Physiology & Immunology Paralell Oral Session
Friday, September 15th, 14h00

PS099

Differences in aerobic capacity and spirometric parameters between athletes and nonathletes

V. Kostić

Department of Physiology, Faculty of Medicine, University of Novi Sad, Serbia
E-mail address: kostasm91@gmail.com.

Aim: To investigate if there are differences in aerobic capacity and spirometric parameters between athletes and nonathletes, and also differences in these parameters between anaerobic and aerobic athletes.

Introduction: Physical fitness is defined as ability of organism to increase level of metabolic processes due to increased level of metabolic needs. Aerobic capacity is measured by maximum level of oxygen consumption (VO2max), and it can be expressed by absolute (l/min) or relative (ml/kg/min) value. Pulmonary capacity has great evaluation importance for sport and health of general population.

Methods: Number of participants was 45 males, aged 18–35 years, divided into 2 groups: athletes and nonathletes. Athletes were divided by sport type in aerobic and anaerobic group of athletes. Testing was consisted of anthropometric measuring, spirometry and measuring of aerobic capacity on ergobycicle with mask, by principle of ramp test.

Results: Value of VO2max in group of athletes (55.46 ml/kg/min, $p < 0.05$) was significantly greater than in group of nonathletes (37.78 ml/kg/min, $p < 0.05$). Compared between all groups, VO2max showed significant difference in both aerobic (58.88 ml/kg/min, $p < 0.05$) and anaerobic (52.04 ml/kg/min, $p < 0.05$) athletes in relation to nonathletes (38.78 ml/kg/min, $p < 0.05$). Spirometric parameters (FVC, FEV1) were significantly greater in group of nonathletes (5.481 L, 4.951 L, $p < 0.05$) than in group of athletes (4.874 L, 4.635 L, $p < 0.05$). Compared between all groups, we found significant difference in FVC between group of nonathletes (5.481 L, $p < 0.05$) and anaerobic athletes (4.807 L, $p < 0.05$), and in Tiffeneau index between group of anaerobic athletes (97.29%, $p < 0.05$) and nonathletes (90.82%, $p < 0.05$).

Conclusion: Values of anthropometric parameters are greater in group of nonathletes. Differences in body weight and body mass caused greater values of FVC and FEV1 in group of nonathletes. Values of aerobic capacity are increasing with training. The greatest values of aerobic capacity are shown by aerobic athletes.

Acknowledgements: To Department of Physiology, Faculty of Medicine, Novi Sad for using their resources; To Athletic Club "Vojvodina", Novi Sad and Triathlon Club "Tryogy" for participating; To Assist. Proff. Aleksandar Klašnja for mentorship.[1–15]

References

1. Bowers RW, Fox EL, Foss ML. In: Bowers RW, editor. The physiological basis of physical education and athletics. 3rd ed. Boston: Saunders College Publishing; 1988.
2. Whyte G, Spurway N, MacLaren D. In: Whyte G, editor. The physiology of training. Churchill Livingstone; 2006.
3. Ranković G, Mutavdžić V, Toskić D, Preljević A, Kocić M, Nedin-Ranković G, et al. Aerobic capacity as an indicator in different kinds of sports. Bosn J Basic Med Sci. 2010;10:44–8.
4. Shin YS, Yang SM, Kim MY, Lee LK, Byoung-Sun Park LWD, Noh JW, et al. Analysis of the respirogram phase of Korean wrestling athletes compared with nonathletes for sports physiotherapy research. Phys Ther Sci. 2016;28:392–8.
5. Ponorac N, Matavulj A, Grujić N, Rajkovača Z, Kovačević P. Maximal oxygen uptake (VO2 max) as the indicator of physicalworking capacity in sportsmen. Acta Med Med. 2005;44:17–20.
6. Pelemiš V, Mitrović N, Cicović B, Lolić D. Maximal oxigen consumption for different groups of athletes. Sportske nauke i zdravlje. 2011;1:52–7.
7. Albouaini K, Egred M, Alahmar A, Wright DJ. Cardiopulmonary exercise testing and its application. Postgrad Med J. 2010;83:675–82.
8. de Jong F. Lung function testing feature: spirometers. Breathe. 2008;4:251–4.
9. Myrianthefs P, Grammatopoulou I, Katsoulas T, Baltopoulos G. Spirometry may underestimate airway obstruction in professional Greek athletes. Clin Respir J. 2014;8:240–7.
10. Wilmore JH, Costil DL. Physiology of sport and exercise. 2nd ed. USA: Human Cinetics; 1999.
11. Verstappen F, Huppertz R, Snoeckx L. Effect of training specificity on maximal treadmill and bicycle ergometer exercise. Int J Sport Med. 1982;3:43–6.
12. Klisuras V. Fundamentals of sports physiology belgrade. Institut Za Sport; 2013.
13. Kausar A, Mudassir S, Badaam KM, Shete A, Khan S. Cardiorespiratory fitness of university volleyball players and sedentary youngpeople in marathwada region of Maharashtra Province in India. J Clin Diagn Res. 2015;9:20–1.
14. Herdy AH, Caixeta A. Brazilian cardiorespiratory fitness classification based on maximum oxygen consumption. Arq Bras Cardiol. 2016;106:389–95.
15. Franchini E, Vecchio FBD, Matsushigue KA, Artioli GG. Physiological profiles of Elite Judo athletes. Sports Med. 2011;41:147–66.

