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THE EFFECT OF TRAINING USING TALK TEST VS. TRADITIONAL HEART RATE RESERVE GUIDELINES ON EXERCISE ENJOYABILITY

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Clinical Exercise Physiology

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THE EFFECT OF TRAINING USING TALK TEST VS. TRADITIONAL HEART RATE RESERVE GUIDELINES ON EXERCISE ENJOYABILITY

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We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Science, Clinical Exercise Physiology.

The candidate has completed the oral defense of the thesis.

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ABSTRACT

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Enjoyment is a strong predictor of exercise adherence and is a key variable to consider when prescribing exercise. Purpose: To investigate enjoyment levels during weekly cycle ergometer exercise training sessions between the talk test and heart rate reserve groups. Methods: Sedentary college-aged students (N=44) participated in a 10-week training intervention. The Exercise Enjoyment Scale (EES) administered one day per week pre, 15 minutes during, and immediately post training. Results: The EES AVNOA indicated that there was no significant difference in response between the two groups. For both groups weeks 7-10 had significantly lower enjoyment levels as compared to week one. Conclusion: The present study revealed that regardless of which group subjects were placed, enjoyment decreased across the 10 weeks of training.

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To my group members Jillian Turek, Kate Falck, and Sam Suckow I want to thank each one of them for the time they put into this study. It was a long journey but I am thankful to have had such a dedicated and hardworking group to work with.

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INTRODUCTION

Physical activity (PA) is vital for the future of public health. Unfortunately, sedentary behavior has become a worldwide epidemic, leading to an increase in health risks. The American Heart Association (AHA, 2014) states that physical inactivity can lead to the development of cardiovascular disease, dyslipidemia, hypertension, and hypercholesterolemia. The American College of Sports Medicine (ACSM) and the AHA have developed PA guidelines for healthy individuals aged 18 to 65 (ACSM, 2013; AHA, 2014). The guidelines recommend that individuals get 20 minutes of vigorous intensity PA 3 days per week or 30 minutes of moderate intensity PA 5 days per week. It is also suggested that individuals incorporate strength training at least 2 days a week to promote muscular fitness (Pescatello, Arena, Riebe, & Thompson, 2014). When PA is prescribed it often follows the FITT-VP principle, which stands for Frequency, Intensity, Time, Type, Volume, and Progression (ACSM, 2013). The most problematic variable involves calculating an appropriate intensity of exercise.

The ACSM (2013) recommends that individuals exercise at 40-60% heart rate reserve (%HRR) for moderate intensity exercise and 60-90% HRR for vigorous intensity exercise. Heart rate reserve is the difference between resting heart rate (HR) and maximum HR. Other methods to determine exercise intensity include determining a percentage of oxygen consumption reserve (%VO_2R), percentage of maximal heart rate (%HR) and utilizing metabolic equivalents (METs) (Pescatello, Arena, Riebe, & Thompson, 2014). Since all of these methods require a maximal exercise test, most of

these forms of determining intensity are not practical for the general population. Therefore, an effective, simple tool to determine exercise intensity of training would be useful.

Subjective methods of regulating exercise intensity include use of the ratings of perceived exertion (RPE) (Borg, 1970) or the Talk Test (TT) (Foster et al., 2008). Both are advantageous because they do not require a maximal exercise test for their determination. They not only monitor exercise intensity, but they also contribute to the safety of exercise training (Foster et al., 2008).

There are two RPE scales; a 6-20 scale and a 0-10 scale (Borg, 1998). The original 6-20 scale is highly correlated to exercise HR, whereas the 0-10 scale is more clearly related to blood lactate. The ACSM (2013) guidelines recommend exercising at the 3-4 RPE level if using the 0-10 scale or 12-14 RPE level if using the 6-20 scale (Kaufman, Berg, Noble, & Thomas, 2006).

The RPE scale is easy to understand, simple to use and is useful to self-regulate exercise in cardiopulmonary rehabilitation facilities. It is also the preferred method to assess intensity among those individuals who take medications that affect HR (Parfitt, Evans, & Eston, 2012). Additionally, Eston (2012) noted that RPE was useful to help regulate pacing in long distance running. The brain regulates RPE in an anticipatory manner to internally regulate a runner's speed based on distance covered and distance to the end point (Eston, 2012).

Extensive research has also shown the validity and reproducibility of the TT for prescribing exercise intensity (Dehart-Beverley, Foster, Porcari, Fater, & Mikat, 2000). The TT involves a person reading a familiar passage out loud during exercise to

determine if they can speak comfortably. The harder a person exercises, the harder it is to speak without difficulty (Rosato, 1995). This allows a person to self-regulate their exercise intensity by monitoring their speaking ability. Independent studies have shown that training based on the TT have both been a valid measurement of intensity and are within the ACSM guidelines (ACSM, 2013). Furthermore, the TT is a safe guideline for exercise intensity for patients with coronary artery disease (Brawner et al., 2006; Foster et al., 2008).

The TT is one of the most effective ways to individualize exercise intensity. It does not matter the age or physical condition of an individual. The events that occur at the ventilatory threshold (VT) are the same for everyone, even though the intensity level for VT will vary from individual to individual (Quinn & Coons, 2011). The TT has been found to be a safe, valid, and practical submaximal method of determining exercise intensity that can be used alone without a maximal exercise test (Ballweg et al., 2013). Additionally, it has an advantage over a maximal exercise test for monitoring exercise because it is based off an individual's unique metabolic or ventilatory response so serves as a surrogate for monitoring the VT (Ballweg et al., 3013).

The enjoyment level of an individual is a good, long term predictor of adherence to an exercise program. Numerous research studies have examined the correlation between exercise enjoyment and exercise adherence (Ebben & Brudzysnski, 2008; Fleig, Lippke, Pomp, & Schwarzer, 2011; McAuley et al., 2007; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997).

Foster, et al. (2015) conducted a study involving sedentary college-aged students participating in an 8-week training intervention testing their enjoyment levels during high

intensity interval training (HIIT). The study concluded that although HIIT was very beneficial for the individual, a more moderate steady-state training is recommended for increased enjoyability and for increased exercise adherence. This substantiated the research by Bartlett et al., (2011).

Knowing the enjoyment levels of the subjects may provide substantial information regarding proper exercise prescription. An individuals' preferences should be taken into account when writing an exercise prescription by including a variety of exercise activities and exercise settings with more enjoyable exercise options thereby increasing exercise adherence (Dishman, 1994; Rose and Parfitt, 2012). Research supports intrinsic motivation such as exercising for enjoyment to increase adherence to exercise programs (Rhodes et al., 1999; McAuley et al., 2007; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997).

The age of the participants also is a determining factor for exercise adherence. Children are less likely to participate in exercise if it replaces a higher valued activity such as watching television (Epstein, Koeske, & Wing, 1984). In adults enrolled in a cardiac rehabilitation program, they found enjoyment through the encouragement of other patients and their exercise therapist (Fleig, Lippke, Pomp, & Schwarzer, 2011).

This enjoyablility study was part of a larger study which compared the physiological responses consequent to training using traditional heart rate reserve (HRR) guidelines, versus the TT. The purpose of this portion of the study was to determine if there were any differences in exercise enjoyment between the two groups.

METHODS

Subjects

Fifty-four healthy, previously inactive, young adults were recruited from the University of Wisconsin-La Crosse community. All subjects completed the Physical Activity Readiness Questionnaire (PAR-Q) and an Exercise History Questionnaire to determine if any contradictions or physical limitations affecting their ability to participate in the study were present. Prior to testing, all subjects were given both oral and written versions of the research protocol and provided written informed consent. The UWL Institutional Review Board for the Protection of Human Subjects reviewed and approved the protocol.

Subjects achieving a relative VO_2max over 50 ml/kg/min or 43 ml/kg/min for males and females, respectively, were excluded from the study. Eight subjects were excluded from the study because of their high aerobic capacity; thus, 46 subjects initially participated in the study. However, of the original 46 subjects, only 42 completed the training program. Descriptive statistics of the subjects who completed the study are presented in Table 1 and data analysis was based only on the subjects who completed the study.

Table 1. Descriptive characteristics of subjects at beginning of study (mean ± SD).

	Talk Test (n=20)	Heart Rate Reserve (n=24)
Age (yrs)		
Males (17)	21.2 ± 2.82	21.0 ± 5.90
Females (27)	20.5 ± 1.97	19.5 ± 1.26
Height (cm)		
Males	179.5 ± 7.27	176.9 ± 3.97
Females	165.0 ± 9.84	166.0 ± 7.74
Weight (kg)		
Males	83.9 ± 10.63	77.0 ± 14.55
Females	67.6 ± 10.72	65.5 ± 11.80

Values presented represent mean ± standard deviation.

