23 - INDIRECT DETERMINATION OF AEROBIC POWER OF WOMEN PRACTITIONERS OF INDOOR CYCLING

LEONARDO GEALH
RICARDO ALEXANDRE SPIRONELLO
Universidade Estadual de Maringá, Maringá – Paraná – Brasil
leogealh@yahoo.com

INTRODUCTION

During the physical exercise practice an increased need for oxygen use by the skeletal muscles involved in this activity is observed. The maximal oxygen consumption (VO2max) is widely used as a parameter variable of maximum aerobic power, used to evaluate cardiorespiratory capacity of individuals athletes and non-athletes, and to determine the level of physical fitness (ROBERTO DENADAI, 1999).

According to Villiger et al. (2002, apud RIBEIRO; LAAT; VLASTUIN, 2002) the VO2max is the most comprehensive denominator for the cardiorespiratory and metabolic factors which affect the body's ability to capture, transport and consume oxygen and therefore it is considered the better global criteria to evaluate aerobic resistance.

Among the aerobic workouts that increase significantly the cardiovascular demand, stationary cycling, known as indoor cycling, has been gaining popularity in recent years in the fitness industry. This sport modality can be offered in sports clubs, gyms and physical activity centers and it is considered as an alternative physical training, simulating the street cycling situations, under guidance of an instructor, aiming at the development of muscle and cardiorrespiratory conditioning, decreasing the risk of possible traffic accidents (BARRY, 2000).

This exercise modality is considered an activity with mixed metabolic characteristics, because at some time in this class it is observed a predominance aerobic and in other times, the anaerobic pathway, since during an indoor cycling class there is a constant variation in the intensity of the load on the bike as well as by the Cadence rhythm followed by music. Thus, it is characterized as mixed or interval workout (ROBERTO DENADAI, 2004).

The VO2max parameter determination in clinical and sport evaluation, an automated ergoespirometer with good temporal resolution. Indirect assessments are practical, easy, low cost, and are efficient to assess an individual's fitness since it provides data with less accuracy to determine VO2max contributing to a safer practice and healthy and adequate cardiovascular estimation (BIANCO, 2008).

Thus, the objective of this study was to determine indirectly the aerobic power (VO2max) of women practitioners of indoor cycling, during the maximum incremental test, conducted in cycle Ergometer and compare the values of heart rate (HR) and subjective perception of effort (PSE) comparing the values obtained during during the test and the indoor cycling class.

METHODOLOGY

This is an observational study, transversal, prospective study conducted in a first moment in the exercise Physiology Laboratory of a medical clinic and later in a gym, both in Maringá, Paraná. The data were collected from 12 women aged 25 to 44 years old with an average height of 166 ± 0. 7 cm; 60. 7 ± 7. 6 kg body weight who were invited to participate as volunteers of the assessments.

As a criterion for inclusion adopted the practice time in the mode that should be at least 12 months participating in the indoor cycling classes. All the participants signed a were informed and consent about all procedures by which they would be subjected.

Before the start of the test in the laboratory, each participant remained sitting for three minutes on the cycle-ergometer for determination of resting heart rate (FCrep) and proper adjustment of ergometer to their correct geometry of pedaling. After that, the exercise for another three minutes was performed without external resistance keeping a 60rpm rotation for heating. Without pause, the progressive stress test was started with a load of 30 watts (W) and 30W increments every two minutes, until voluntary exhaustion or when the end could not keep the Cadence of pedaling in 60rpm for more than five seconds. After the end of the test, it was suggested to the participants an active recovery on the bike pedaling for five minutes, in order to verify the FC of recovery.

For indirect determination of VO2max was using the formula proposed by Cooper (1982): VO2max (ml. kg. min -1) = (watts x 12) + 300\/body mass (kg). In which watts refers to the maximum load achieved incremental test; it was considered only the load reached the final stage. Two weeks after the test in the laboratory, the subjective perception of effort (PSE) and heart rate (HR) during an indoor cycling class lasting 45 minutes consisting of eight songs, were determined at the end of each stage with all the study participants simultaneously.

The data are presented as mean ± standard deviation (SD), the normality of the data was checked by the Shapiro-Wilk test.

RESULTS

Table 1 shows the average values ± standard deviation (SD) of variety of characterization of the sample. The group is within the normal range of BMI for age and gender, but with average levels in relation to% G (GH, 1994).

TABLE 1- average values ± standard deviation (SD) of variables: body mass (kg), height (cm), body mass index (BMI, kg/m2), fat percentage (%F), length of lower limbs (MI) left and right.

