

INCREASING OF AEROBIC FITNESS OF STUDENTS WITH PRECISELY DOSED WORKLOADS

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Abstract

Aerobic physical working capacity (PWC) or aerobic fitness is one of the health indicators that characterize the cardiovascular, respiratory and other systems of the body functional state. Youth and student physical activity levels are very low. 254 students participated in aerobic fitness activities test to find improvement opportunities in aerobic fitness using precisely dosed workloads. The research results show that aerobic fitness is not dependant from physical activities with low intensity. Training program with gradually increasing and varying workload and intensity increases aerobic fitness much more than the program with the same volume, average intensity but homogeny workload.

KEYWORDS: Maximal oxygen consumption, aerobic fitness, precisely dosed workloads

Introduction

Aerobic physical working capacity (PWC) or aerobic fitness is one of the health indicators that characterize the cardiovascular, respiratory and other systems of the body functional state. Aerobic fitness is dependent on many factors: health status, gender, age, and the level of physical activity. Youth and student physical activity levels are very low. Students spend many hours sitting in lectures, libraries, doing homework, as well as sitting in front of TV and computer. It will result in the students' physical working capacity decreasing and does not improve health. Different sources of literature have different data on student activity level, but generally inactive student rate ranges from 22% to 88 % [Bianchini de Quadros, 2009; Irwin, 2007; Madanat, 2006; Mitchell, 2008]. Physical inactivity is an actual public health problem [Bianchini de Quadros, 2009, Chevan, 2010; Rees, 2006; Rezaimakesh, 2006], and lack of physical fitness at a young age is a provocative factor for health problems later in life [Madanat, 2006, Rees, 2006; Sauka, 2011; Warburton, 2006]. It is therefore important to start training, or to continue the exercise. Similarly, physical activity affects the improvement of metabolism; reduce blood pressure, increase blood volume, decreasing heart rate both at rest and during exercise, increasing heart and contractile ability to increase blood volume, as well as improving both inspiratory and expiratory reserve volumes and vital intensity and total capacity [Love, 2011; Park, 2010; Rezaimakesh, 2006, Scharhag-Rosenberg, 2010; Schjerve 2008]. Medical and health care professionals need to be physically active themselves, not only their own well-being and health, but also to be able to motivate their customers to an active lifestyle [Chevan, 2010; Mitchell, 2008; Rao, 2012]. Regular physical activity in a relatively short time, substantially increase aerobic physical working capacity [Arnīs, 2004; McArdle, 2010], coaching effectiveness depends mainly on the intensity of the load.

Aim of the research. To asses relationship between maximal oxygen consumption and physical activity at different intensities and find improvement opportunities in aerobic fitness using precisely dosed workloads.

Object of the research. 254 students (198 women and 56 men) participated in aerobic fitness activities

Methods and methodologies. Students participated in aerobic fitness activities by using Eurofit cycle ergometer (endurance) test, which evaluated maximum oxygen consumption (ml) to body weight (kg) in minute. Three sets of results according hearth rate (HR) (120-140; 140-160 and 160-180 beets/minute) and different length workloads been evaluated during the research: relationship between maximal oxygen consumption and physical activity with low intensity (walking, housework, gardening etc.), as well as relationship between maximal oxygen consumption and frequency of physical exercise and change of aerobic fitness with precisely dosed workloads for 54 students. For precisely dosed workloads we used heart rate monitors "Polar Coach" and Polar A5"

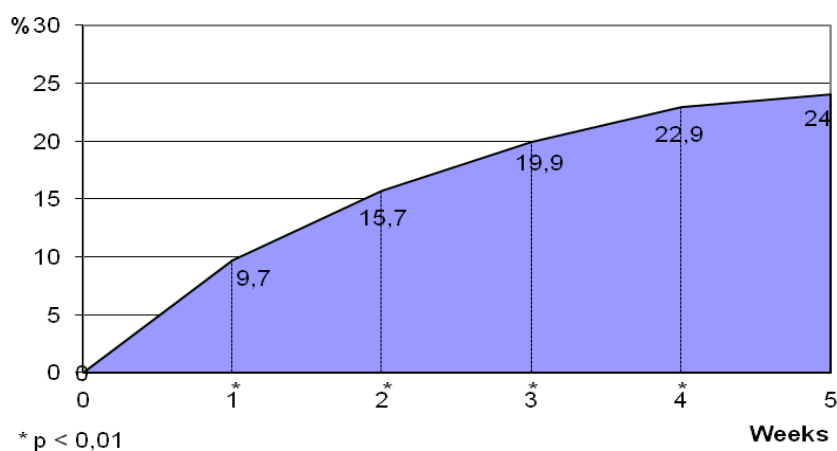
Results of the research

Results of the research showed that there was no statistically significant relationship between maximal oxygen consumption and low-intensity physical activity not women, nor men.