PROTOCOL

Each subject performed pre and post training incremental maximal exercise tests on an electrically-braked cycle ergometer (Lode Excallibur, Groningen, The Netherlands). The workload began at 25 W and increased by 25 W every 2 min up to maximal exertion. Subjects wore a scuba type mask to allow analysis of respiratory gas exchange using open circuit spirometry (AEI, Pittsburgh, Pennsylvania). Calibration was conducted using reference gases (16% O_2, 5% CO_2) and room air. The pneumotach was calibrated with a 3-liter syringe. Maximal oxygen uptake (VO_2max) was defined as the highest continuous 30s VO_2 during the test. Ventilatory threshold was identified using a combination of the v-slope and ventilatory equivalent methods (Foster & Cotter, 2005). Heart rate was measured continuously using radiotelemetry, and RPE was assessed using the 6-20 category ratio scale of Borg (Borg, 1970) at the end of each stage. Following the completion of the initial exercise tests, subjects were stratified by VO_2max within each gender and then randomly assigned to either the TT or HRR training groups.

The training program was 10 weeks in duration (3 times weekly for 40 minutes per session). All training sessions were performed on a mechanically-braked cycle ergometer (Monarch, Stockholm, Sweden). The pedaling rate was fixed at 60 rpm (reinforced by music with a dominant beat of 120 counts per minute). Thus, the power output (PO) was effectively regulated by changing the resistance on the pedals. All subjects wore a HR monitor during training.

Talk Test Group

The TT group trained solely using the TT as the intensity measure. All training sessions began with a 5-min warmup at ~30 W. For the first exercise session, the initial workload was set at a PO corresponding to 90% of VT. After 5 min, subjects recited the 'Rainbow Passage' and speech comfort was assessed. If the subject was able to speak comfortably, PO was increased by ~30 W. If comfortable speech was either equivocal or not possible, PO was reduced by ~30 W. Although not used to determine training PO, %HRR, and RPE were assessed using the 6-20 Borg scale (Foster et al., 1995) at 5-min intervals. A 5-min cool down at ~30 W followed the 30 min training session. Session RPE (sRPE) (0-10 scale) was recorded at the conclusion of the session. For all subsequent exercise sessions, PO for the initial 5 min after the warmup was set at the same PO where the subject could speak comfortably during the previous workout.

Heart Rate Reserve Group

The HRR group trained solely using HR as the intensity measure. All training sessions began with a 5-min warmup at ~30 W. For the next 30-min, training intensity was set using %HRR ranges calculated from their pre testing maximal exercise test. The prescribed %HRR ranges were 40-59% for weeks 1-4, 50-69% for weeks 5-8, and 60-79% for weeks 9-10. Every 5-min during the workout HR was assessed. If HR was below the %HRR range, PO was increased ~30 W. If HR was within the %HRR range, PO remained the same. If HR was above the %HRR range, PO was reduced by ~30 W. A 5-min cool down at ~30 W followed the 30-min training session. Although not used to determine training intensity, RPE (6-20 scale) was recorded at 5-min intervals and sRPE (0-10 scale) was recorded at the conclusion of the session.

Exercise enjoyment (EE) was assessed during 1 session each week. Enjoyment was assessed using the Exercise Enjoyment Scale (Stanley & Cumming, 2010). This was given to the subjects before exercise, 15 min into the exercise bout, and at the conclusion of the 5-min cool down.

STATISTICAL ANALYSIS

Standard descriptive statistics were used to describe the subject population and to summarize differences from pre to post testing. Independent t-tests were used to compare pre-testing scores between the HRR and TT groups. If there was no significant difference in pre-testing scores between groups, changes from pre to post testing were compared using two-way ANOVA with repeated measures. If the pre-testing scores were significantly different between the HRR and TT groups, changes from pre to post testing were compared using analysis of covariance. If there was a significant F ratio, Tukey's post-hoc tests were used to isolate pairwise differences. Alpha was set a .05 to achieve statistical significance.

RESULTS

Data relative to training intensity for the TT and HRR groups are presented in Figure 1. The vertical dashed lines at weeks four and eight indicate a change in prescribed exercise intensity in the HRR group. When looking at exercise intensity, the TT group exercised at a higher percentage of HRR than the HRR group for weeks 1-8. For both RPE and sRPE, the TT group worked significantly harder than the HRR group for weeks 1-4. For PO the TT group worked at significantly higher workloads for weeks1-5.

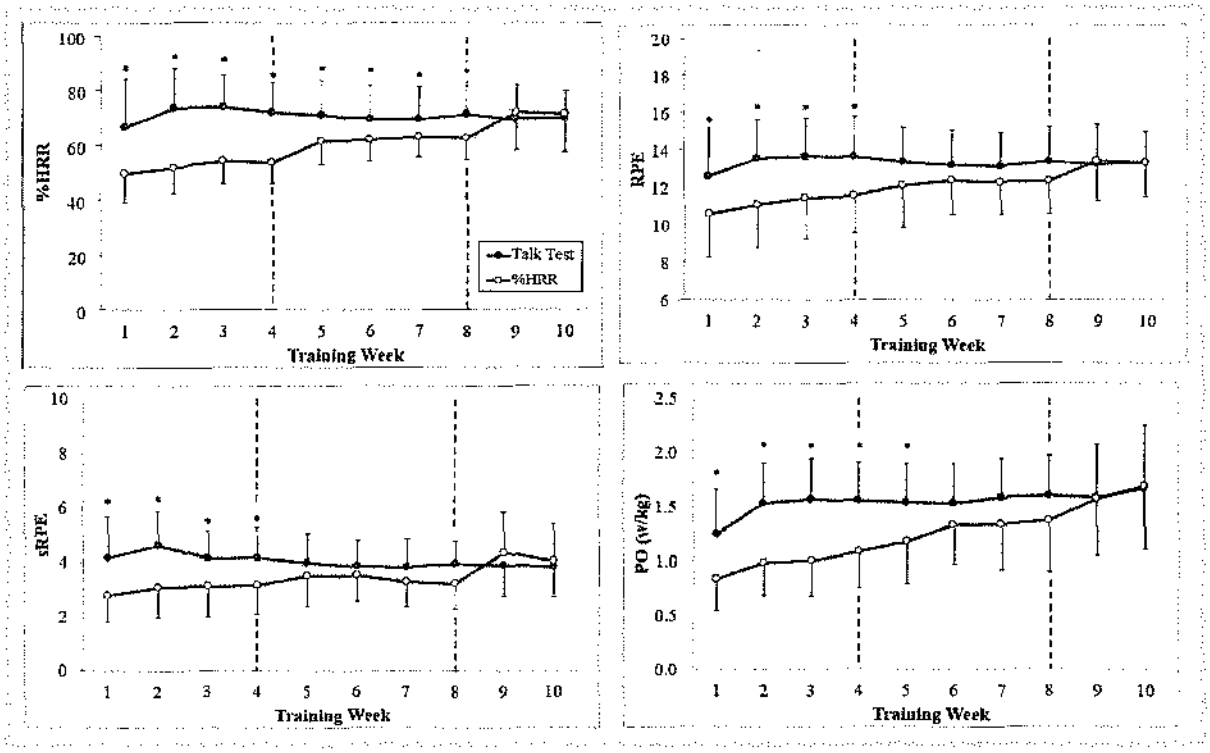

Figure 1. Comparison of training between the Talk Test and the %HRR groups measuring heart rate, RPE, sRPE, and PO across weeks of training in relation to method of controlling training. Accepted ACSM ranges are shaded.
*Significant difference between groups ($p<0.05$).

Exercise enjoyment was measured during one training session each week. It was measured before training, 15 minutes into the training bout, and at the conclusion of the cool-down. The pre-training enjoyment data is presented in Figure 2. There was no significant weeks x group interaction for pre-training EE scores.

Exercise enjoyment was measured during one training session each week. It was measured before training, 15 minutes into the training bout, and at the conclusion of the cool-down. The during-training enjoyment data is presented in Figure 3. There was no significant weeks x group interaction for during-training EE scores.

Exercise enjoyment was measured during one training session each week. It was measured before training, 15 minutes into the training bout, and at the conclusion of the cool-down. The post-training enjoyment data is presented in Figure 4. There was no significant weeks x group interaction for post-training EE scores.

