishman, 2002).

Defining fatigue through teleoanticipation

More than 200 scientific articles discussing perceived exertion are published each year (Borg, 1998), but one in particular has changed the way many researchers and field experts view the area of perceived exertion. German researcher, H.V. Ulmer, suggested a type of central programmer exists in the brain and takes into consideration the finishing point of a given task, working backwards from that point to regulate and provide an optimal metabolic rate for an athlete to finish a heavy bout of exercise in the quickest time possible (1996).

This model has gained support in the literature by several investigations on fatigue in highly trained athletes. According to St. Clair Gibson and Noakes (2004), fatigue during exercise is not due to one single regulatory component. Rather it is the result of multiple, continuous levels of regulation compensating for peripheral feedback. Levels of regulation from feedback work together with central control mechanisms, which use feed forward components, to ensure that homeostasis is maintained. These controls guarantee the body is not pushed to the absolute maximal capacity, but allows the system to be "reset" through various stimuli such as training and previous experience in order to allow for gains in performance. Teleoanticipation suggests that athletes regulate their intensity based on experience, sensory feedback (afferent information such as peripheral sensations of fatigue), and feed forward (efferent information such as pacing strategy) within an event.

Investigating teleoanticipation's regulation of effort

In a study on the effect of distance feedback on pacing strategy and perceived exertion during cycling, researchers provided 15 competitive endurance trained male cyclists with either correct or incorrect distance splits to observe the effect on RPE and pacing strategies (Albertus, Tucker, St Clair Gibson, Lambert, Hampson, & Noakes, 2005). The experiment found that participants had comparable finishing times regardless of receiving correct or incorrect distance splits and the rate of increase in RPE was not different between trials, suggesting that the teleoanticipatory response may be more vital in regulating pace than distance feedback and is insensitive to incorrect verbal feedback during the actual exercise bout. RPE was found to be similar in all time trials despite significant variations in heart rate responses.

Though incorrect distance feedback had no affect on RPE, researchers were curious about potential effects of pre-fatiguing on RPE (Eston, Faulkner, St Clair Gibson, Noakes, & Parfitt, 2007). Ten participants were recruited to perform four lab-based exercise tests on an electronically braked cycle ergometer in order to test this question. The first session involved determining peak aerobic power from a graded exercise test. After 15 minutes of recovery time, participants were required to perform a constant load exercise test to exhaustion at 75% of their VO2peak and a pedal cadence between 60 and 90 revolutions per minute. The remaining tests were performed two to three days later and about two to three days apart from each other. The same constant load exercise test was performed to exhaustion with the exception of a pre-fatiguing exercise bout prior to the test for both of the remaining sessions. The study found a significant reduction in time to exhaustion when a pre-fatiguing activity was performed, but the rate of increase for perceived exertion was similar for both the non-fatigued and pre-fatigued conditions demonstrating that perceived exertion may have scalar time properties. This suggests an internal timing device regulates RPE in an anticipatory manner with a specific endpoint set for the exercise bout at the beginning of the session.

Complementing the notion of teloanticipation's regulation of effort, an investigation examining the regulation of pacing strategies recruited seven, highly trained, male cyclists to perform three consecutive 4 kilometer time trials in the fastest times possible (Ansley, Schabort, St Clair Gibson, Lambert, and Noakes, 2004). The primary findings were that the first and last time trials were completed in similar times, and that power output increased during the last 60 seconds of each time trial, allowing for a surge at the end. This change in power output implies that participants did not reach absolute fatigue during the time trials, supporting the theory that a central programmer determines the recruitment pattern of muscle fibers to allow an athlete to successfully finish an exercise bout.

Further evidence of teleoanticipatory regulation has been provided in a study on prolonged athletic competition (Foster, Hoyos, Earnest, & Lucia, 2004). Data from seven elite, professional cyclists completing one 3 week cycle tour race in two different racing seasons were examined. The relative exercise intensity during the three weeks was similar to the pacing pattern found in single exercise bout, suggesting that these same pacing strategies can be employed in competitions up to three weeks long. These results support the concept that humans can actively regulate energy expenditure to optimize their competitive effort.

Investigating teleoanticipation's regulation of RPE

The theory that teleoanticipation also regulates the perception of exertion was tested in a recent study which compared how RPE and attentional focus changed over time during both short and long running sessions in two different studies (Baden, Warwick-Evans, and Lakomy, 2004). The first study focused on two cognitive strategies of twenty-two members of a running club during a short run of 8 miles and a long run of

10 miles. The strategies included association – focusing oneself on bodily signals – and dissociation – focusing on the environment or daydreaming to distract oneself from bodily sensations. Participants were asked to rate their thoughts four to five times during the run. The researchers found RPE to be higher overall during the shorter run than the longer run and that RPE increased over distance in both instances. Participant percentage of associative thoughts were also found to be higher during the short run than during the long run, displaying a significant, positive relationship between associative thoughts and RPE. The higher RPE during the short run led researchers to suggest that RPE is a psychophysiological construct and that the psychological components of RPE are controlled partly by attentional focus.

To further test the possibility of RPE and associative/dissociative thoughts, Baden and colleagues (2004) conducted a follow-up study which admitted both healthy individuals and individuals from an Active Options program designed to reduce risk of coronary heart disease. Participants in this program were prescribed an exercise routine updated every eight sessions. After 16 sessions, the participants were dubbed graduates and it was from this group Baden and colleagues recruited. The authors considered these graduates to be trained, thus all participants included in the study were regarded as trained.