Relationship between maximal oxygen consumption and frequency of physical exercise (picture 1.) shown statistically validity ($p < 0,1$), but correlation between data is low (women $r=0,27$, men $0,41$).

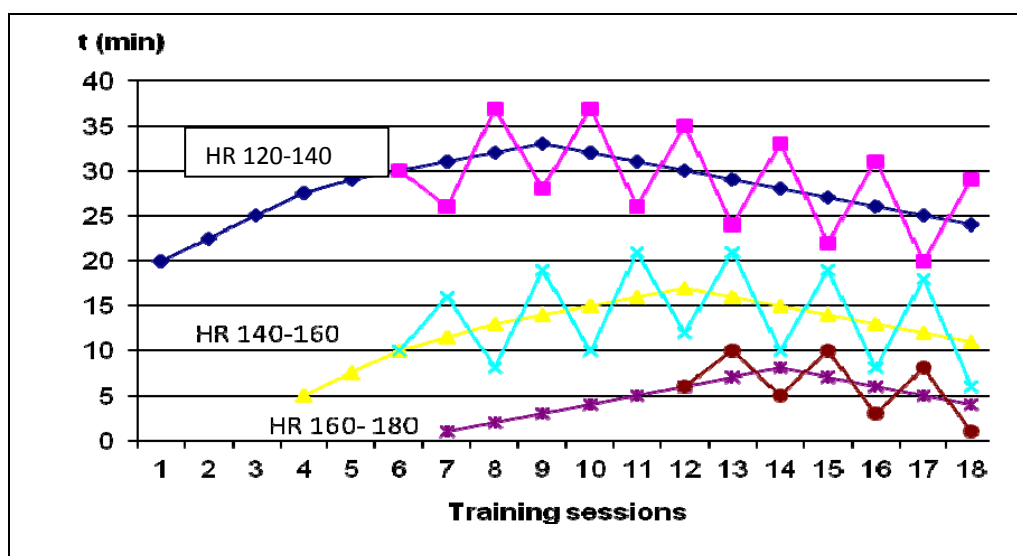
Regularly engaging in various physical exercises twice a week for 1 to 1.5 hours without heart rate monitoring, aerobic physical working capacity is increasing in one year on average, for women only 8.6% for men 9.5% [McArdle, 2010]. If workloads is precisely dosed and heart rate (HR) in the range 60-80% of the maximal HR (or HR 120-160x per minute) twice a week for 40 minutes, then the aerobic fitness increasing in a month on average rates for women (n = 19) for 21 6% (from 32.6 ± 4.4 to 39.64 ± 4.8 ml / kg / min) and women (n = 13) 19.7% (from 41.7 ± 5.1 to $49,91 \pm 5.6$ ml/kg/min).

Dosage of training workload in three diapasons of intensity (HR 120-140 27 min, HR 140-160 10 min, HR 160-180 3 min), with homogeny type of exercises aerobic fitness increased statistically valid ($p < 0,01$) in first forth weeks, but at the fifth week changes are small and not statistically valid. (picture 1).

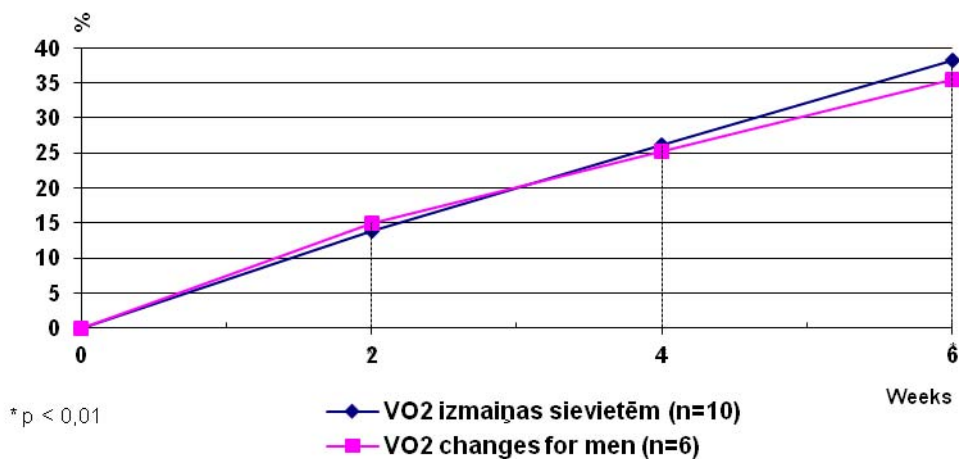


Picture 1. Changes in aerobic fitness for women (n=6) exercising 40 minutes 3 times per week (HR 120-140 27 min, HR 140-160 10 min, HR 160-180 3 min) in %.