PRE-TRAINING

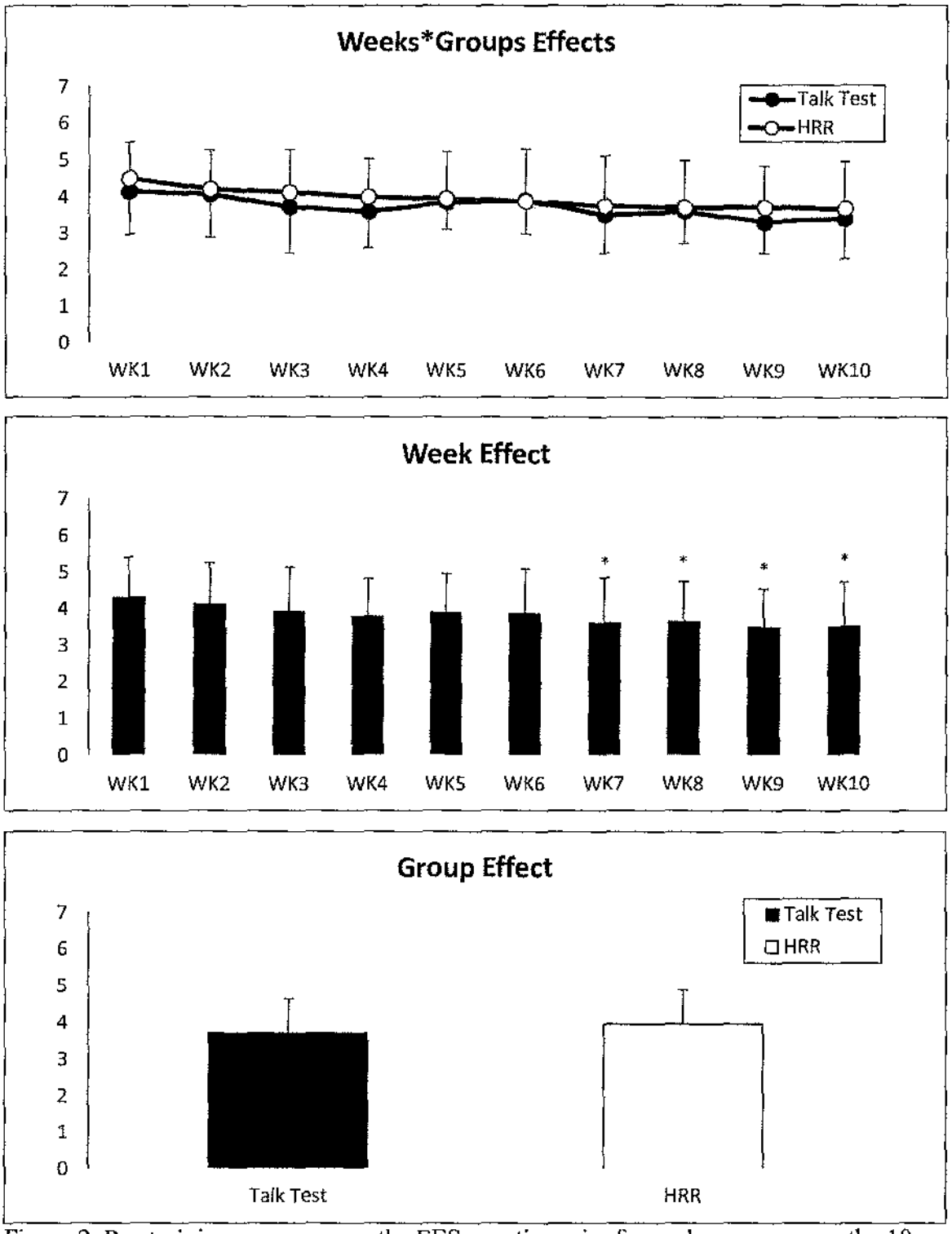

Figure 2. Pre-training responses on the EES questionnaire for each group across the 10-week training period.

* Pre-training enjoyment scores for weeks 7 through 10 are significantly lower compared to week 1 ($p<.05$).

DURING-TRAINING

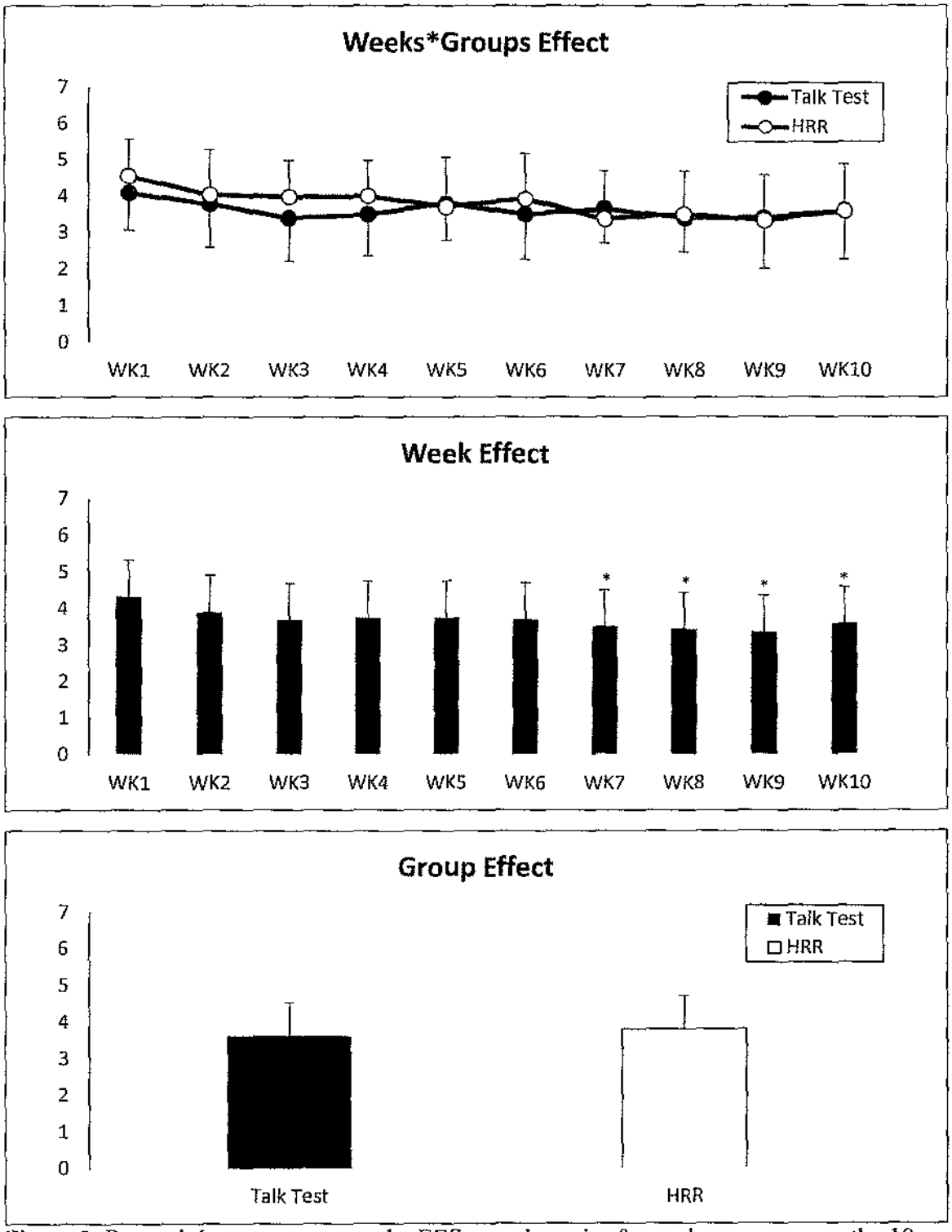

Figure 3. Pre-training responses on the EES questionnaire for each group across the 10-week training period.

* Pre-training enjoyment scores for weeks 7 through 10 are significantly lower compared to week 1 ($p<.05$).