Participants in this investigation were asked to run on a treadmill at a self-selected pace during two sessions separated by one week. During one session, participants were asked to run for 10 minutes and were stopped after 10 minutes had been reached (short session). In the other session, participants were told to run for 20 minutes but were unexpectedly stopped after just 10 minutes (long session). Associative and dissociative thoughts were recorded at regular intervals during the run. Results indicated that RPE was higher during the session in which participants believed they would be running for only 10 minutes as compared to the session participants believed they would be running for 20 minutes. Additionally, RPE increased over time in both sessions. The percentage of associative thoughts trended toward being higher during the short session than the long session. RPE was also positively correlated with the percentage of associative thoughts as was found during the former study conducted by Baden and colleagues (2004). These results indicate that the volunteers paced themselves by manipulating their cognitive focus.

Teleoanticipation and deception

The effect of deception on RPE in a trained population was again examined in 16 moderately trained runners performing three trials at 75% of their peak treadmill running speed (Baden , McLean, Tucker, Noakes, & St Clair Gibson, 2005). Each trial was 20 minutes in length and varied in terms of what duration participants were told prior to exercise and what duration they actually performed. In the first trial, participants were told to run for 20 minutes and were stopped after the 20 minutes had expired. In the second trial, participants were told to run for 10 minutes but once the first 10 minutes were completed they were required to run 10 more minutes. In the third trial, participants were not told how long they were to run for but were stopped after 20 minutes. Though all three trials were of equal duration, when participants were deceived, their RPE increased significantly at the eleventh minute and affect scores significantly decreased.

These results could signify a close relationship between RPE and affect that may support the hypothesis made in the earlier studies that fatigue may be an emotional construct.

The aforementioned studies all resulted in findings that support the concept that RPE is not purely a measure of physical exertion, but a complex interaction of physiological systems and psychological aspects in athletes or physically trained populations. It was suggested that the athlete's subconscious brain anticipates the duration of an exercise bout and RPE scales with the proportion of perceived exercise time remaining. In those articles which examined pace and RPE, the evidence supported the idea of pacing strategies that are regulated by a central mechanism that decides motor unit recruitment and is set before the exercise bout even begins. However, it is unclear if this mechanism for regulating pace and perceived exertion during exercise is applicable to all populations, sedentary as well as physically active. If sedentary populations are able to use teleoanticipation's regulation and trainability to enhance physical activity and increase enjoyment, they may be able to reach new potentials for health and fitness levels previously thought unattainable.

CHAPTER 3: METHODOLOGY

Participants

Twenty volunteers between the ages of 18 and 45 years were recruited from the University population to participate in the study, with ten volunteers completing the testing. Ten of the participants missed at least one of the three testing sessions and were not included in the study analyses. Volunteers participating in the investigation were young, normal weight on average, and averaged a walking speed just under 3 miles per hour. Descriptive statistics for the participants and the exercise session are presented in Table 3.1.

Table 3.1: Descriptive statistics

Demographics	Mean ± Standard Deviation
Age (years)	22.30 ± 3.40
Height (m)	1.67 ± 0.12
Weight (kg)	69.85 ± 20.70
BMI	24.56 ± 5.49
Treadmill Speed (mph)	2.78 ± 0.47

All participants were sedentary or insufficiently active with respect to elective physical activity, as defined by the ACSM guidelines (ACSM, Physical Activity & Public Health Guidelines, 2007) and a score of “low” or “moderate” on the IPAQ (Craig, et al., 2003), for at least six months prior to the beginning of the study. Only volunteers with low to moderate risk according to ACSM guidelines (ACSM, Physical Activity & Public

Health Guidelines, 2007), who had a resting blood pressure less than 140/90mm Hg, and no symptoms that would have precluded safe participation in a cardiovascular training program were admitted into the study. The topic of this study required all participants to have at least one risk factor, sedentary behavior, and it is very possible that individuals with this risk factor had more leading them to be categorized as moderate risk. In terms of safety, it would have been necessary for a physician to be present during all exercise testing if high risk subjects were admitted into the study. With low to moderate risk subjects, a physician would only be required to be present during maximal effort trials, which was not a factor in this research study.

Instrumentation

Instrumentation in the study involved the use of the International Physical Activity Questionnaire (IPAQ) Long Form (Appendix C) for physical activity screening purposes as the questionnaire has been shown to produce repeatable data and has acceptable validity, and the long form was recommended for research purposes (Craig, et al., 2003). A Physical activity Readiness Questionnaire (PAR-Q – Appendix D) was also instrumental in screening potential participants for any signs or symptoms of disease (ACSM, 1997). Before participants began the screening process, they were given an informed consent (Appendix B) explaining what they could expect from the study.

During the testing sessions, participants used the Borg 6-20 RPE scale (Appendix A), where a 6 corresponds to “no exertion at all” and a 20 corresponds to “maximal exertion,” to report their exertion during each exercise session. It was explained that a 9 on the scale is “very light” and could be the equivalent to walking slowly (Borg, 1998).

Participants were instructed to rate their perceived exertion based on their overall feeling, not solely on sensations in the legs or other body parts. Affect was measured using the 11-point feeling scale (FS) (Appendix E) where a positive five, corresponds to “very good” and a minus five, corresponds to “very bad” (Rejeski & Kenney, 1987). Data logs (Appendix F) were used to record the heart rate, blood pressure, and verbal responses to perceived exertion and affect measured during each trial.