http://dx.doi.org/10.1016/j.pbj.2017.07.022

PS070

The assessment of body composition, energy demands and muscle strength in people on different dietary regimes

Dj. Milicev[1,*], M. Bogdan[2], A. Rakovac[1,2], V. Karan[1,2], A. Klašnja[1,2], M. Drapšin[1,2]

[1] *Faculty of Medicine, University of Novi Sad, Serbia*
[2] *Department of Physiology, Faculty of Medicine, University of Novi Sad, Serbia*
E-mail address: milicev.dj@gmail.com
(Dj. Milicev).

Aim: The aim of this study was to determine whether there are any differences in body composition, energy demands and muscle strength between people on different dietary patterns.

Introduction: There are numerous types of diets: vegan, vegetarian, and non-vegetarian. Considering the dietary pattern, the assessment of the body composition and determining the resting metabolic rate are a major challenge for many researchers. Regarding the muscle strength of physically inactive participants related to dietary patterns, there is no current data in literature.

Methods: The study was conducted at the Department of Physiology, Faculty of Medicine University of Novi Sad from November 2016 to February 2017. The study included 45 healthy, physically inactive randomly selected respondents (15 vegans, 15 vegetarians, 15 on a mixed diet) aged 20–30 years. All respondents practiced their dietary regime for at least 6 months before research. Firstly, the anthropometric measurements were done, and later the body composition was assessed using bioelectrical impedance and by measuring skin folds. The resting metabolic rate was estimated using the indirect calorimetric method. The muscle strength was determined using the isoaccelerating dynamometer.

Results: The values of body mass index (BMI) between the group on a mixed diet (23.9 ± 2.95 kg/m^2) and vegans (20.8 ± 2.58 kg/m^2) showed a statistically significant difference ($p < 0.05$). The BMI (21.3 ± 2.63 kg/m^2) for vegetarians did no differ from the other groups. Statistically significant differences between groups in other parameters of body composition, resting metabolic rate and muscle strength were not found. A negative correlation was observed between total body fat, resting metabolic rate and muscle strength in all groups.

Conclusion: Diet differences between tested groups affected only the value of BMI between vegans and non-vegetarians. The impacts of different diets on other parameters of body composition,

resting metabolic rate and muscle strength were not confirmed by this study.

http://dx.doi.org/10.1016/j.pbj.2017.07.023

PS146

Titin phosphorylation by protein kinase G as a novel mechanism of diastolic adaptation to acute load

R. Rocha [1,*], J. Almeida-Coelho [1], A.M. Leite-Moreira [1], J.S. Neves [1,2], N. Hamdani [3], I. Falcão-Pires [1], A.P. Lourenço [1,4], W.J. Paulus [5], W.A. Linke [3], A.F. Leite-Moreira [1,6]

[1] *Department of Physiology and Cardiothoracic Surgery & Cardiovascular Research Center, Faculty of Medicine, University of Porto, Portugal*
[2] *Department of Endocrinology, São João Hospital Center, Porto, Portugal*
[3] *Department of Cardiovascular Physiology, Ruhr University Bochum, Germany*
[4] *Department of Physiology, Institute for Cardiovascular Research, VU University Medical Center, Amsterdam, The Netherlands*
[5] *Department of Anesthesiology, São João Hospital Center, Porto, Portugal*
[6] *Department of Cardiothoracic Surgery, São João Hospital Center, Porto, Portugal*
E-mail address: rafaelm_rocha@hotmail.com
(R. Rocha).

Aim: To evaluate acute adaptions of myocardial stiffness to acute stretch and characterize the underlying mechanisms.

Introduction: Systolic adaption to myocardial stretch/volume overload is known, but whether the heart is also able to modulate its stiffness following such challenges remains unknown.