POST-TRAINING

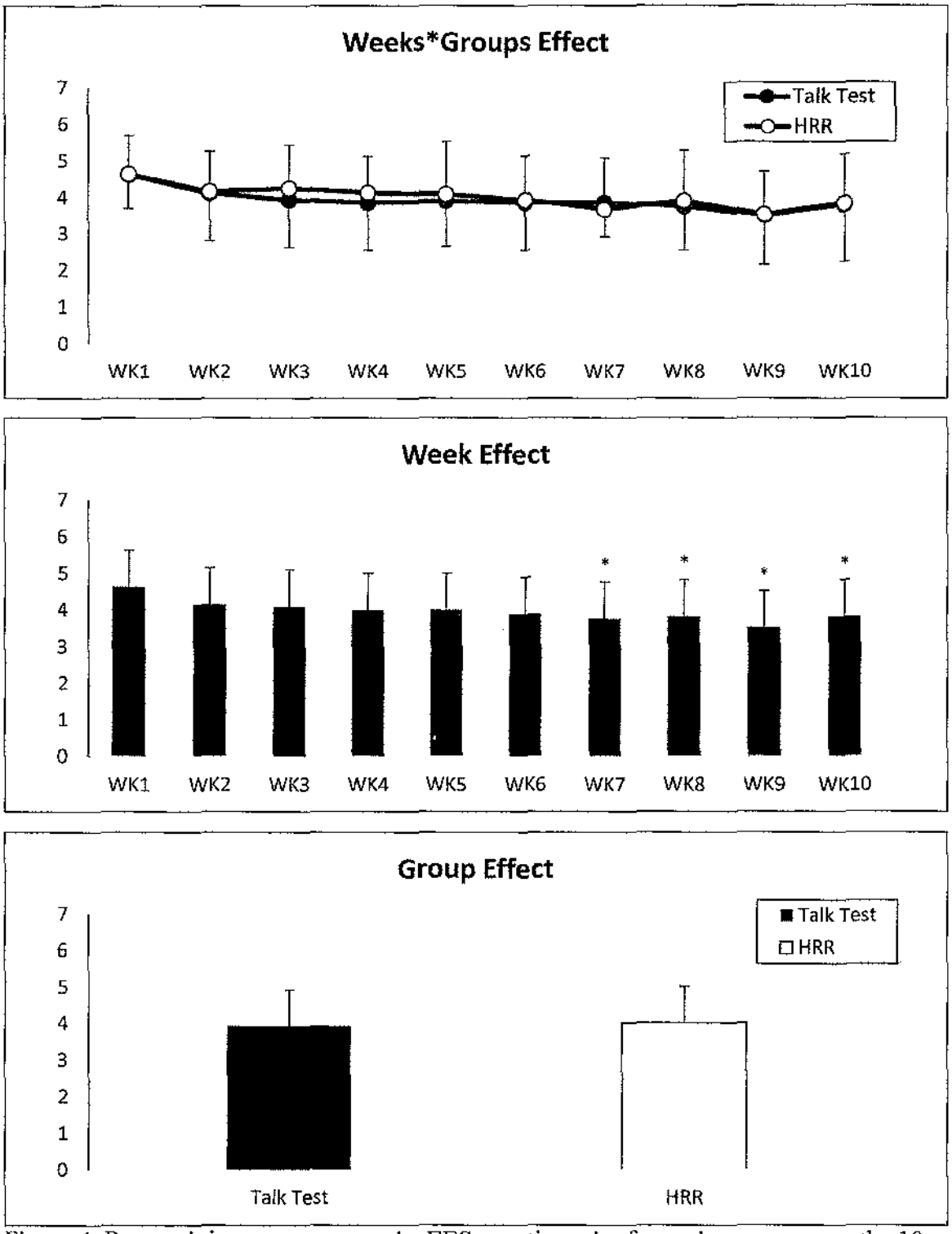

Figure 4. Post-training responses on the EES questionnaire for each group across the 10-week training period.

* Post-training enjoyment scores for weeks 7 through 10 are significantly lower compared to week 1($p<.05$).

DISCUSSION

The purpose of this study was to investigate the enjoyment of sedentary college-aged students undergoing a 10-week exercise training intervention. The two interventions were either the TT (Rosato, 1995) where the group was trained solely using the TT as the intensity measure or the HRR where the intensity was based solely off of HRR (Pescatello, Arena, Riebe, & Thompson, 2014).

Exercise enjoyment was assessed before the start of the training, during the training, and following a cool-down. It was found that both groups had a significant decrease in level of enjoyment from weeks 7-10. However, there was no significant difference between groups. These findings agree with the study done by Foster, et al. (2015), where EE pre, during, and post-training indicated a significant decrease in enjoyment for three training groups as the study progressed. It may be possible that subjects became preoccupied with school or work obligations, which may have interfered with the enjoyability towards the end of the study which corresponded with the end of the academic semester.

Another possible factor impacting why there was not a significant decrease in enjoyability until week 7 was that the participants became familiar with the volunteers supervising training sessions. Relationships were formed which may have allowed the participants to enjoy the sessions in the beginning. However, this enjoyment may have been overridden as the semester went on and the students became busier.

A study by Wininger and Pargman (2003) studied 282 students in an aerobics class and found that satisfaction with the music and the instructor were positively correlated to EE. In our study a variety of music was played and was used to guide pedaling frequency. Several students voiced their opinions throughout the 10 weeks as to whether or not they enjoyed the music. However, there was no consistent opinion. Certain volunteers in this study were often preferred by certain participants. Similar observations were noted by Wininger and Pargman (2003). It was noted that if some subjects did not get the volunteer they normally had to administer their training session they would get upset. This may have had an overall impact on their level of enjoyment.

Enjoyment levels are also correlated with variations in exercise intensity levels. A study to promote more PA among primary health care patients found that the best intervention program was one that provided more variations in exercise levels, which corresponded to more enjoyment (Hagberg, Lindahl, Nyberg, & Hellenius, 2009). This is the basis of high-intensity interval training (HIIT) which provides the individual variation in the exercise intensity. A training study by Jung, Bourne, and Little (2014) compared the affective responses between HIIT, continuous vigorous-intensity exercise (CVI), and continuous moderate-intensity exercise (CMI) before, during and after exercise. They found that overtime participants reported greater enjoyment of HIIT as compared to CMI and CVI. Sedentary adults rated HIIT as more enjoyable than engaging in 30 or 60 minutes of continuous moderate-intensity exercise.

There were no significant differences in the level of enjoyment between the TT and HRR over the course of the 10 weeks. This contradicts what was witnessed as several participants stated, "I sure am lucky I don't have to keep reciting the Rainbow Passage"

or stated that they believed they were in the "easy group." The participants could not select which group they preferred to be in which could have impacted the enjoyment level of the exercise and biased the study. Gauvin and Rejeski (1993) stated that people are more likely to enjoy exercise if they are able to choose their own exercise modality. If they are unable to choose their exercise modality, they are pre-disposed to already have a negative outlook to the training. Future studies may need to access enjoyment levels where every training session the exercise modality is different.

CONCLUSIONS

The present study found that subjects randomly assigned to either the TT or HRR groups did not have statistically different enjoyment scores throughout the 10-week training intervention. After week 7, both groups had a significant decline in enjoyment for the pre, during, and post enjoyment scores. Using the cycle ergometer as the sole type of exercise modality for the 10 weeks may have had an adverse effect on enjoyment. Future studies may want to look at the effect that a variety of exercise modalities may have on enjoyment and adherence to exercise.

REFERENCES

American College of Sports Medicine. (2013). ACSM's Guidelines for Exercise Testing and Prescription. (9th ed.). *Philadelphia, PA: Lippincott, Williams and Wilkins.*

American Heart Association. (2014). ACC/AHA Prevention Guideline, 129(25) S49-S73.

Ballweg, J., Foster, C., Porcari, J. P., Haible, S., Aminaka, N., & Mikat, R.P. (2013). Reliability of the Talk Test as a surrogate of ventilatory and respiratory compensation thresholds. *Journal of Sports Science and* Medicine, 12, 610-611.

Bartlett, J.D., Close, G.L., Maclaren, D.M., Gregson, W., Drust, B., & Morton, J.P. (2011). High-intensity interval running is perceived to be more enjoyable than moderate-intensity continuous exercise: Implications for exercise adherence. *Journal of Sports Sciences, 29*(6), 547-553.

Borg, G.A. (1970). Perceived exertion as an indicator of somatic stress. *Scandinavian Journal of Rehabilitation Medicine, 2* (2), 92-98.

Borg, G.A. (1998). Borg's Perceived Exertion and Pain Scales. *Champaign, IL: Human Kinetics.*

Brawner, C. A., Vanzant, M. A., Ehrman, J. K., Foster, C., Porcari, J.K., Kelso, A. J., & Keteyian, S. J. (2006). Guiding exercise using the talk test among patients with coronary artery disease. *Journal of Cardiopulmonary Rehabilitation, 26,* 72-75.

Dehart-Beverley, M., Foster, C., Porcari, J., Fater, D., & Mikat, R. (2000). Relationship between the talk test and ventilator threshold. *Clinical Exercise Physiology*, 2, 34-38.

Dishman, R. K. (1994). Prescribing exercise intensity for healthy adults using perceived exertion. *Medicine & Science in Sports & Exercise, 26*(9), 1087-1094.

Ebben, W., & Brudzynski, L. (2008). Motivations and barriers to exercise among college students. *Journal of Exercise Physiology Online, 11*(5), 1-11.

Epstein, L. H., Koeske, R., & Wing, R. R. (1984). Adherence to exercise in obese children. *Journal Cardiac Rehabilitation, 4*(5), 185-195.

Eston, R. (2012). Use of ratings of perceived exertion in sports. *International Journal of Sports Physiological Perform,* 7(2), 175-82.

Fleig, L., Lippke, S., Pomp, S., & Schwarzer, R. (2011). Exercise maintenance after rehabilitation: How experience can make a difference. *Psychology of Sport & Exercise,* 12(3), 293-299.

Foster, C. & Cotter, H.M. (2005). Blood lactate, respiratory, and heart rate markers on the capacity for sustained exercise. Physiological Assessment of Human Fitness, *Champaign, IL: Human Kinetics.* 63-76.

Foster, C., Farland, C.V., Guidotti, F., Harbin, M., Roberts, B., Schuette, J., Tuuri, A., Doberstein, S.T., Porcari, J.P. (2015). The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of Sports Science and Medicine,* 14, 747-755.