Equipment

A Trackmaster TMx22 treadmill, FS1 Polar heart rate monitor, stethoscope and sphygmomanometer were necessary equipment in order to conduct this research. According to Trackmaster, the TMx22 model of treadmill was ideal as it has a longer and wider deck than most other treadmills, allowing participants who had never exercised on a treadmill more room for possible drift from the middle of the deck during the exercise session (n.d.). The Polar FS1 heart rate monitor was chosen due to its ease with which it can be used and the extra large numbers displayed. As some of the measurements during the sessions were taken every minute, investigators were able to glance at the watch quickly and be able to read the measurement. A manual stethoscope and sphygmomanometer were used to assess participants’ blood pressures at rest, during exercise, and after recovery.

Procedures

All participants took part in one familiarization session followed by two trials of treadmill exercise at an RPE of 9, corresponding to a “very light” intensity. The familiarization trial allowed participants to practice walking on the treadmill at various speeds until they felt comfortable walking without using hand rails and while looking straight ahead. Participants also practiced using the RPE scale to determine walking speed which was used in subsequent trials. RPE and HR were recorded every minute during the test to preclude subjects from noticing the increased interest in RPE around the 20-minute mark. This was similar to protocols used in previous research (Baden, McLean, Tucker, Noakes, & St Clair Gibson, 2005). Blood pressure (BP) was taken immediately before, every fifth minute during, immediately after, and ten minutes after all trials. FS was measured immediately before, every other minute during, immediately after, and ten minutes after the second and third exercise trials.

All trials were 30 minutes in length in partial accordance with ACSM guidelines suggesting adults perform at least 150 minutes per week of moderate-intensity physical activity (2009). Despite the actual length, one trial was presented as being 20 minutes and was extended to 30 minutes using a deception procedure employed in related research. All exercises sessions were performed in the same order – familiarization trial, expected duration trial, un-expected duration trial. The expected duration trial informed participants of the speed at which they would walk and that they would be walking for 30 minutes. The unexpected duration trial informed participants of the speed at which they walk and that they would be walking for 20 minutes. Participants were then informed at the 20-minute mark, termed the critical minute, that this session would be extended to 30 minutes. The following phrase was used to convey the increase, “You are scheduled to walk for 30 minutes. I will need you to continue this exercise bout for another 10 minutes.” Duration of all trial sessions was equal to 30 minutes and speed during each session remained constant. A two minute warm-up and a three minute cool-down were included in each session, but did not count towards part of the 30 minute duration.

Statistical Analysis

Analyses of the data proceeded in three phases. The first phase utilized a 2 (trial: expected duration and unexpected duration) x 30 (time: 1-min, 2-min… 30-min) repeated measures ANOVA on RPE. Additionally, a 2 (trial: expected duration and unexpected duration) x 15(time: 2-min, 4-min… 28-min, 30-min) repeated measures ANOVA on FS was utilized to analyze data related to FS. The second phase involved the calculation of change scores between time points for both RPE and FS. The third phase employed dependent t-tests were employed to identify specific differences between groups and across time. Because these comparisons increase the risk for Type I error, the P-value for post hoc analyses of means was adjusted to a more conservative significance criterion of $p < 0.01$. Finally, mean differences were utilized to determine effect size (d) for all t-tests.

CHAPTER 4: RESULTS

Rating of Perceived Exertion

Ho1 stated there would be no difference in RPE between the unexpected duration trial and the expected duration trial. Analyses of RPE indicate a significant main effect for time ($p = 0.001$; $d = 0.45$), however there was no significant main effect for trial and no interaction ($p > 0.05$). Delta score analysis indicated no significant change in either trial with respect to deception at the 20 minute mark ($p > 0.05$). Results indicate that the null hypothesis cannot be rejected.

The main interest in RPE was the effect deception would have on it after a participant became aware the he or she was being deceived. Table 4.1 provides RPE values obtained during both experimental trials. The asterisk denotes the time just before and three minutes after the 20 minute mark, termed the critical minutes, to provide reference of any change in RPE after participants were made aware of the deception. Figure 4.1 demonstrates the RPE values during the critical minutes.

Table 4.1: RPE responses in expected and unexpected duration trials

Time (min)	Unexpected Duration Trial (mean + SD)	Expected Duration Trial (mean + SD)
01	8.40 + 1.27	8.4 + 1.08
02	8.40 + 1.27	8.4 + 1.08
03	8.60 + 1.23	8.5 + 1.08
04	8.60 + 1.13	8.9 + 0.79
05	8.90 + 1.14	8.8 + 0.66
06	9.10 + 1.09	9.0 + 0.58
07	9.20 + 1.06	9.30 + 0.68
08	9.50 + 1.13	9.90 + 0.71
09	9.50 + 1.13	10.00 + 0.48
10	9.70 + 1.07	10.10 + 0.53
11	9.90 + 1.09	10.20 + 0.56
12	10.00 + 1.07	10.60 + 0.60
13	10.00 + 0.89	10.60 + 0.60
14	10.10 + 0.86	10.50 + 0.61
15	10.20 + 0.88	10.60 + 0.77
16	10.50 + 0.70	10.70 + 0.76
17	10.50 + 0.70	10.80 + 0.81
18*	10.50 + 0.97	10.80 + 1.14
19*	10.40 + 1.17	11.10 + 1.37
20*	10.60 + 1.43	11.20 + 1.23
21*	10.60 + 1.43	11.10 + 1.29
22*	10.90 + 1.20	11.20 + 1.32