Dosage of training workload in three diapasons of intensity and exercising 3 times per week (picture 2.) 20-55 minutes (average 40 min) aerobic fitness in 6 weeks statistically significant increased (picture 2.) for women (n=10) by 38,2% (VO₂ increase from $34,3 \pm 4,2$ to $47,4 \pm 4,9$ ml/kg/min) un men (n=6) by 35,6% (VO₂ increase from $42,1 \pm 6,8$ to $57,1 \pm 7,3$ ml/kg/min).



Picture 2. Dosage of training workload in three diapasons of intensity with gradually increasing and varying workload and intensity (3 trainings per week, 6 weeks, totally - 18 trainings)



Picture 3. Changes % of aerobic fitness exercising 3 times per week with varying workload capacity (20-55 min) and gradually increasing and varying intensity

Conclusions

Aerobic fitness is not dependant from physical activities with low intensity for women and man ($p > 0.05$). Relationship ($p < 0.01$) between maximal oxygen consumption and frequency of physical exercises was found. As a result of precisely dosed physical workloads aerobic fitness of untrained students remarkably increased. Training program with gradually increasing and varying workload and intensity increases aerobic fitness much more than the program with the same volume, average intensity but homogeny workload.

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Ievads. Aerobās darbaspējas (AD) ir viens no veselības rādītājiem, kas raksturo sirds un asinsvadu, elpošanas, kā arī citu organisma sistēmu funkcionālo stāvokli. Aerobās darbaspējas ir atkarīgas no daudziem faktoriem: veselības stāvokļa, dzimuma, vecuma, kā arī no fiziskās aktivitātes līmeņa. Jaunatnes un studentu fiziskās aktivitātes līmenis ir ļoti zems. Studenti daudzas stundas pavada sēžot lekcijās, bibliotēkās, gatavojot mājas darbus, kā arī pie televizora un datora. Tā rezultātā pazeminās studentu darbaspējas un pasliktinās veselības stāvoklis.

Pētījuma mērķis. Izpētīt aerobo darbaspēju atkarību no dažādas intensitātes fiziskām slodzēm un to paaugstināšanas iespējas ar precīzi dozētām slodzēm.

Metodes un rezultāti. Aerobās darbaspējas un to izmaiņas noteiktas ar Eirofit veloergometrisko testu pēc kura nosaka skābekļa maksimālo patēriņu milimetros uz ķermeņa masas kilogramu minūtē. Aerobās darbaspējas tika noteiktas 254 studentiem (198 sievietēm un 56 vīriešiem) vecumā no 18 līdz 24 gadiem

Pētījumā tika noskaidrots, ka nav statistiski ticama sakarība starp aerobajām darbaspējām un zemas intensitātes fizisko aktivitāti ne sievietēm, ne arī vīriešiem. Regulāri nodarbojoties ar dažādiem fiziskiem vingrinājumiem divas reizes nedēļā pa 1 - 1,5 stundām bez sirds ritma kontroles, aerobās darbaspējas sievietēm mācību gada laikā pieaug vidēji tikai par 8,6% un vīriešiem par 9,5% (10). Ja slodze tiek precīzi dozēta un noturēta sirds ritma (SR) diapazonā 60 – 80% no maksimālā SR (jeb SR 120-160x minūtē) divas reizes nedēļā pa 40 minūtēm, tad darbaspējas jau mēneša laikā vidēji pieaug sievietēm (n=19) par 21,6% (no 32,6±4,4 līdz 39,64±4,8 ml/kg/min) un vīriešiem (n=13) par 19,7% (no 41,7±5,1 līdz 49,91±5,6 ml/kg/min). Ja slodze ir saplānota un precīzi dozēta trijos intensitātes diapazonos, kā arī slodzes apjoms un intensitāte ir pakāpeniski augoši un mainīgi (sk.4. att.), tad, nodarbojoties trīs reizes nedēļā pa 20-55 minūtēm (vidēji 40 min) aerobās darbaspējas 6 nedēļās statistiski ticami pieaug (sk.5. att.) vidēji sievietēm (n=10) par 38,2% (VO₂ pieaug no 34,3±4,2 līdz 47,4±4,9 ml/kg/min) un vīriešiem (n=6) par 35,6% (VO₂ pieaug no 42,1±6,8 līdz 57,1±7,3 ml/kg/min).

Secinājumi. Precīzi dozētu fizisku slodžu (2-3 reizes nedēļā pa 20 – 55 min) ietekmē mazinātu studentu aerobās darbaspējas pieaug ievērojami, strauji un statistiski ticami. Treniņu programma ar pakāpeniski augošu un mainīgu slodzes apjomu un intensitāti dod daudz lielāku darbaspēju pieaugumu nekā tāda pati pēc kopējā apjoma un vidējās intensitātes vienveidīga slodze.