Foster, C., Porcari, J.P., Anderson, J., Paulson, M. Smaczny, D., Webber, H., Doberstein, S.T., & Udermann, B. (2008). The talk test as a marker of exercise training intensity. *Journal of Cardiopulmonary Rehabilitation and Prevention,* 28, 24-30.

Foster, C., Porcari, J.P., de Koning, J.J., Bannwarth, E., Casolino, E., Condello, G. (1995). Exercise training for performance and health. *Applied Physiology,* 70, 367-372.

Gauvin, L., & Rejeski, J. (1993). The exercise-inducted feeling inventory: Development and initial validation. *Journal of Sports Exercise Psychology,* 15, 403-423.

Hagberg, L.A., Lindahl, B., Nyberg, L., & Hellenius, M.L. (2009). Importance of enjoyment when promoting physical exercise. *Scandinavian Journal of Medical Science and Sports,* 19, 740-747.

Jung, M.E., Bourne, J.E., & Little, J.P. (2014). Where Does HIIT Fit? An examination of the Affective Response to High-Intensity Intervals in Comparison to Continuous Moderate- and Continuous Vigorous- Intensity Exercise in the Exercise Intensity-Affect Continuum. *PLOS ONE,* 9(12), 1-18.

Kaufman, C., Berg, K., Nobel, J. & Thomas, J. (2006). Ratings of perceived exertion of ACSM exercise guidelines in individuals varying in aerobic fitness. *Res. Q. Exercise Sport.* 77(1):122-30.

McAuley, E.E., Motl, R.W., Morris, K.S., Hu, L.L., Doerksen, S.E., Elavsky, S.S., & Konopack, J.F. (2007). Enhancing physical activity adherence and well-being in multiple sclerosis: A randomized controlled trial. *Multiple Sclerosis, (13524585), 13*(5), 652-659.

Parfitt, G., Evans, H., & Eston, R. (2012). Perceptually regulated training at RPE13 is pleasant and improves physical health. *Medicine & Science in Sports & Exercise,* 10, 1613-1618.

Pescatello, L., Arena, R., Riebe, D., & Thompson, P. (2014). *ACSM's: Guidelines for Exercise testing and prescription*, 9, 166-167. Baltimore, MD and Philadelphia, PA: Wolters Kluwer Health and Lippincott, W. & W.

Quinn, T.J., & Coons, B.A. (2011). The talk test and its relationship with the ventilatory and lactate thresholds. *Journal of Sports Sciences*, 29 (11), 1175-1182.

Rhodes, R.E., Martin, A.D., Taunton, J.E., Rhodes, E.C., Donnelly, M., & Elliot, J. (1999). Factors associated with exercise adherence among older adults. *Sports Medicine*, 28(6), 3977-411.

Rosato, F. (1995). Jogging and walking for health and fitness. Morton, Colorado, 25-30.

Rose, E.A., & Parfitt, G.G. (2012). Exercise experience influences affective and motivational outcomes of prescribed and self-selected intensity exercise. *Scandinavian Journal of Medicine & Science In Sports*, *22*(2), 265-277.

Ryan, R.M., Frederick, C.M., Lepes, D., Rubio, N., & Sheldon, K.M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology*, *28*(4), 335-354.

Stanley, D.M., & Cumming, I. (2010). Are we having fun yet? Testing the effects of imagery use on the affective and enjoyment responses to acute moderate exercise. *Psychology of Sport and Exercise*, 11, 582-590.

Wininger, S.R., & Pargman, D. (2003). Assessment of Factors Associated with Exercise Enjoyment. *Journal of Music Therapy, 40*(1), 57-73.

APPENDIX A

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE-PAR-Q & YOU

Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

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: check YES or NO.

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 (for example, back, knee or hip) 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 with 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. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

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: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT or GUARDIAN (for participants under the age of majority) _____ WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

CSEP·SCPE

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APPENDIX B

EXERCISE HISTORY QUESTIONNAIRE

UNIVERSITY of WISCONSIN
LA CROSSE

Exercise History Questionnaire

1. **Are you currently involved in regular endurance (cardiovascular) exercise? If so, how many minutes/days a week do you engage in this activity?**

   Yes ☐ **No** ☐ **If Yes,** _____ **Days/Week for** _____**Minutes/Session**

2. **Do you currently play a sport or other recreational activities (besides HPR 105 Lab)? If yes, what types of sports/physical activity?**

   Yes ☐ **No** ☐ **If Yes, explain** _____

3. **Does your job involve physical labor?**

   Yes ☐ **No** ☐

4. **In the past 6-8 weeks, explain what you have done for physical activity?**

_____

_____

_____

_____

_____

APPENDIX C

INFORMED CONSENT

UNIVERSITY of WISCONSIN
LA CROSSE

Prospective Research Participant:

You are invited to participate in our research study entitled *Training Effect on Talk Test vs Heart Rate Reserve* conducted by graduate students, Kate Falck, Sam Suckow, Jillian Turek, Anna Wargowsky, Dr. Carl Foster, Ph.D., and Dr. John Porcari, Ph.D. The main purpose of this study is to compare the training effect between using heart rate reserve and the talk test as exercise intensity measures. Participation in this study may benefit you, along with the general population, by gaining knowledge of how individuals respond to difference exercise training intensity measures. Direct benefits you *will* experience include increasing your physical fitness and living a healthier lifestyle.

If you decide to participate in the study, you will be asked to fill out a Physical Activity Readiness Questionnaire (PAR-Q) and sign an informed consent. If no exclusion criteria exists, you will complete a pre-maximal exercise test in order to evaluate fitness level. You will be required to wear a scuba type breathing valve and a chest strap to measure heart rate during the exercise test. After completion of the pre-maximal exercise test, you will be randomly divided into one of the 2 training groups for 10.5 weeks (3 times weekly for 40 minutes per session). Following the 10.5 week training portion, you will complete a post-maximal exercise test. During both pre and post testing along with training sessions, you will be asked to complete several questionnaires about the perceived exertion and the enjoyability aspect of the session. The enjoyability questions will be asked twice a week before, during, and after the training session to gauge how the enjoyability may change over time.

Participation is completely voluntary. By returning your completed PAR-Q and informed consent, you are giving your consent to participate in this study. All data will be coded to maintain confidentiality; thus, no data will be personally identified with you. Your name will not appear in any presentation or publication coming from this research. If you agree to participate, you may choose not to answer any given questions, and you may withdraw your consent and discontinue your participation at any time. There are no known risks beyond the inconvenience of time and mild discomfort in wearing the breathing mask or heart rate monitor. Additional symptoms you may experience during the exercise tests and training sessions include perspiration, be out of breath, and leg fatigue. You will be under supervisor at all times, and the primary investigators are all certified in CPR/First Aid and Advanced Cardiac Life Support, and the test will be terminated if complications should arise.

If at any time you have questions about this study, you may contact, Kate Falck, Sam Suckow, Jillian Turek, or Anna Wargowsky via email: **cepresearch16@gmail.com** or their advisors, Dr. Carl Foster (608-785-8687) or Dr. John Porcari (608-785-). Questions regarding the protection of human subjects may be addressed to the UW-La Crosse Institutional Review Board of the Protection of Human Subjects (608-785-8124 or irb@uwlax.edu).

Thank you for your consideration in participating in this study!

UNIVERSITY of WISCONSIN
LA CROSSE

Informed Consent Form

Title of Investigation: *Training Effect on Talk Test vs Heart Rate Reserve*

Names of Principal Investigators: Kate Falck, Sam Suckow, Jillian Turek, or Anna Wargowsky

This document is to certify that I, _____, hereby freely agree to participate as a subject in a research study as an authorized part of the educational and research program of the University of Wisconsin-La Crosse under the supervision of Dr. Carl Foster, Ph.D and Dr. John Porcari, Ph.D.

- The research project has been fully explained to me by Kate Falck, Sam Suckow, Jillian Turek, or Anna Wargowsky, and I understand this explanation, including what I will be asked to do. A copy of the procedures of this investigation and a description of any risks, discomforts and benefits associated with my participation has been provided and discussed in detail with me.

- I have been given an opportunity to ask questions, and all such questions and inquiries have been answered to my satisfaction as well as I am free to decline to answer any specific items or questions in interviews or questionnaires.

- I understand that, in the event of physical injury resulting from this investigation, neither financial compensation nor free medical treatment is provided for such physical injury.

- I certify that to the best of my knowledge, I have no physical or mental illness or weakness that would increase the risk during participation in this investigation.

- I understand that participation in this research project is voluntary and not a requirement or a condition for being the recipient of benefits or services from the University of Wisconsin-La Crosse or any other organization sponsoring the research project.

- I understand that the approximate length of time required for participation in this research project is 22 hours.

- I understand that if I have any questions concerning the purposes or the procedures associated with this research project, I may call or write to the principal investigator(s) or to the Institutional Review Board for the Protection of Human Subjects.