23*	10.90 ± 1.20	11.30 ± 1.34
24	10.90 ± 0.86	11.30 ± 0.96
25	11.00 ± 0.83	11.20 ± 0.94
26	11.10 ± 0.92	11.40 ± 0.91
27	11.20 ± 1.00	11.40 ± 1.13
28	11.30 ± 0.96	11.50 ± 1.08
29	11.30 ± 0.96	11.20 ± 1.25
30	11.10 ± 0.79	11.30 ± 1.12

Note: the asterisks (*) represents "critical minutes"

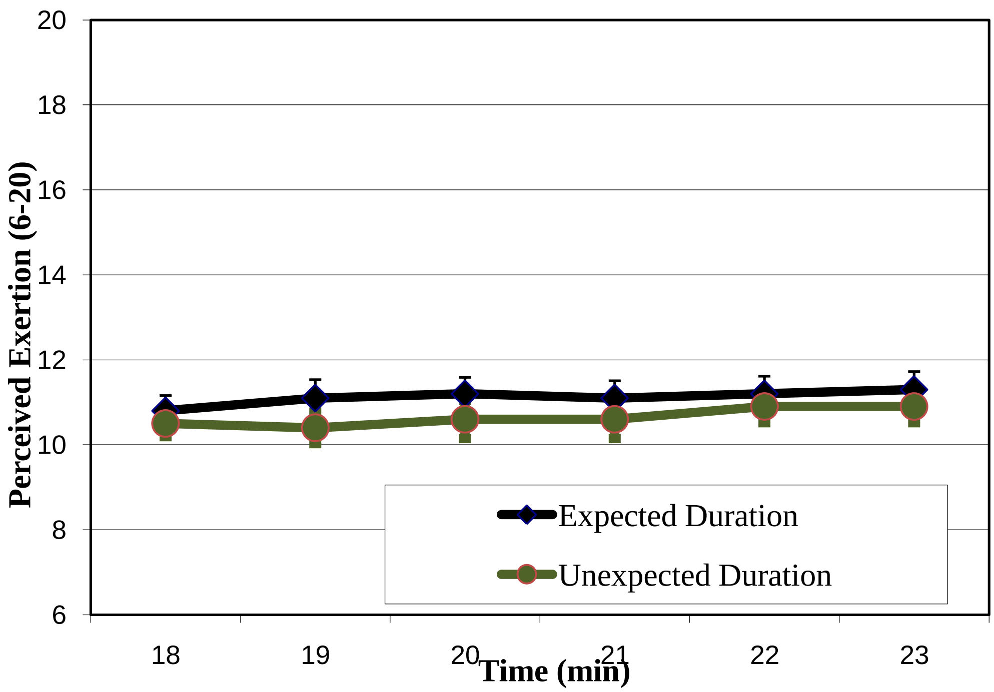

Figure 4.1: RPE values during critical minutes

Affect

Ho2 stated there would be no difference in FS between the unexpected duration trial and the expected duration trial. The within-subjects test performed on FS provided no significant main effect and no interaction (p > 0.05; d = 0). Delta scores analysis indicated no significant change in either trial with respect to deception at the 20 minute mark (p > 0.05). Results indicate that the null hypothesis cannot be rejected.

Table 4.2: FS responses in expected and unexpected duration trials

Time (min)	Unexpected Duration Trial (mean ± SD)	Expected Duration Trial (mean ± SD)
02	2.50 ± 2.07	2.90 ± 1.66
04	2.50 ± 2.07	2.90 ± 1.66
06	2.50 ± 2.07	2.80 ± 1.62
08	2.40 ± 2.22	2.80 ± 1.62
10	2.50 ± 2.07	2.80 ± 1.62
12	2.50 ± 2.07	2.70 ± 1.83
14	2.60 ± 1.96	2.50 ± 1.84
16	2.60 ± 2.07	2.50 ± 1.84
18*	2.50 ± 2.01	2.60 ± 1.96
20*	2.40 ± 2.22	2.40 ± 1.96
22*	2.20 ± 2.15	2.50 ± 1.84
24*	2.10 ± 2.38	2.40 ± 2.07
26	2.00 ± 2.45	2.20 ± 2.20
28	1.80 ± 2.78	2.30 ± 2.00
30	1.90 ± 2.60	2.40 ± 1.96

Note: the asterisks (*****) represents “critical minutes”.

Table 4.2 provides FS values obtained during both the expected and unexpected duration trials. The asterisk denotes the critical minutes to provide reference of any change in affect after participants were made aware of the deception. As interest in FS was centered on the effect deception would have on it, Figure 4.2 provides the FS values obtained during the critical minutes. These results suggest that deception had no affect on FS at this intensity within this population.

