



The Relationship between Physical Fitness and Selected Anthropometric and Cardiometabolic Parameters in Adults

Jana Lipkova¹, Helena Medekova¹, Lukas Chovanec¹, Katarina Hirosova²,
Martin Samohyl², Ivana Kachutova², Lubica Argalasova², *Jana Jurkovicova²

1. Faculty of Physical Education and Sports, Comenius University in Bratislava, Bratislava, Slovakia
2. Institute of Hygiene, Faculty of Medicine, Comenius University in Bratislava, Bratislava, Slovakia

*Corresponding Author: Email: jana.jurkovicova@fmed.uniba.sk

(Received 10 Dec 2019; accepted 25 Dec 2019)

Dear Editor-in-Chief

Repeatedly observed physical inactivity and poor physical fitness in the population of developed countries have a significantly negative impact on overall health, and consecutively, quality of life (1). The burden of cardiovascular and other chronic diseases caused by insufficient physical activity is huge mainly due to the high prevalence of sedentary lifestyle in recent decades (2, 3).

We aimed to assess the association between physical fitness and selected anthropometric and cardiometabolic factors in adults of working age and to evaluate intersexual differences in men and women with different levels of physical fitness.

One hundred sixty-nine participants (36.7% men; an average age 42.6 ± 14.0 yr.) were enrolled in the study from employees of the research institutes in Bratislava, the capital of Slovakia with predominantly university educational degree (87% men, 78% women). Regular anthropometric methods were used (weight, height, waist/hip circumferences; body fat content using bioelectric impedance analysis). Body Mass Index (BMI), waist/hip ratio (WHR), and waist/height ratio (WHtR) were calculated. Blood lipids (TC, TG, HDL-C) were determined using an automated dry chemical screening method (Reflotron system). LDL

cholesterol (LDL-C) and atherogenic indexes (TC/HDL-C; $\log(\text{TG}/\text{HDL-C})$) were calculated. Blood pressure (BP) as well as resting heart rate (HR) were measured by means of the digital BP monitor Omron. The 2-km Walk Test – a well-suited test for the assessment of health-related fitness among the general population (4) was used to detect the overall physical fitness.

The outcome was evaluated as a Fit index (FI); the person's gender, age, weight, height, the total time required for 2km walking, and a final HR were taken into consideration. The level of physical fitness can be evaluated according to FI in 5 classes as considerably and/or somewhat below average (<70; 70-89, respectively), average (90-110), somewhat and/or considerably above average (111-130; >130, respectively).

The data were analyzed by the SPSS software (Chicago, IL, USA). Descriptive statistics, Pearson's chi-square test, Spearman's correlations, partial linear regression model (education level and age adjusted) and Kruskal-Wallis test were used. The significance level was set at P -value <0.05.

The average fitness level of all participants was lower than the average range ($\text{FI}=87.2 \pm 15.4$).



Copyright © 2021 Lipkova et al. Published by Tehran University of Medical Sciences.
This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license
(<https://creativecommons.org/licenses/by-nc/4.0/>). Non-commercial uses of the work are permitted, provided the original work is properly cited.

None of the whole sample achieved a maximal fitness level (>130). A significantly higher level of physical fitness in men compared to women has been confirmed ($\chi^2=9.262$, $P<0.05$). The correlation analyses as well as partial linear regression model present significant negative associations between physical fitness and all observed anthropometric parameters in both genders. This means that subjects with lower BMI, body fat percentage, WHR and WHtR have significantly higher physical fitness level. In the whole sample, significant negative correlations were found between FI and resting HR ($r=-0.453$, $P<0.001$), TG levels ($r=-0.225$, $P=0.005$) and atherogenic index $\log(\text{TG}/\text{HDL-C})$ ($r=-0.205$, $P=0.010$).

The differences among three fitness classes (FI <70 ; FI=70-89; FI >89) in anthropometric and cardiometabolic parameters were analyzed separately in men and women. Significant differences were found in all observed anthropometric parameters and in diastolic BP and resting HR both in men and women. However, no significant differences in systolic BP were found. As regards blood lipids, a significant difference among three fitness classes in women was found only in TC levels, in men significant differences were confirmed in TG levels and $\log(\text{TG}/\text{HDL-C})$ (Table 1).

Table 1: Differences among three fitness classes (FI <70 ; FI70-89; FI ≥ 90) in anthropometric and cardiometabolic parameters

<i>Cardiometabolic factor</i>	<i>Men (n=62)</i>		<i>Women (n=107)</i>	
	Chi-square	<i>P</i> -value*	Chi-square	<i>P</i> -value*
BMI	17.04	<0.001	29.09	<0.001
Waist circumference	13.89	0.001	21.34	<0.001
WHR	8.00	0.018	6.99	0.030
WHtR	7.07	0.008	17.41	<0.001
Body fat %	8.27	0.016	18.40	<0.001
BP systolic	0.16	0.925	4.62	0.099
BP diastolic	6.43	0.040	12.38	0.002
Resting HR	11.06	0.004	16.98	<0.001
TC	2.49	0.288	7.95	0.019
LDL-C	0.92	0.632	2.84	0.242
HDL-C	4.51	0.105	4.10	0.129
TG	9.83	0.007	3.86	0.145
TC/HDL-C	3.86	0.145	4.13	0.127
$\log(\text{TG}/\text{HDL-C})$	8.38	0.015	2.67	0.263

* Kruskal-Wallis test

In the sample of adult participants with sedentary lifestyle we have found out a low level of physical fitness, especially in women (2, 5) (much lower than the estimated reference value for the general population) (4). Subjects with lower BMI, body fat percentage and waist circumference have higher physical fitness level and the results suggest high significant differences in anthropometric parameters also among fitness classes. On the contrary, subjects with higher physical fitness level achieved more favorable values of some

cardio-metabolic risk factors as well, and as follows a lower level of total cardiovascular (and other noncommunicable) diseases risk can be predicted.

Funding

This manuscript was partially supported by the VEGA project No 1/1045/12.

Conflict of interest

None

References

1. Van Tuyckom C, Van De Velde S, Bracke P (2013). Does country-context matter? A cross-nation analysis of gender and leisure time physical activity in Europe. *Eur J Public Health*, 23 (3): 452-457.
2. Bergier J, Ács P, Salonna F, Junger J (2018). Differences in the level of physical activity among adolescents from various European countries. *Iran J Public Health*, 47 (4): 603-605.
3. Afghan M, Ghasemi A, Azizi F (2016). Seven-year changes of leisure-time and occupational physical activity among Iranian adults (Tehran Lipid and Glucose Study). *Iran J Public Health*, 45 (1): 41-47.
4. Ojala K (ed.) (2013). *UKK WALK TEST Tester's guide*. 4th revised edition. Tampere: UKK Institute for Health Promotion Research. Available from: http://www.ukkinstituutti.fi/filebank/1118-UKK_walk_test_testers_guide.pdf
5. Wan Putri Elena WD, Hamid Jan JM, Hafzan Y (2018). Nutrient Intakes Status and Physical Inactivity among Overweight and Obese School Children in Kota Bharu, Kelantan, Malaysia. *Iran J Public Health*, 47 (8): 1098-1107.