- I understand that it will not be necessary to reveal my name in order to obtain additional information about this research project from the principal investigator(s).

_____ _____

Signature of Subject Date

_____ _____

Signature of Investigator Date

APPENDIX D

EXERCISE ENJOYMENT SCALE

Exercise Enjoyment Scale

Damian M. Stanley and Jennifer Cumming

University of Brimingham

There are three different version of the scale.

Use the following scale to indicate how much you will **enjoy** the upcoming exercise session:

1	2	3	4	5	6	7
Not at all	Very little	Slightly	Moderately	Quite a bit	Very much	Extremely

Use the following scale to indicate how much you are **enjoying** this exercise session:

1	2	3	4	5	6	7
Not at all	Very little	Slightly	Moderately	Quite a bit	Very much	Extremely

Use the following scale to indicate how much you **enjoyed** the exercise session:

1	2	3	4	5	6	7
Not at all	Very little	Slightly	Moderately	Quite a bit	Very much	Extremely

Reference for the scale:

Stanley, D. M., & Cumming, L. (2010). Are we having fun yet? Testing the effects of imagery use on the affective and enjoyment responses to acute moderate exercise. Psychology of Sport and Exercise. 11, 582-590.

Validation of the scale has been reported here:

Stanley, D. M., Williams, S. E., & Cumming, J. (2009). Preliminary validation of a single-item measure of exercise enjoyment: The Exercise Enjoyment Scale. Journal of Sport and Exercise Psychology, 31, 5138-139.

APPENDIX E

REVIEW OF THE LITERATURE

REVIEW OF LITERATURE

Introduction

In today's society, obesity is on the rise; people have become more sedentary, and heart disease is the number one killer in America according to the American Heart Association (AHA, 2014). It was shown that regular physical activity (PA) declines from high school to college with only 38% of college students participating in regular vigorous intensity activity and only 20% participating in regular moderate intensity activity (Douglas et al., 1997). Only 15% of American adults report engaging in PA for 30 minutes or more five days each week and 40% of American adults report no leisure time physical activity (U.S. Department of Health and Human Services, 2000). Guidelines established in 1995 by the Center of Disease Control (CDC) and by the American College of Sports Medicine (ACSM) recommend that all adults should be getting 30 minutes of moderate-intensity PA on most days of the week (ACSM, 2000). The guidelines by the ACSM and the AHA were revised to recommend that all physically able adults participate in moderate-intensity PA for 30 minutes a day for five days a week or vigorous-intensity PA for 20 minutes a day three days a week (Pescatello, Arena, Riebe, & Thompson, 2014). Additionally, recommendations include incorporating activities that increase strength and endurance twice a week. These recommendations are suggested for individuals who wish to maintain or improve their current health status. Individuals may wish to exceed the minimum requirements for extra health

improvements or to further reduce their risk for chronic diseases (ACSM, 2013). When PA is prescribed, it often follows the FITT-VP principle which stands for Frequency, Intensity, Time, Type, Volume, and Progression (ACSM, 2013). The ACSM (2013) recommends using this principle when prescribing exercise. The only part about this principle that can be problematic is gauging the intensity of exercise.

The ACSM (2013) states that the intensity of exercise can be obtained from a graded exercise test (GXT), where maximum heart rate (HR_{max}) and maximum oxygen uptake (VO_{2max}) is obtained. Guidelines recommend exercising at 40%-60% of heart rate reserve (HRR) or VO_2 for moderate intensity exercise, and 60%-90% HRR or VO_2 for vigorous intensity exercise. However, a GXT is time consuming, expensive, and may not be readily available which makes it impractical for the average American. It may also be potentially dangerous to obtain a GXT in some populations such as the elderly and those with cardiac issues.

Subjective methods have also been used to help regulate exercise intensity. These include using the rating of perceived exertion scale (RPE) (Borg, 1970) and the Talk Test (TT) (Foster et al., 2008).

Talk Test

The importance of exercise has been established. However, how does an individual outside a clinical setting know what intensity they should be exercising at to be beneficial yet safe level? A practical concept to monitor exercise intensity was first suggested by Professor Grayson in 1939 (Foster et al., 1995). His famous quote to British mountaineers to "climb no faster than you can speak" has transitioned into the Talk Test (TT) (Rosato, 1995). The TT involves reading a familiar passage out loud during exercise

to determine if they can "speak comfortably." The harder a person exercises the harder it is to speak without difficulty.

Over the years various researchers have tested and studied different aspects of the TT to quantify its value as a tool for subjectively monitoring exercise intensity. The correlation between breathing and speech was discussed by Doust and Patrick (1981). The same air is needed both for breathing and for speaking and needs to be rationed out to where it is most critically needed. By 1991 there was enough interest in using the TT to monitor exercise levels that ACSM published guidelines on the use of TT for training and exercise. However, these guidelines were withdrawn due to a lack of supportive documentation (ACSM, 2000).

Future research continued to confirm the validity of the TT. Brawner et al. (2006) correlated the TT with heart rate (HR) and Czaplicki, Keteyian, Brawner, and Weingarten (1997) applied the TT to arm-leg exercise. Goode, Mertens, Shariman, and Mertens (1998), confirmed the relationship between breathing and exercise with exercise tests on a cycle ergometer. This "hear your breathing test" under increasing workloads was further evaluated by Mertens, Bell, and Goode (2001). Consequently, in 2010, the ACSM approved and recommended the TT as a subjective method in regulating exercise intensity and uses it in their guidelines for exercise testing and prescription (ACSM, 2010).

Numerous studies have documented that the TT is a reliable indicator of exercise intensity. There is a significant positive relationship between the ventilatory threshold (VT) and the highest exercise intensity at which individuals can talk comfortably (Dehart-Beverley, M., Foster, C., Porcari, J., Fater, D., & Mikat, R., 2000). Brawner et al.

(2006) found the TT to be a safe guideline for use with patients with coronary artery disease. A study by Foster et al. (2008) demonstrated that both cardiac patients and healthy volunteers were exercising below their VT when they were able to talk comfortably during exercise, but they were exercising above their VT when they were unable to talk comfortably while exercising.

Determining a safe and easy way to monitor exercise prescription that is applicable to individuals of all health conditions and physical conditioning variations offers a challenge. Foster et al. (2009) found the TT to be a reliable adequate tool for translating submaximal exercise test responses to exercise prescriptions. Rodriguez-Marroyo, Villa, Garcia-Lopez, and Foster (2013) validated the correlation between the TT and the VT in elite cyclists suggesting a low cost monitoring tool available to professional athletes.

The TT has been shown to be a viable alternative to standard methods of prescribing exercise training intensity (Woltmann et al., 2015: Lyon et al., 2014; Engen, 2015; Doro, 2015). They found that TT can be used alone as the primary method to control the exercise training intensity in both normal and clinical populations. Woltmann et al. (2015) found a correlation between physiological markers such as heart rate, blood lactate, RPE, and the TT while performing incremental exercise test. It was found that various levels of exercise intensity could be regulated solely by the TT response desired and then monitoring the conventional physiological markers. Ultimately, Woltmann et al. (2005) demonstrated that the TT can be used as the primary method to solely guide exercise training intensity.

Talk Test Practicality for Exercise Programs

A critical component of any exercise program is monitoring the physiological condition of the individual. The exercise program needs to be of the correct intensity and duration for the individual's health. A program tailored at a level to provide enough exercise to benefit the individual, yet not be so taxing as to put strain on the individual and pose a health risk. To determine this level of training, physiologic thresholds are critical to determine endurance capacity. Threshold-based exercise prescription probably provides the ideal level of intensity (Mezzani et al., 2012). Physiologic thresholds can be determined by using a variety of techniques which require sophisticated equipment, trained personnel, are expensive and not readily available to everyone. Numerous studies have shown that the TT is an inexpensive, noninvasive, practical method to monitor exercise levels. It can be used routinely by people of all ages, physical stature, or physical condition (Foster, et al., 2008; Jeans, Foster, Porcari, Gibson, & Doberstein, 2011; Lyon, et al., 2014).

Speech Production Relative to Talk Test

The relationship between speech production and exercise is a critical component for the use of the TT in exercise monitoring; for speech production, ventilation is necessary. However, breathing frequency is reduced when an individual speaks as there is a lengthening of the expiration phase. This was verified by Doust and Patrick (1981) who conducted a study using a treadmill at different speeds with individuals reading a passage. Respiration was monitored and it showed that ventilation was reduced during speech. They demonstrated that during speech production there is a reduction in exercise ventilation and breathing frequency.

Mertens, Bell, and Goode (2001) documented that the Breath Sound check where you "can hear your breathing" is at the intensity level which correlates with a HR that is within the recommended range according to the ACSM (2013) guidelines for achieving health benefits. This means that exercise intensity can be monitored and controlled by the Breath Sound check.