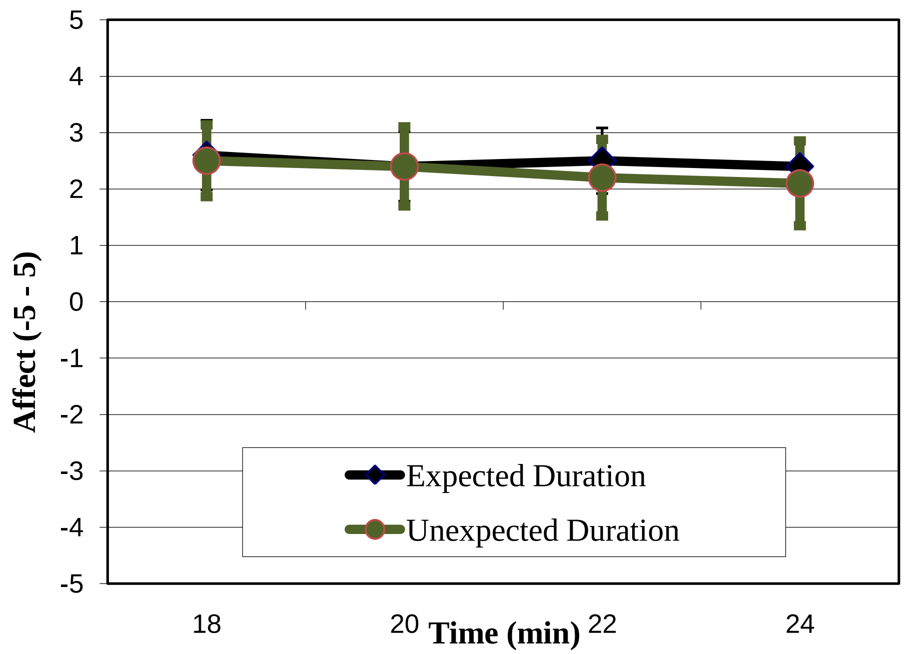

Figure 4.2: FS Values during Critical Minutes

CHAPTER 5: DISCUSSION

The purpose of this study was to determine the effect of unexpected increases in exercise duration on rating of perceived exertion (RPE) and affect (FS) during treadmill walking at a light intensity in an untrained, sedentary population. The primary finding from this investigation is that unexpected exercise duration sessions have no affect on RPE or FS at low intensities in untrained, sedentary populations. Compared to the expected duration trial, the unexpected duration trial did not provide any significant change in RPE or FS before or after participants were told they were to continue the exercise bout for another ten minutes. These results differ from the findings of other investigations which have shown sharp increases in reported RPE values and significant decreases in FS scores during the minutes after participants were made aware of the deception and the necessity to continue exercising for a longer period of time (Baden et al., 2004; Baden et al., 2005).

Baden and colleagues conducted an investigation on RPE using unexpected exercise distances (2005). These investigators found that when participants were deceived while performing at 75% of their peak treadmill running speed, their reported RPE values significantly increased the minute after learning of the deception and their affect scores were significantly depressed. Similarly, when participants believed they would be exercising for longer than in reality, Baden and colleagues (2004) discovered volunteers decreased their reported RPE values. In all trials, however, RPE values were discovered to increase over time. These results were thought to be due to pacing strategies used by the participants and perhaps not a true report of what the actual perceived exertion was. The present investigation found no significant difference in RPE values or affect scores in either the expected or unexpected duration trial. However there was a significant increase in RPE over time which would agree with previous investigations (Baden et al., 2004; Baden et al., 2005).

The present investigation is not the only study to have differing results from those mentioned above. A 2006 study on teleoanticipation and deception during repeated sprint performances recruited six men and women to complete two trials of two sets of cycling sprints. The sets consisted of three cycling sprints lasting four seconds (Bishop, Mendez-Villanueva, Calvo-Ruiz, & Morton, 2006). Trials were performed in random order. During the deception trial, the volunteers were told they would be completing two sets of six sprints instead of the two sets of three they would actually be completing. All trials allowed 20 seconds of passive recovery between the sprints and 180 seconds of passive recovery between the sets. Results showed no significant difference in the amount of work performed between trials or in the amount of decrease in power output. Due to the lack of significant difference in power output between trials, researchers concluded that fatigue experienced during maximal sprint exercise is due to centrally mediated changes and not to the participants' perception about the end point.

When the results from the investigation led by Bishop and colleagues are considered with the results from the present investigation, it appears that intensity may play a role in the use of the teleoanticipation model. During research studies mentioned previously supporting the teleoanticipation model, the intensity of every exercise session was considered high, however participants were not expected to begin at maximal exertion. Though the study led by primary investigator Bishop and the present study were conducted at very different levels of intensity, they both had participants begin each session at extreme levels of intensity (very light or maximal). Due to the findings from both studies, it appears there may be a threshold of intensity required for the teleoanticipatory effect. The present study may not have reached the threshold necessary for participants to pace themselves.

Though this present study did find a significant main effect of time on RPE from the beginning of an exercise session to the end, it did not find a significant difference in reported RPE values between the two exercise sessions. The conflicting findings of previous studies with those of this present investigation may be due to several factors. Changes to the study protocol, such as population and intensity, are believed to be the leading factors. Previous experiments focused in on populations of moderately to highly trained athletes who are accustomed to exercising regularly (Albertus et al., 2004; Easton et al., 2007; Ansley et al., 2004; Foster et al., 2004; Baden et al., 2004; Baden et al., 2005). The current study recruited sedentary individuals in anticipation of focusing on the role of teleoanticipation in the general public. The purpose of choosing a sedentary population was to gain knowledge on the role of teleoanticipation, if any, on increasing exercise tolerance and adherence in the physical activity level representing the majority of the US population.

Previous research has also maintained high rates of intensity during trials, often requiring volunteers to run for predetermined distances (Albertus et al., 2005; Ansley et al., 2004; Foster et al., 2004; Baden et al., 2004a; Baden et al., 2004b; Baden et al., 2005). As the population in question during this study was sedentary, high intensity physical activity was not realistic. Therefore participants were allowed to exercise at a low intensity with the expectation of minimizing attrition, injuries, and providing a sensible exercise stimulus for this population. It is possible that the low intensity during these sessions was inadequate to elicit the responses seen in prior studies. The research may have benefited from adding a second group of sedentary individuals exercising at a speed of moderate intensity.

