Comparison of hiit exercise and cycling

1. State the research question being studied by the authors. Write a brief overview of the research topic by explaining the purpose of the study, the purpose of the problem being studied, and the results and conclusions.

The purpose of this study was to explore physiological effects for a duration of eight weeks of regular physical activity in gym classes while doing either high intensity interval exercise or continuous moderate exercise on a bicycle. While the effects of high intensity interval exercise (HIIE) was researched in athletic populations, studies analyzing the effects of such interval workouts once per week in sedentary individuals while they also performed regular cardiorespiratory physical activity was uncommon. The results of this study were significant in finding that continuous moderate exercise when cycling improved body composition and cardiorespiratory fitness in collegiate aged females who also participated in physical education classes. Cardiorespiratory fitness, measured by assessing maximum oxygen untake (VO_2 Max), also improved in collegiate aged females during HIIE while cycling. Based on the results of this study, it was concluded that female students in college could benefit from continuous moderate exercise (CME) training, when spin cycling. As the obesity epidemic and chronic disorders continue, which occurred due to a lack of physical activity, it was clear that the purpose of this study was to provide evidence to decrease the problems resulting from bad physical activity patterns.

2. State the null and research hypotheses based upon the type of research design and statistics used in the study.

The research hypothesis was that regular physical fitness classes complemented with HIIE were more effective in improving body composition and cardiorespiratory fitness in college aged females than CME. The null hypothesis would be that there was no relationship between the type of exercise and body composition or cardiorespiratory fitness in collegiate aged females.

3. State the independent, dependent and potentially confounding variables (if any) in the study.

The independent variables were HIIE and CME. The dependent variables were body composition and cardiorespiratory fitness. Confounding variables were gender, age, and prior physical activity.

4. Describe the methods section in its entirety to test the null (describe the participants, instrument, procedures, and analysis).

Forty-eight college aged females from a university in Poland participated in the study. While the students were not considered athletes, they had enrolled in a gym class that required them to exercise regularly for 45 minutes at a time twice a week. Measurements of body mass were taken to the nearest tenth of a kilogram. Body height was measured to the nearest centimeter. Body composition was calculated through body mass index after analyzing the fat mass and fat-free mass using a stand-on hand-to-foot analyzer with eight electrodes connecting the body without skin-to-skin contact. Waist and hip circumference were taken by one skilled exercise physiology expert to the nearest tenth of a centimeter. Each subject was placed in a random group. Twenty-four were performing HIIE. The other 24 participants were performing CME. Each session lasted 63 minutes over an

eight-week period while being under the supervision of the trained exercise physiology specialist. The cycling program was done using a mechanically braked cycle ergometer so that the resistance of the cycle could be altered given the results from a heart rate monitor. Each training session started with a five-minute warm-up. The HIIE program required subjects to have two sessions of six sets of ten second sprints during each intervention. In between the ten second sprints were a one minute active recovery period with the subject pedaling to a speed so their heart rate was about 75% of their maximum heart rate. The CME program required subjects to pedal at a speed so they had a consistent heart rate of 75%. A ten-minute cool-down was also a part of both programs. VO_2 Max was estimated using the Astrand-Rhyming nomogram at steady heart rate and heavy work load and the cycle ergometer test. Heart rate was assessed with a monitor and adjusted accordingly throughout the test. The aerobic capacity test started with a one W/kg load and continued until a heart rate was obtained between 135-150 beats per minute. The anaerobic test (AnT) was done on a mechanically braked cycle ergometer. After the five-minute warm-up, as previously discussed, and after a five-minute rest, the AnT started using a load of 7. 5% of the subject’s body mass. With positive, verbal encouragement, the participants were instructed to progress to their maximum pedaling rate while cycling their fastest for a ten second period. After a period of maintaining a speed where the heart rate was 75% of the maximum heart rate for one minute, the participant was encouraged five more times to pedal their maximum speed while maintaining the appropriate heart rate after each time. To begin the analysis, body mass and height were similar within both groups before the testing. A two-factor analysis of

variance (ANOVA) was utilized to find results. Body composition results revealed fat mass decreased after the programs were completed. However, a larger increase in fat free mass was observed in the CME intervention compared to the HIIE intervention. The findings were significant. As far as analyzing aerobic and anaerobic capacity, VO_2 max, as well as power output and total work, presented a significant time effect of the program which resulted in improvement from both programs although power output was more improved in the HIIE subjects than the subjects who performed CME.

5. Discuss and describe at least three ways to check for validity of findings.

Content validity was a way to accurately assess what is being measured while using different aspects (Nelson, Silverman, & Thomas, 2015). During the assessments of this study, a way content validity was checked throughout the study was by having an expert exercise physiologist measure each subject under supervision. To improve the content validity, another expert in the exercise physiology field should perform another similar assessment. Another way to check content validity was using the same formula to determine maximum heart rate.

Construct validity was based on if the testing measures what was supposed to be assessed (Nelson et al., 2015). Since the research was done with female subjects in college, construct validity can be checked in the findings. The only difference with construct validity in this research was that only 48 females participated in the process. Based off those 48 females, the results generalize to college aged, female population. If a different group of female

college students participated in the same study, the construct validity would improve.

Criterion validity, in this research, was how well the type of exercise relates to body composition or cardiorespiratory fitness. Therefore, a way to check the validity of HIIE cycling would be comparing it to HIIE training using a different type of aerobic and anaerobic capacity.

6. Discuss and describe at least five ways to check for reliability of findings.

One of the ways to check reliability of these findings was using the test-retest reliability. To do so, all 48 participants in this study would be required to participate in an additional study performing the same tests using the same methods.

Another way to check the reliability of findings is having multiple experts of exercise physiology assess and take measurements of the same subjects who performed during the study.

Parallel forms reliability was another way to test the consistency of the findings. The subjects who performed the HIIE cycling should perform the CME while cycling so measurements can be taken. On the contrary, the subjects who performed the CME while cycling should perform the HIIE cycling. Subjects then can be evaluated to see if similar results occur.

Internal consistency reliability was also a way to check for reliability of findings. Since the study was measured by one exercise physiologist with expertise in administering and measuring data from both cycling tests,

including the positioning of the heart rate monitor or applying the correct resistance with the appropriate exercise program, the test has high internal consistency reliability (Henson, 2001, p. 177).

The quality of the administrative procedure also affected the reliability of the study. During the study, participants were encouraged to participate using their best effort throughout the duration of the program testing. Keeping a consistent background with the correct explanation and process of testing, such as starting everyone with a five-minute warm-up and finishing with the appropriate cool down, was important for reliability purposes (Miller, 2006, p. 70).

7. Describe methodology decisions that should reduce risk of Type I OR Type II errors in the study.

One of the limitations of the research was not controlling the physical activity outside of the physical education classes and the HIIE or CME by cycling. Not controlling physical activity outside of the study could have influenced results if students performed extra physical activity. On the other end of the spectrum was calorie consumption which also was not strictly maintained. To reduce a type I error, which would provide false positive results, limiting physical activity outside of those parameters could provide more valid and reliable results because subjects reduce any number of excess calories burned outside of the study. Limiting the number of calories consumed per day throughout the duration of the study would also reduce the risk of a type I error.

References

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