Ventilation for the removal of CO_2 from the body and for the transportation of O_2 to the muscles during exercise is critical. Meckel, Rotstein, and Inbar (2002) studied physiological changes to the body for speech production during exercise. When someone is speaking they found a reduction in VO_2, VCO_2, and VE, and an increase in lactic acid and blood pressure. This study supports the correlation of physiologic changes during exercise relative to speech and the inference that it impacts the TT. Rotstein, Meckel, and Inbar (2004) also conducted a study on physiological changes to the body during exercise and the correlation with perceived speech difficulties (PSPD). They found a statistically significant correlation between various physiological responses and PSPD.

Motivation Impact on Adherence to Physical Activity

To encourage individuals to initiate as well as continue adherence to a PA program, there is documentation that a motivational factor needs to be incorporated. Intrinsic motivation is the most desirable level of motivation whereby a person chooses to engage in a PA for the sake of the activity itself (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Examples of intrinsic motivation include enjoyment, excitement, and challenges. Research supports the observation that intrinsically motivated individuals adapt and continue PA better than individuals who are extrinsically motivated (Ryan et al., 1997). A very important factor facilitating adherence to continue PA was found to be

allowing individuals choice in their exercise prescription which serves to foster intrinsic motivation (Omar & McAuley, 1993).

Kilpatrick, Hebert, and Bartholomew (2005) further supported the intrinsic and extrinsic motivation factors with a college students' PA study. Intrinsic motives included such factors as enjoyment and challenge for engaging in sports, while appearance, weight, and stress management were reported as extrinsic motives for exercise.

A goal of any exercise prescription should be to facilitate the development of the desire and willingness to continue adherence to a PA program. To monitor this goal, positive or negative feelings of performing a PA need to be documented at the start of a fitness program and at regular intervals to detect when and if a negative feeling is developing toward the training. If a negative feeling is detected, it is an indication that the subject could potentially drop out of an exercise program. Therefore, early detection of reduced motivation would allow time for intervention to adjust the exercise program (Haile et al., 2013).

Enjoyability and its Correlation to Physical Activity

Adherence to a prescribed or self-motivated exercise program requires a certain degree of enjoyment. It has been clearly documented in the literature that although the level of enjoyment and how to measure it is difficult, it is important for exercise adherence (Foster, et al., 2015). Salmon, Owen, Crawford, Bauman, and Sallis (2003) documented in a population-based postal survey of adults that elevated activity levels corresponded to a higher level of enjoyment of that activity. Physically active participants in the 2002 senior games noted their motivation for PA at their age was due to fun or recreational enjoyment, while less active senior athletes indicated that improving their

quality of life was their primary motivator (Merrill, Shields, Wood, & Beck, 2004). Another study on seniors put the emphasis towards enjoyment and satisfaction rather than behavioral changes (Thurston & Green, 2004). Dishman et al. (2005) found that the primary factors promoting increased PA among adolescent females was their enjoyment of physical education and enjoyment of PA. Male officers in the Finnish Police Academy stated that the most significant factor contributing to their physical fitness and PA was the enjoyment of the PA (Sorensen, 2005). In a Goal Orientation Exercise Scale (GOES) study in 2003, a correlation analyses revealed significant, positive relationships between task orientation and enjoyment of exercise, years of exercise experience, and exercise intensity (Kilpatrick, Hebert, & Bartholomew, 2005). A study to promote more physical activity among primary health care patients found that the best intervention program was one that provided more variations in exercise levels, which corresponded to more enjoyment (Hagberg, Lindahl, Nyberg, & Hellenius, 2009).

Enjoyability and its Relationship to Various Intensity Levels of Exercise.

An individuals' response to continuous moderate-intensity exercise (CMI) and continuous vigorous-intensity exercise (CVI) has been studied more than high-intensity interval training (HIIT). High-intensity interval training (HIIT) involves brief bursts of vigorous exercise followed by periods of recovery and provides an alternative to continuous exercise and saves time. Gibala and McGee (2008) found that evidence indicates that HIIT provides similar health-enhancing adaptations compared to continuous exercise in addition to providing a substantially lower time commitment.

A training study by Jung, Bourne, and Little (2014) compared the affective responses between HIIT, CVI, and CMI before, during and after exercise using the

Physical Activity Enjoyment Scale of Kendzierski and DeCarlo (1991). They found that participants reported greater enjoyment of HIIT as compared to CMI and CVI, with over 50% of participants reporting a preference to engage in HIIT as opposed to either CMI or CVI. Sedentary adults rated HIIT as more enjoyable than engaging in 30 or 60 minutes of continuous moderate-intensity exercise. Jung, Bourne, & Little, (2014) believe the recovery periods built into low-volume HIIT decreased monotony, and the reduced total exercise time, supports HIIT exercise as more pleasurable and less aversive than CVI. There is an increased sense of pride and accomplishment after completing each interval, which may alter the intensity-affect relationship and make it more enjoyable than CVI exercise.

HIIT has also been found to increase self-efficacy (Jung et al., 2014). The individual's exercise becomes a series of short sessions with successful experiences and successful accomplishments. It pushes an individual harder as it is only for a short period of time instead of having to push hard continuously for 20-30 minutes.

Further enhancing an individual's enjoyment and exercise performance was found to be the application of music (Stork, Kwan, Gibala, & Ginis, 2014). Music before and during all out sprint interval training (SIT) improved acute exercise performance and improved the enjoyment of SIT. Stork et al. (2014) conducted the first study to demonstrate both the psychological and the physiological benefits of listening to self-selected music during a SIT protocol. Listening to music during exercise improves motivation and reduces perceived exertion. Music is easy to incorporate and readily available for exercise programs. The positive impact of adding music to an exercise program is recommended as it can lead to adherence to exercise.

A study involving sedentary college-aged students participating in an eight-week training intervention tested their enjoyment levels during HIIT. Students were randomly placed into three groups with either a steady-state aerobic training, a more moderate interval training (referenced as the Meyer group), or a very high intensity training (referenced as the Tabata group). The study found that the Tabata training group had statistically higher physical exhaustion scores and statistically lower exercise enjoyment scores both during and post-training (Foster et al., 2015). It was concluded that although HIIT was very beneficial for the individual, the lower enjoyment level may impact an individuals' adherence to exercise. More moderate intervals or steady-state training is recommended for increased enjoyability and for increased exercise adherence.

Enjoyability and its Relationship to Adherence and Self-Efficacy

The level of enjoyment experienced by an individual during different types of exercise sessions will impact if an individual will continue to exercise in the future. The adherence to continue a prescribed exercise program is correlated to enjoyment or the perceived enjoyment and a positive experience perceived in the participants' mind. Dishman (1994) found that a majority of individuals who initiate a PA program discontinue regular participation within 1 year. Data by Berry and Walsh (2001) found that an estimated 50% of participants withdraw from exercise programs within six months of starting, suggesting non-adherence arises early. Balady et al. (2012) also found that a difference in adherence correlated with the sex of the participants, with women more likely to withdraw from participating in cardiac rehabilitation programs. Exercise adherence declines over time, but Dishman (1982) found that the dropout rate decreases

over time. The longer an individual stays actively involved in a physical program the stronger the potential an individual will continue with that program.

Interrelated with enjoyment and correlated with the adherence to continue an exercise treatment is an individual's self-efficacy. Bandura (1982) proposed the Albert Bandura's Social Cognitive Theory which involves the personal belief an individual has that they can successfully perform a specific task. An individual with high self-efficacy will have more confidence to take on challenges or a difficult task, as well as potentially continue with a prescribed exercise treatment. Additionally, they are also more apt to recover from setbacks or shortcomings. Conversely, an individual with a low self-efficacy will be less apt to take on new challenges and difficult tasks, less apt to bounce back from shortcomings and setbacks, as well as potentially drop out from a prescribed exercise treatment. Bandura (1982) believes personal self-efficacy begins at childhood and continues throughout an individual's lifespan as a person has positive or negative reinforcement feedback. Interrelated and impacting an individual's self-efficacy is verbal persuasion by other people, and the anxiety and emotional wellbeing of the individual.

The challenge confronting the health profession is to assess what factors impact an individual's perceived enjoyment of an exercise program and to find motivational tools to encourage adherence to prescribed exercise treatment programs. This also includes finding clues specific to an individual to improve their self-efficacy level and developing prescribed treatment incentives tailored specific to that individual.

REFERENCES

American College of Sports Medicine. (2000). ACSM's Guidelines for Exercise Testing and Prescription (6th ed.). *Philadelphia, PA: Lippincott, Williams and Wilkins.*

American College of Sports Medicine. (2010). ACSM's Guidelines for Exercise Testing and Prescription (8th ed.). *Philadelphia, PA: Lippincott, Williams and Wilkins.*

American College of Sports Medicine. (2013). ACSM's Guidelines for Exercise Testing and Prescription (9th ed.). *Philadelphia, PA: Lippincott, Williams and Wilkins.*

American Heart Association. (2014). ACC/AHA Prevention Guideline, 129(25) S49-S73.