Variables	Average ± DP
Body Mass (kg)	60,7 ± 7,67
Height (cm)	166,0 ± 0,7
BMI (kg/m^2)	22,7 ± 2,67
%Fat	25,6 ± 6,30
Right MI (cm)	90,8 ± 4,96
Left MI (cm)	90,2 ± 4,85

TABLE 2- The medium values ± standard deviation (DP) of the physiologic variables: maximum consumption of oxygen (VO2max) in relative values and maximum heart rate (FCmax) and subjective perception of effort (PSE) in class and in test:

Variables	Class (n=12)	Test (n=12)
VO_{2max} ($ml.kg.min^{-1}$)	--------	47,7 ± 5,50
HR_{max} (bpm)	176,1 ± 2,7	185,9 ± 10,2
PSE_{final}	17,8 ± 3,5	20 ± 0,0

TABLE 3 – The medium values ± standard deviation (DP) of PSE and FC at the end of each song during a class:

Song	Class PSE	FC (bpm)	N
1	11,2 ± 0,5	112,1 ± 2,7	12
2	12,7 ± 1,1	133,2 ± 2,2	12
3	14,5 ± 7,2	152,1 ± 8,4	12
4	13,9 ± 1,9	135,8 + 3,1	12
5	15,4 ± 6,9	159,5 ± 7,8	12
6	14,1 ± 1,3	146,4 ± 2,8	12
7	17,3 ± 7,1	176,8 ± 8,9	12
8	10,7 ± 2,6	128,2 ± 2,3	12

TABLEA 4 – The medium values ± standard deviation (DP) of PSE and FC at the end of each stage of incremental test:

Stages	Incremental Test PSE	FC (bpm)	N
1	11,6 ± 0,7	128,1 ± 1,8	12
2	11,3 ± 1,1	142,4 ± 3,2	12
3	14,7 ± 3,2	158,6 ± 2,9	12
4	14,2 ± 2,8	144,3 ± 5,3	12
5	16,9 ± 2,1	167,8 ± 7,0	12
6	17,8 ± 1,9	172,8 ± 8,1	12
7	18,1 ± 0,9	185,9 ± 10,2	10
8	19 ± 1,7	190± 13,6	3
9	20 ± 0,0	202	1

DISCUSSION

The values related to anthropometry and body composition are within the reference values for women, as shown in table 1. Both BMI and body fat percentage (% G) are in accordance with the values recommended by ACSM (1998), which reveal that are physically active women. We observed that the measures relating to the length of the lower limbs (90. 8 ± 4. 96) and left (90. 2 ± 4. 85) minor influence on the performance of the incremental test.

In table 2, it was demonstrated that the average value of the VO2max found in our study (47 ml. kg. min -1) is classified highest for the sample evaluated, when compared to the values suggested by Cooper (1982), 45 ml. kg. min -1 for ages of 30 to 39 years old; data showed that the subjects had an excellent level of fitness according to this parameter.

However, this physical conditioning classification is not due only by the training practiced indoor cycling, since many participants were also engaged in other modalities of exercises which were not controlled in our study, such as bodybuilding, squash and other classes that the academy offers, being one of the limitations of the study.

In the study of Vareed (2011), where it was assessed 22 women practitioners of RPM with age of 23. 3 ± 6. 72 years in maximum incremental test, found values of Vo2max of 49 ± ml. kg. min -1 6. 87 which represents similar results to that of our sample, though, using protocols other than the effort.

In table 3 and 4 we can observe that the results for each stage is directly proportional to the progressive moments of the test, i. e. during class at songs 3, 5 and 7 whereas the highest values for both FC and PSE. However during the test the values it found a progressive increase in the effort, respectively.

With respect to these results, other studies showed relative intensity values of similar efforts in indoor cycling classes. In one of them, Ferrari (2004) compared the average stress intensity through the response by percentage of FCmax in the Spinning ® RPM ®programs in 14 young women practitioners of these programs.

However, it was not observed significant differences among them. The average values of FCmáx during classes were from 82.7% for the Spinning ® program and 84. 7% for the RPM program ®. These values are in accordance to the ACSM recommendations (2006) about the intensity of effort to the aerobic training and the improvement of the cardio-respiratory capacity.

CONCLUSIONS

Our data showed that the indoor cycling classes promote a great request cardio-respiratory system, promoting values of FC according to the ACMS recommendations (1998). Also, that the two forms of control (FC and PSE) are complementary. The values obtained through the incremental cycle Ergometer test in these women were satisfactory and considered highest in the average predicted for age according to the guidelines of the ACMS (2006).

However, the values of FCmáx and PSEmáx found in class were lower than those attained during the test, indicating that in class the maximum effort was not reached by the participants, addressing that the type of effort into the indoor cycling class is mixed, predominantly aerobic or anaerobic.

It is recommended that the practice of indoor cycling as exercise to acquire a better cardio-respiratory conditioning and improving aerobic fitness as well as other studies with different samples to ascertain other physiological variables compared to maximum tests.