Methods: Left ventricle (LV) of intact rat Langendorff hearts, rabbit papillary muscles and myocardial strips from cardiac surgery patients were acutely stretched. Skinned cardiomyocytes from Stretched and Non-stretched myocardium were studied. Stretch by increased venous return or volume loading was assessed by echocardiography in healthy volunteers; pressure-volume hemodynamics in cardiac surgery patients and in a rat model of LV hypertrophy. Myocardial cGMP, phosphorylated vasodilator-stimulated phosphoprotein (VASP) and titin phosphorylation were quantified. Pharmacological studies assessed the role of NO and natriuretic peptides (NP).

Results: After stretch, end-diastolic pressure (EDP) or passive tension (PT) decreased over 15 min in all preparations. Skinned cardiomyocytes from Stretched hearts showed decreased PT – abrogated by protein phosphatase incubation – those from Non-stretched hearts showed decreased PT after protein kinase (PKG) incubation. Stretched samples showed increased cGMP levels and phosphorylation of VASP. Titin phosphorylation was increased in Stretched samples – attenuated by PKG inhibition (PKGi). PT decay after stretch was blunted by PKGi or by joint NP antagonism, NO synthase inhibition and NO scavenging. Moreover, it was remarkably attenuated in hypertrophic rat hearts which showed reduced titin phosphorylation and no increase with stretch. Healthy volunteers and cardiac surgery patients showed E/E' and EDP decrease after sustained stretch maneuvers, respectively.

Conclusion: We describe a novel physiological mechanism whereby myocardial compliance is increased in response to stretch/volume overload, by titin phosphorylation through cGMP-PKG signaling. The mechanism was translated to human physiology and may be abolished in the hypertrophic heart (potential role in the pathophysiology of heart failure with preserved ejection fraction).

http://dx.doi.org/10.1016/j.pbj.2017.07.024

PS172

Cannabis sativa tetrahydrocannabinol (THC) impact on placental endocrine function

L. Midão [1,3,*], J. Maia [1,2], M. Almada [1,2], B. Fonseca [1,2], D. Gonçalves [4], J. Braga [4], N. Teixeira [1,2], G. Correia-da-Silva [1,2]

[1] *Laboratório de Bioquímica, Faculdade de Farmácia Universidade do Porto, Porto, Portugal*
[2] *UCIBIO-REQUIMTE, Porto, Portugal*
[3] *Departamento de Química, Universidade de Aveiro, Aveiro, Portugal*
[4] *Departamento da Mulher e da Medicina Reprodutiva, Serviço de Obstetrícia, Centro Materno-Infantil do Norte- Centro Hospitalar do Porto, Porto, Portugal*
E-mail address: midao@ua.pt
(L. Midão).

Aim: The main goal of this work is to understand the impact of THC on placenta endocrine function.

Introduction: Cannabis sativa-based medicines have been used to help ease pain, nausea and loss of appetite in cancer and HIV patients. Endocannabinoid system plays an important role in the regulation of female fertility and pregnancy. This system is implicated in proliferation, differentiation and apoptosis of placental stem cells, the trophoblasts (1). These mediate critical steps such as hormone production, fetal immune protection and increase in maternal vascular blood flow. Previous studies have shown that cannabis consumption during pregnancy is associated with intrauterine growth restriction, preterm labor and low birth weight. Moreover, tetrahydrocannabinol (THC), the main psychoactive compound of cannabis, is able to cross the placental barrier. However its effect on trophoblasts turnover and hormone production are unknown.

Methods: Term placental explants were treated with THC [1–40 μM] for 24 h to 72 h. The relative mRNA levels of 3β-HSD, aromatase, leptin and PP13 were determined by qRT-PCR. The protein expression levels of 3β-HSD, aromatase and leptin were assessed by Western Blot. Progesterone, estradiol and β-human chorionic gonadotropin (β-hCG) levels were measured by ELFA.

Results: After 24 h, PP13 mRNA levels were significantly increased at 40 μM of THC, while for leptin this effect was observed at 10 μM. Moreover, after 72 h aromatase mRNA levels were increased, while there was no effect on 3β-HSD. No differences were observed regarding progesterone whilst, an increase in estradiol and β-hCG with 40 μM at 72 h was detected.

Conclusion: These findings suggest that THC may impair trophoblast turnover and endocrine function which may affect pregnancy outcome. Moreover these results may contribute to disclose the cellular effects of cannabis-derived drugs.

Acknowledgements: Work financed by FEDER through COMPETE and FCT through PTDC/DTP-FTO/5651/2014-POCI-01-0145-FEDER-016562; FCT/MEC and FEDER, under PT2020 (UID/01/0145/FERDER/007728) and CCDR-N/NORTE2020/Portugal 2020 (norte-01-0145-FEDER-000024.[1]