Another possibility for the differences in results is the population being investigated. Unlike the majority of studies presented who chose volunteers moderately to highly trained and physically aware of their own bodily reactions to certain stimuli, the present investigation focused solely on a population not accustomed to physical exertion and their own reaction to it. According to Edwards and colleagues, teleoanticipation is partly based on past experience with similar exercise bouts (Edwards, Bentley, Mann, & Seaholme, 2010). Hence, a person who has never participated in a comparable training session may still receive the same feedback mentioned in the model, but not have the same feedforward planning or the ability to produce an appropriate pacing strategy as those trained persons who have such experience.

Limitations to this study include the small sample size which may have inhibited any further findings of statistical significance other than the main effect of time, though the results do not specifically suggest the investigation was underpowered to detect differences RPE as its low effect size implies no practical differences. Although sessions strived to maintain a light intensity, attrition rates remained high during this investigation possibly due to volunteers' lack of motivation and/or dislike of physical activity. Testing sessions were conducted during the end of a spring semester for some volunteers and the occurrence of final exams and summer relocation may have had some influence on the dropout rate. Comfort with using and understanding the questions related to RPE is a considerable limitation. Participants may or may not have given true RPEs based on how they felt at a specific moment in time. However, these participants were given a familiarization trial using the Borg RPE Scale so they would be comfortable reporting perceived exertion during the experimental sessions. Therefore, it is assumed that all participants reported their true RPE values during testing.

Technical difficulties experienced during some testing sessions also provide some limitations. The FS1 Polar heart rate monitors were not always able to pick up heart rates and at times they displayed incorrect measurements. Therefore, it was necessary to palpate volunteers' heart rates at some points. As this measure was taken every minute, it provided an unseen difficulty in timing measuring and recording heart rate along with the measuring and recording the other necessary measures. The manual assessments may have also served as an impediment to participants during their session, possibly throwing off their gait and/or thought processes and perhaps increasing RPE.

The practical applications of these findings refer back to the trainability and psychological characteristics of teleoanticipation. Though there was no evidence of pacing strategies used during the light intensity activities performed by this sedentary population, most participants stated they had never walked for 30 minutes before and may have been surprised by their ability to complete the task. Therefore, they increased awareness of their current physical limitations, or better yet, their current physical abilities. Though deceived, when those who volunteered for this study were pushed past the time limit they were mentally prepared for, results show they could complete the unexpected change in duration without a significant increase in the perception of exertion. Repeating bouts of exercise beyond what volunteers believe they are capable of successfully completing may be enough to increase exercise tolerance and therefore improve a participant's overall fitness and self efficacy for exercise. According to Albert Bandura's Self-Efficacy Theory (1977), how an individual perceives his or her capability and the extent to which the individual feels he or she will be successful in completing a task dictates self-confidence. The less self-confident an individual feels about successfully completing a bout of exercise, the less likely they are to begin and adhere to a regular exercise routine. Bandura speculated that an individual's repeated attempts at an activity perceived as intimidating (in this case physical activity) would increase that person's mastery of the action. An increase in proficiency will in turn increase perceived capability and self-confidence, thereby furthering an individual's enjoyment and adherence to the activity (Bandura, 1977). As physical limits are challenged and conquered, those who partake in this type of training can decrease their level of perceived exertion for a given intensity and/or duration allowing themselves to reach a new potential in their level of fitness while gaining a sense of mastery in exercise.

Future Research

It would be important to conduct future studies on teleoanticipation and compare the results of moderately and highly trained athletes with those of insufficiently active individuals in a number of scenarios. Possible set-ups could include changes in RPE in highly trained versus moderately trained or sedentary volunteers during low intensity, moderate intensity, or high intensity activities of unknown or unexpected durations.

Conclusion

Unexpected exercise durations do not significantly affect rating of perceived exertion at low intensities in untrained, sedentary populations. This finding suggests that sedentary populations most likely do not use pacing strategies to finish a bout of exercise when performing at low intensities. Though it is reasonable to assume that untrained, sedentary populations have a central programmer and experience the physiologic signals of exertion, it appears that low intensity work bouts do not provide enough strain in this population to signal a change in perceived exertion with the change in expected exercise duration.

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APPENDIX A: Borg RPE Scale

Table A1: RPE 6-20 Scale

Rating of Perceived Exertion	
6	No exertion at all
	Extremely light
7	
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

APPENDIX B: Informed Consent

UNIVERSITY OF SOUTH FLORIDA

Informed Consent to Participate in Research

Information to Consider Before Taking Part in this Research Study

IRB Study # _____2623_____________

You are being asked to take part in a research study because you have the necessary exercise level, do not have any major signs or symptoms suggestive of cardiovascular, pulmonary, or metabolic disease, and one or more positive risk factors for cardiovascular disease. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. We encourage you to talk with your family and friends before you decide to take part in this research study. The nature of the study, risks, inconveniences, discomforts, and other important information about the study include sore muscles and muscle strain.

Please tell the study doctor or study staff if you are taking part in another research study.

We are asking you to take part in a research study called:
The effect exercise on rating of perceived exertion in an untrained, sedentary population
The person who is in charge of this research study is Lisa Giblin**.** This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Dr. Marcus Kilpatrick.

The research will be conducted at University of South Florida HES Lab REC 004.

APPENDIX B (Continued)

Purpose of the study

The purpose of this study is to:

- The purpose of this study is to determine the effect of unexpected increases in exercise duration on rating of perceived exertion during treadmill walking at light and moderate intensities in an untrained, sedentary population.
- This study is being conducted for a thesis

Should you take part in this study?