REFERENCES

AMERICAN COLLEGE OF SPORTS MEDICINE. Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. Med Sci Sports Exerc, Hagerstown, v. 30, p. 975-989, 1998.

BARRY, E. et al. Manual do Professor de RPM. Nova Zelandia: Les Mills International, Auckland, 2000.

BIANCO, A. New insights into indoor cycling training. A review. Revista Della Facolta Di Scienze Motorie, Verona, v.1, no. 1, p. 219-228, 2008.

DENADAI B. S. Índices fisiológicos da avaliação aeróbia: conceitos e aplicações. Ribeirão Preto: BSD, 1999.

RIBEIRO A. S; LAAT E.; VLASTUIN J. A comprovação do princípio da especificidade na escolha do ergômetro como um meio de avaliação da capacidade cardiorrespiratória em atletas de diferentes modalidades esportivas. Simpósio de educação física e desportos do sul do Brasil, v.14, 2002, Ponta Grossa. Anais. Ponta Grossa: Ed., 2002. p. 39.

DENADAI B. S. Comparações das respostas fisiológicas durante a corrida e o ciclismo: implicações para a avaliação e prescrição do exercício. In: MOREIRA WW, SIMÕES R. Educação Física, intervenção e conhecimento científico. Piracicaba: Ed. da Unimep, 2004. p. 220-233.

FERRARI H. G. Comparação da intensidade de esforço entre dois diferentes programas de ciclismo indoor: Spinning e RPM®. Congresso científico latino-americano de educação física, v.3, 2004, Piracicaba. Anais... Piracicaba: Unimep, 2004. p. 67-71.

GUEDES D. P. Composição corporal: princípios, técnicas e aplicações. Londrina: Associação dos Professores de Educação Física, 1994.

VIDOTTI, M; FÁVARO, O. R. Intensidade de esforço durante ciclismo indoor em mulheres treinadas e iniciantes. Revista Digital E.F. Deportes, Buenos Aires, ano 15, n. 153, 2011.

leogealh@yahoo.com
Rua: Bogotá. N° 1064. Vila Morangueira.
Maringá – PR. CEP: 87040-120

INDIRECT DETERMINATION OF AEROBIC POWER OF WOMEN PRACTITIONERS OF INDOOR CYCLING

ABSTRACT

The indoor cycling (IC) is currently one of the most physical practice performed in gyms. Thus, the knowledge of the physiological responses of this sport practice is important. The aim of this study was to determine indirectly the aerobic power (VO2max) of women practitioners of IC during an incremental cycle Ergometer test performed at maximum and to compare the values of heart rate (HR) and subjective perception of effort (PSE) obtained during the test and a class of IC. Twelve apparently healthy women have participated in this study, all active physically and practitioners of RPM ® program for at least 12 months. We conducted a maximum incremental test cycle Ergometer cycling with 30W increments every two minutes until voluntary exhaustion. Later, the participants were followed during a lesson in ICI being monitored by CF and PSE at the end of each song. The average value of Vo2max found was 47 ml. kg. min -1 which was considered excellent for this sample. The average values of FCmax during the test and class were 185. 9 ± 10. 2 bpm and 176. 1 ± 2, 7bpm, respectively and the PSE was 17. 8 ± 3. 5 maximum for in class and 20.0 ±0.0 for the test. Therefore, we conclude that during the incremental test the participants reached higher values of FC and PSE, demonstrating a submaximal effort during the IC class, since the type of exercise is characterized as emphasizing the importance of interval workouts with varying intensity.

KEYWORDS: maximal oxygen consumption, indoor cycling, subjective perception of effort.

DÉTERMINATION INDIRECTE DE LA PUISSANCE AÉROBIE DES FEMMES MEDECINS DU CYCLISME EM SALLE

RÉSUMÉ

Le cyclisme intérieur (IC) est actuellement une pratique physique (indoor) plus exécutée dans des gymnastiques (des salles de sport). Ainsi, la connaissance des réponses physiologiques de cette pratique sportive est importante. Le but de cette étude était de déterminer indirectement la puissance aérobie (VO2max) des femmes praticiens de d'IC pendant un cycle progressif par le test d'ergomètre exécuté au maximum et comparer les valeurs de taxe du coeur (HR) et la perception subjective d'effort obtenu par le test pendant une classe d'IC. Douze femmes apparemment saines ont participatée dans cette étude, tout actif physiquement et les praticiens du programme RPM® pendant au moins 12 mois. Nous avons conduit un cycle progressif maximal de test Ergomètre faisant du vélo avec 30W des incréments toutes les deux minutes jusqu'à l'épuisement volontaire. Plus tard, les participants ont été suivis pendant une leçon dans ICI étant contrôlé par FC et à la fin de chaque chanson. La valeur moyenne de VO2max trouvé était 47 ml.kg.min-1 qui a eté considéré excellent pour cet échantillon. Les valeurs moyennes de FCmax pendant le test et la classe étaient 185.9 ± 10.2 bpm et 176. 1 ± 2, 7bpm, respectivement et la PSE maxime était 17. 8 ± 3. 5 dans la classe et 20.0 ±0.0 pour le test. Nous concluons que pendant le test progressif les participants ont atteint les valeurs plus hautes de FC, démontrant un effort sous maximal pendant la classe d'IC, puisque le type d'exercice est caractérisé comme le soulignage de l'importance de séances d'entraînement d'intervalle avec l'intensité variante.