Berry, T., & Walsh, J. (2001). Mental health and cardiovascular disease: Challenges for counsellors. *Canadian Journal of Counselling,* 35(3), 196-207.

Balady, G., Arena, R., Sietsema, K., Myers, J., Coke, L., Fletcher, G., Forman, D., & Franklin, B. (2012). Clinician's guide to cardiopulmonary exercise testing in adults. *AHA Scientific Statement,* 191-219.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist,* 37, 122-147.

Borg, G.A. (1970). Perceived exertion as an indicator of somatic stress. Scandinavian *Journal of Rehabilitation Medicine*, 2 (2), 92-8.

Brawner, C.A., Vanzant, M.A., Ehrman, J.K., Foster, C., Porcari, J.K., Kelso, A.J., & Keteyian, S.J. (2006). Guiding exercise using the talk test among patients with coronary artery disease. *Journal of Cardiopulmonary Rehabilitation*, 26, 72-75.

Czaplicki, T.E., Keteyian, S.J., Brawner, C.A., & Weingarten, M.A. (1997). Guiding exercise training intensity on a treadmill and dual-action bike using the talk test. *Medicine and Science in Sports and Exercise*, 29, S70.

Dehart-Beverley, M., Foster, C., Porcari, J., Fater, D., & Mikat, R. (2000). Relationship between the talk test and ventilator threshold. *Clinical Exercise Physiology*, 2, 34-38.

Disman, R.K. (1982). Compliance/adherence in health-related exercise. *Health Psychology,* 1(3), 237-276.

Dishman, R.K. (1994). Advances in exercise adherence. *Human Kinetics,* Champaign, IL.

Dishman, R.K., Motl, R.W., Saunders, R., Felton, G., Ward, D.S., Dowda, M., & Pate, R.R. (2005). Enjoyment mediates effects of a school-based physical-activity intervention. *Medical Science Sports Exercise,* 478-487.

Doro, K. (2015) Talk test as intensity guide for cardiac patients. (In Press).

Douglas, K.A., Collins, J.L., Warren, C., Kann, L., Gold, R., Clayton, S., Ross, J.G., & Kolbe, L.J. (1997). Results from the 1995 National College Risk Behavior Survey. *Journal of American College Health,* 46(2), 55-67.

Doust, J.H., & Patrick, J.M. (1981). The limitation of exercise ventilation during speech. *Respiration Physiology,* 46(2), 137-147.

Foster, C., Farland, C.V., Guidotti, F., Harbin, M., Roberts, B., Schuette, J., Tuuri, A., Doberstein, S.T., Porcari, J.P. (2015). The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of Sports Science and Medicine,* 14, 747-755.

Foster, C., Porcari, J.P., Anderson, J., Paulson, M. Smaczny, D., Webber, H., Doberstin, S.T., & Udermann, B. (2008). The talk test as a marker of exercise training intensity. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 28, 24-30.

Foster, C., Porcari, J.P., de Koning, J.J., Bannwarth, E., Casolino, E., Condello, G. (1995). Exercise training for performance and health. *Applied Physiology,* 70, 367-372.

Foster, C., Porcari, J.P., Gibson, M., Wright, G., Greany, J., Talati, N., & Recalde, P.T. (2009). Translation of submaximal exercise test responses to exercise prescription using the talk test. *Journal of Strength and Conditioning Research*, 23(9), 2425-2429.

Gibala, M.J. & McGee, S.L. (2008). Metabolic adaptations to short-term high-intensity interval training: a little pain for a lot of gain? *Exercise and Sport Science Review*, 36, 58-63.

Goode, R.C., Mertens, R.W., Shariman, S., & Mertens, J. (1998). Voice, breathing, and the control of exercise intensity. *Advances in Experimental Medicine and Biology,* 450, 223-9.

Hagberg, L.A., Lindahl, B., Nyberg, L., & Hellenius, M.L. (2009). Importance of enjoyment when promoting physical exercise. *Scandinavian Journal of Medical Science and Sports,* 19, 740-747.

Haile, L., Goss, F.L., Robertson, R.J., Andreacci, J.L., Gallagher, M., & Nagle, E.F. (2013). Session perceived exertion and affective responses to self-selected and imposed cycle exercise of the same intensity in young men. *European Journal of Applied Physiology.* 113, 1755-1765.

Jeans, E.A., Foster, C., Porcari, J.P., Gibson, M., and Doberstein, S. (2011). Translation of exercise testing to exercise prescription using the talk test. *Journal of Strength and Conditioning Research,* 25(3), 590-596.

Jung, M.E., Bourne, J.E., & Little, J.P. (2014). Where Does HIIT Fit? An examination of the Affective Response to High-Intensity Intervals in Comparison to Continuous Moderate- and Continuous Vigorous- Intensity Exercise in the Exercise Intensity-Affect Continuum. *PLOS ONE,* 9(12), 1-18.

Kendzierski, D. & DeCarlo, K.J. (1991). Physical Activity Enjoyment Scale: Two validation studies. *Journal of Sport & Exercise Psychology,* 13, 50-64.

Kilpatrick, M., Hebert, E., & Bartholomew, J. (2005). College Students' Motivation for Physical Activity: Differentiating Men's and Women's Motives for Sport Participation and Exercise. *Journal of American College Health,* 54(2), 87-94.

Lyon, E., Menke, M., Foster, C., Porcari, J.P., Gibson, M., & Bubbers, T. (2014). Translation of incremental talk test responses to steady-state exercise training intensity. *Journal of Cardiopulmonary Rehabilitation and Prevention,* 34(1), 271-275.

Meckel, Y., Rotstein, A., & Inbar, O. (2002). The effects of speech production on physiologic responses during submaximal exercise. [Miscellaneous Article]. *Medicine & Science in Sports & Exercise August 2002,* 34(8), 1337-1343.

Merrill, R.M., Shields, E.C., Wood, A., & Beck, R.E. (2004). Outcome expectations that motivate physical activity among world senior games participants. *Perceptual and Motor Skills,* 99, 1277-128.

Mertens, R.W., Bell, H.J., & Goode, R.C. (2001). The breath sound check and exercise at or above the ventilator threshold. *AdvaExp. Med. Biol.* 499, 369-374.

Mezzani, A., Hamm, L.F., Jones, A.M., McBride, P.E., Moholdt, T., Stone, J.A., Urhausen, J.P., & Williams, M.A. (2012). Aerobic exercise intensity assessment and prescription in cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation and Prevention,* 32, 327-350.

Omar, R. & McAuley, E. (1993). Intrinsic motivation and exercise behavior. *Journal of Health Education,* 24, 232-238.

Pescatello, L., Arena, R., Riebe, D., & Thompson, P. (2014). *ACSM's: Guidelines for exercise testing and prescription,* 9, 166-167. Baltimore, MD and Philadelphia, PA: Wolters Kluwer Health and Lippincott, W &W.

Rosato, F. (1995). Jogging and walking for health and fitness. Morton, Colorado, 25-30.

Rotstein, A., Meckel, Y., & Inbar, O. (2004). Perceived speech difficulty during exercise and its relation to exercise intensity and physiological responses. *European Journal of Applied Physiology,* 92(4-5), 431-436.

Rodriguez-Marroyo, J.A., Villa, J.G., Garcia-Lopez, J., & Foster, C. (2013). Relationship Between the Talk Test and Ventilatory Thresholds in Well-Trained Cyclists. *Journal of Strength and Conditioning Research,* 27(7), 1942-1949.

Ryan, R.M., Frederick, C.M., Lepes, D., Rubio, N., & Sheldon, K.M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology,* 28, 335-354.

Salmon, J., Owen, N., Crawford, D., Bauman, A., & Sallis, J.F. (2003). Physical activity and sedentary behavior: A population-based study of barriers, enjoyment, and preference. *Health Psychology,* 22,178-188.

Sorensen, L. (2005). Correlates of physical activity among middle-aged Finnish male police officers. *Occupational Medicine,* 55, 136-138.

Stork, M.J., Kwan, M.Y.W., Gibala, M.J., and Ginis, K.A.M., (2014). Music Enhances Performance and Perceived Enjoyment of Sprint Interval Exercise. *Medicine & Science in Sports & Exercise,* 0195-9131 (15), 1052-1060.

Thurston, M., & Green, K. (2004). Adherence to exercise in later life. How can exercise on prescription programs be made more effective? *Health Promotion International,* 19, 379-387.

U.S. Department of Health and Human Services (2000). *Healthy People 2010.* Washington, DC: Author.

Woltmann, M. L., Foster, C., Porcari, J. P., Camie, C. L., Dodge, C., Haible, S., Mikat, R. P. (2015). Evidence that the Talk Test can be used to regulated exercise intensity. *The Journal of Strength and Conditioning Research,* 29(5), 1248-1254.