Differences in oxygen puls values between physically active versus sedentary adolescents during maximal exercise testing

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Introduction
During exercise, the fraction of the cardiac output diverted to the skeletal muscles increases, while the fraction perfusing organs such as the kidney, liver and gastrointestinal tract decreases. Oxygen puls is a measure of cardiovascular efficiency indicating what metabolic value in terms of oxygen uptake derives from every heart beat. Oxygen puls is useful noninvasive measurement for monitoring perfusion redistribution and increased O2 extraction. It is intricately related to cardiac stroke volume (SV) and can be used to estimate stroke volume at various stages of incremental exercise. The exceptionally high O2 puls at maximum work rate reflects the very large stroke volume and arterial-mixed venous O2 difference that this subject must have. The aim of the study was to assess the cardiovascular function during maximal exercise test in Belgrade adolescents.

Methods
Twenty-four male sedentary high school students (17 years of age), and 24 physically active students of the same age and gender, were engaged in this study. Originally developed protocol for maximal incremental exercise test on electronically braked cycle ergometer (Ergo-Oxycon Pro, Jaeger, Würzburg, Germany) was used. The gas analyzers were calibrated before each measurement. Parameters were measured by analysis of the expired gas every 30 s with the use of a computerized system.

Results
The sedentary and physically active subjects were similar in age, but body height, body mass and body surface area were significantly different (p<0.01). Maximal oxygen consumption (VO2max) was significantly higher in physically active adolescents (2065.92±380.3 ml in sedentary vs. 3557.71±529.78 ml for physically active, p<0.01). Physically active adolescents sustained significantly higher maximum overload (p<0.01). Oxygen puls was also significantly higher in physically active adolescents (12.05±2.18 ml in sedentary vs. 20.53±3.12 ml for physically active students, p<0.01).

Discussion/Conclusion
Maximum oxygen puls depends upon fitness level. A sedentary 20 year old individual has a maximum oxygen puls of 12-15 ml, corresponding to a cardiac stroke volume of 100-120 ml, while athlete can have a maximum oxygen puls of 16-20 ml, corresponding to a SV of 120-140 ml. Our results showed again importance of regular physical activity. Oxygen puls was significantly different (p<0.01) in two groups, where values for sedentary students were on the lower limit for sedentary group, and values for physically active students even slightly exceeded upper limit for their group.

References
Cooper C., Storer T (2001). Exercise testing and interpretation