MOTS-CLÉS: consommation d'oxygène maximale, cyclisme intérieur, perception subjective d'effort.

DETERMINACIÓN INDIRECTA DE LA POTENCIA AERÓBICA DE MUJERES PROFESIONALES DE CICLISMO INDOOR

RESUMEN

El ciclismo de interior (IC) es actualmente una de la práctica física más realizada en gimnasias. Así, el conocimiento de las respuestas fisiológicas de esta práctica de deporte es importante. El objetivo de este estudio fue determinar indirectamente el poder aeróbico (VO2max) de mujeres practicantes de IC durante un ciclo incremental en la prueba de ergómetro realizada en el máximo, y comparar los valores de la tasa de lo corazón , y la percepción subjetiva de esfuerzo obtenido durante la prueba del examen y una clase de IC. Doce mujeres al parecer sanas tienen paticipated en este estudio, todasf ísicamente activas y practicantes del programa RPM ® durante al menos 12 meses. Condujimos un ciclo incremental máximo de prueba em com el Ergómetro con incrementos de 30W en cada dos minutos hasta el agotamiento voluntario. Más tarde, los participantes fueron seguidos durante una classe de IC siendo supervisado por FC al final de cada canción. El valor medio de VO2max encontrado fue 47 ml. kg. min -1que fue considerado excelente para esta muestra. Los valores medios de FCmax durante la prueba y la clase eran 185. 9 ± 10. 2 bpm y 176. 1 ± 2, 7bpm, respectivamente y del PSE fue de 17. 8 ± 3. 5 máximo para en clase y 20.0 ±0.0 para la prueba. Por lo tanto, concluimos que durante la prueba incremental los participantes alcanzaron los valores más altos de FC demostrando un esfuerzo submáximo durante la classe de IC, ya que el tipo de ejercicio es caracterizado como la acentuación de la importancia de entrenamientos de intervalo con la intensidad que varía.

PALABRAS CLAVE: consumo de oxígeno máximo, ciclismo de interior, percepción subjetiva de esfuerzo.

DETERMINAÇÃO INDIRETA DA POTÊNCIA AERÓBIA DE MULHERES PRATICANTES DE CICLISMO INDOOR

RESUMO

O ciclismo indoor (CI) é uma das modalidades mais praticadas, atualmente, nas academias de ginástica. Desta forma, o conhecimento das respostas fisiológicas que este exercício provoca se faz importante. O objetivo deste trabalho foi determinar indiretamente a potência aeróbia (VO2max) de mulheres praticantes de CI durante teste incremental máximo realizado em cicloergômetro e comparar os valores de freqüência cardíaca (FC) e percepção subjetiva de esforço (PSE) obtidos durante um teste e durante uma aula de CI. Participaram do estudo 12 mulheres aparentemente saudáveis, todas ativas fisicamente e praticantes do programa RPM® há pelo menos 12 meses. Foi realizado um teste incremental máximo de ciclismo em cicloergômetro com incrementos de 30W a cada dois minutos até exaustão voluntária. Posteriormente, as participantes foram acompanhadas durante uma aula de CI sendo monitoradas pela FC e PSE ao final de cada música. Os valores médios de VO2máx encontrados foram de 47 ml.kg.min-1 considerados excelente para esta amostra. Os valores médios da FCmax durante o teste e aula foram de 185,9 ± 10,2 bpm e 176,1 ± 2,7bpm, respectivamente e a PSE máxima foi de 17,8 ± 3,5 em aula e de 20,0 ± 0,0 no teste. Portanto, concluímos que durante o teste incremental as participantes atingiram valores mais elevados de FC e PSE máximos, demonstrando que durante a aula de CI realiza-se um esforço submáximo, visto que o tipo de exercício é caracterizado como intervalado ressaltando a importância de realizar treinos com variação de intensidade.

PALAVRAS-CHAVE: consumo máximo de oxigênio, ciclismo indoor, percepção subjetiva de esforço.