Before you decide:

- Read this form and find out what the study is about.
- You may have questions this form does not answer. You do not have to guess at things you don't understand. If you have questions ask the person in charge of the study or study staff as you go along. Ask them to explain things in a way you can understand.
- Take your time to think about it.

This form tells you about this research study. This form explains:

- Why this study is being done.
- What will happen during this study and what you will need to do.
- Whether there is any chance of benefits from being in this study.
- The risks involved in this study.
- How the information collected about you during this study will be used and with whom it may be shared.

Taking part in this research study is up to you. If you choose to be in the study, then you should sign this informed consent form. If you do not want to take part in this study, you should not sign this form.

Why is this research being done?

The purpose of this study is to find out how unknown exercise duration affects a person's exertion level during an exercise session. A volunteer's perceived exertion level will be inquired upon and recorded every minute of his/her exercise session.

APPENDIX B (Continued)

Why are you being asked to take part?

We are asking you to take part in this study because you represent the majority of the population in exercise habits. We would like to find out how exercise duration affects the general population.

What will happen during this study?

You will be asked to spend about 3 weeks in this study. This time frame is based on your attendance in three, one-hour sessions.

During the study you will be asked to walk at a predetermined pace for a predetermined time limit. Before, during, and after your exercise session, you will be asked a series of questions including your level of perceived exertion and level of anxiety.

A study visit is with the person in charge of the study or study staff. You will need to come for 3 study visits in all. Most study visits will take about one hour.

Volunteers will be asked to abstain from ingesting food, alcohol, or caffeine no less than three hours prior to the scheduled session. Significant exertion or exercise will be avoided the day of the exercise session to allow all subjects to be well rested and participants will be asked to wear comfortable clothing that permits freedom of movement, including closed-toed walking shoes.

Participants will schedule each session about seven days apart for a total of three sessions. During each session, staff members will monitor participants' blood pressure and heart rate before, during and after exercise. Sessions will last approximately one hour.

At each visit, participants will be asked to:

- First visit will allow volunteers to familiarize themselves with the treadmill along with the questions that will be asked during the two later visits.
- Report their level of anxiety and perceived exertion during the exercise session
- Fill out a two questionnaires (anxiety and affect) before and after the exercise session
- Level of anxiety will be determined after volunteers have read over several statements commonly used to describe anxiety states and circle a number one through four.

  Level of anxiety will be determined after volunteers have reviewed the affect scale and have circled a number relating to their mood.

Total Number of Participants

About 40 individuals will take part in this study at USF.

APPENDIX B (Continued)

Alternatives

You do not have to participate in this research study

Benefits

There are no known benefits to this study

Risks or Discomfort

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.

Compensation

You will be compensated with a personalized exercise regimen based on research data and body composition assessment

Cost

There will be no additional costs to you as a result of being in this study.

Privacy and Confidentiality

We will keep your study records private and confidential. Certain people may need to see your study records. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:

- The research team, including the Principal Investigator, study coordinator, research nurses, and all other research staff.
- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
- Any agency of the federal, state, or local government that regulates this research. This includes the Department of Health and Human Services (DHHS) and the Office for Human Research Protection (OHRP).

APPENDIX B (Continued)

- The USF Institutional Review Board (IRB) and its related staff who have oversight responsibilities for this study, staff in the USF Office of Research and Innovation, USF Division of Research Integrity and Compliance, and other USF offices who oversee this research.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

New information about the study

During the course of this study, we may find more information that could be important to you. This includes information that, once learned, might cause you to change your mind about being in the study. We will notify you as soon as possible if such information becomes available.

What if you get sick or hurt while you are in the study?

If you need emergency care:

- Go to your nearest hospital or emergency room right away or call 911 for help. It is important that you tell the doctors at the hospital or emergency room that you are participating in a research study. If possible, take a copy of this informed consent form with you when you go. USF does not have an emergency room or provide emergency care.

If you do NOT need emergency care:

- Go to your regular doctor. It is important that you tell your regular doctor that you are participating in a research study. If possible, take a copy of this informed consent form with you when you go.
- The USF Medical Clinics may not be able to give the kind of help your needs.

Will I be compensated for research related injuries?

If you believe you have been harmed because of something that is done during the study, you should call Lisa Giblin at 850-566-5472 immediately. The University of South Florida will not pay for the cost of any care or treatment that might be necessary because you get hurt or sick while taking part in this study. The cost of such care or treatment will be your responsibility. In addition, the University of South Florida will not pay for any wages you may lose if harmed by this study. The University of South Florida is considered a state agency and therefore cannot usually be sued. However, if it can be shown that the researcher, or other USF employee, is negligent in doing his or her job in a way that harms you during the study, you may be able to sue. The money that you might recover from the State of Florida is limited in amount.

APPENDIX B (Continued)

You can also call the USF Self Insurance Programs (SIP) at 1-813-974-8008 if you think:

- Someone from the study did something wrong that caused you harm, or did not do something they should have done.
- Ask the SIP to look into what happened.

What happens if you decide not to take part in this study?

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study to please the study doctor or the research staff. If you decide not to take part in the study you will not be in trouble or lose any rights you normally have. You will still have the same health care benefits and get your regular treatments from your regular doctor.

You can decide after signing this informed consent document that you no longer want to take part in this study for any reason at any time. If you decide you want to stop taking part in the study, tell the study staff as soon as you can.

- We will tell you how to stop safely. We will tell you if there are any dangers if you stop suddenly. There will be no consequences of your decision to withdraw from the research
- If you decide to stop, you can continue getting care from your regular doctor.
- You can discontinue your participation in this research study at any time by contacting the principle investigator via email or phone. Participants who leave the study will still be provided with a personalized exercise plan.

Even if you want you to stay in the study, there may be reasons we will need to withdraw you from the study. You may be taken out of this study if we find out it is not safe for you to stay in the study or if you are not coming for the study visits when scheduled. We will let you know the reason for withdrawing you from this study.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, call Lisa Giblin at 850-566-5472.

If you have questions about your rights, general questions, complaints, or issues as a person taking part in this study, call the USF IRB at (813) 974-5638.

APPENDIX B (Continued)

Consent to Take Part in Research

It is up to you to decide whether you want to take part in this study. If you want to take part, please read the statements below and sign the form if the statements are true. I freely give my consent to take part in this study and authorize that my health information as agreed above, be collected/disclosed in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

______________________________ ____________

Signature of Person Taking Part in Study Date

____

Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I hereby certify that when this person signs this form, to the best of my knowledge, he/ she understands:

- What the study is about;
- What procedures/interventions/investigational drugs or devices will be used;
- What the potential benefits might be; and
- What the known risks might be.

I can confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in the appropriate language. Additionally, this subject reads well enough to understand this document or, if not, this person is able to hear and understand when the form is read to him or her. This subject does not have a medical/psychological problem that would compromise comprehension and therefore makes it hard to understand what is being explained and can, therefore, give legally effective informed consent. This subject is not under any type of anesthesia or analgesic that may cloud their judgment or make it hard to understand what is being explained and, therefore, can be considered competent to give informed consent.

______________________________ ______

Signature of Person Obtaining Informed Consent Date

____

Printed Name of Person Obtaining Informed Consent

(University of South Florida Division of Research Integrity & Compliance, 2011)

APPENDIX C: International Physical Activity Questionnaire (IPAQ), Long Form

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE
(October 2002)
LONG LAST 7 DAYS SELF-ADMINISTERED FORMAT
FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health–related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is encouraged to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective.* Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

APPENDIX C (Continued)

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
_____ Yes
_____ No → ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ **days per week**

_____ No vigorous job-related physical activity → ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

_____ **hours per day**

_____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ **days per week**

APPENDIX C (Continued)

_____ No moderate job-related physical activity → ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

_____ **hours per day**

_____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ **days per week**

_____ No job-related walking → ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?

_____ **hours per day**

_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

_____ **days per week**

_____ No traveling in a motor vehicle → ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?
_____ **hours per day**

_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**
_____ No bicycling from place to place → ***Skip to question 12***

APPENDIX C (Continued)

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

_____ **hours per day**

_____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

_____ No walking from place to place → ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?

_____ **hours per day**

_____ **minutes per day**

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

_____ **days per week**

_____ No vigorous activity in garden or yard → ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

_____ **hours per day**

_____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

_____ **days per week**

APPENDIX C (Continued)

_____ No moderate activity in garden or yard → ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ **hours per day**

_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ **days per week**

_____ No moderate activity inside home → ***Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY***

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ **hours per day**

_____ **minutes per day**

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ **days per week**

_____ No walking in leisure time → ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ **hours per day**

_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?
_____ **days per week**

_____ No vigorous activity in leisure time →***Skip to question 24***

APPENDIX C (Continued)

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

_____ **hours per day**

_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

_____ **days per week**

_____ No moderate activity in leisure time → ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

_____ **hours per day**

_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ **hours per day**

_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

_____ **hours per day**

_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

APPENDIX D: Physical Activity Readiness Questionnaire (PAR-Q)

Physical Activity Readiness Questionnaire (PAR-Q) and You

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly:

YES	NO		
☐	☐	1.	Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
☐	☐	2.	Do you feel pain in your chest when you do physical activity?
☐	☐	3.	In the past month, have you had chest pain when you were not doing physical activity?
☐	☐	4.	Do you lose your balance because of dizziness or do you ever lose consciousness?
☐	☐	5.	Do you have a bone or joint problem that could be made worse by a change in your physical activity?
☐	☐	6.	Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
☐	☐	7.	Do you know of any other reason why you should not do physical activity?

If you answered:

YES to one or more questions

Talk to your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want – as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- Start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- Take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

Delay becoming much more active:

- If you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- If you are or may be pregnant – talk to your doctor before you start becoming more active.

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed use of the PAR-Q: Reprinted from ACSM's Health/Fitness Facility Standards and Guidelines, 1997 by American College of Sports Medicine

Figure A1: PAR-Q

APPENDIX E: Affect Feeling Scale

Affect Scale

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
very bad		bad		slightly bad	neutral	slightly good		good		very good

Figure A2: Feeling Scale

APPENDIX F: Data Logs

Table A2: Data Log

Name____________________________ Date ____________________

Technician Name _________________________ Trial _____________________

	TIME (min)	SPEED (mph)	HR (bpm)	BP (mmHg)	RPE (6-20)
Pre-exercise: Resting					
Warm-up	0-1				
	1-2				
Exercise	2-3				
	3-4				
	4-5				
	5-6				
	6-7				
	7-8				
	8-9				
	9-10				
	10-11				
	11-12				
	12-13				
	13-14				
	14-15				
	15-16				
	16-17				
	17-18				
	18-19				
	19-20				
	20-21				
	21-22				
	22-23				
	23-24				
	24-25				
	25-26				
	26-27				
	27-28				
	28-29				
	29-30				
	30-31				
	31-32				
Cool-down	32-33				
	33-34				
	34-35				
Post Exercise: Recovery					

(Kilpatrick, 2010)