

The effects of variable load exercise on cardiovascular response in young and middle-age men

Damir Zubac^{1,2}, Zoran Valić³, Ante Obad⁴, Vladimir Ivančev²

¹Science and Research Center Koper, Institute for Kinesiology Research, Koper, Slovenia

²University of Split, Faculty of Kinesiology, Split, Croatia

³University of Split, School of Medicine, Department of Integrative Physiology, Split, Croatia

⁴University of Split, University Department of Health Sciences, Split, Croatia

BACKGROUND

- Aging imposes a substantial decline in muscle structure and function
- To counter the above-mentioned muscle wasting the flywheel exercise (FW) was suggested as the most prominent exercise model
- However, it is still unknown whether this type of exercise imposes a substantial challenge to the cardiovascular system during the FW exercise

STUDY AIM AND HYPOTHESIS

- The aim of the present study is to compare differences in cardiovascular response during FW exercise between young and middle-age men
- We hypothesized that the repeated bouts of FW exercise would impose a significant challenge to the cardiovascular system, and that the magnitude of the cardiovascular response would be greater in middle-age compared to young men

MATERIALS AND METHODS

- Thirteen, healthy, active, normotensive men were separated into two groups: young (n=7, 24±4 y, VO₂ peak=46±4 mL kg min⁻¹) and middle-age (n=6, 48±2 y, VO₂ peak=45±5 mL kg min⁻¹)
- During their first visit all participants underwent a general medical examination and their VO₂ peak was determined
- On the second visit to the laboratory, they completed a 60-minute experimental procedure that can be summarized into five different phases of data collection, including: supine rest (pre/post exercise), the flow mediated dilatation (FMD) assessment (pre/post exercise), stepping warm-up protocol, and a vigorous exercise on the FW ergometer
- Arterial blood pressure and heart rate were constantly monitored via photoplethysmograph using a pneumatic cuff positioned around the middle finger of the right hand throughout
- The exercise intervention, consisted of four consecutive bouts of squat exercise performed on a FW ergometer (with 2 minutes of rest in between exercise sessions) at a predetermined level of inertia (set at 0.075 kg cm²)
- The brachial artery flow-mediated dilatation (FMD) was assessed using ultrasound imaging, pre and immediately after exercise cessation

RESULTS

	Young	Middle-age	p-level
VE peak (L/min ⁻¹)	158±29	159±16	.179
VO ₂ peak (L/min ⁻¹)	4.0±0.7	3.9±0.6	.570
RQ	1.19±0.03	1.21±0.08	.057
VO ₂ max. (mL kg min ⁻¹)	46±4	45±6	.157
HR peak (bpm)	187±7	175±4*	.014
PPO (Watt)	313±59	300±48	.450

Notes: VE - peak pulmonary ventilation, VO₂ peak - peak oxygen uptake, RQ - respiratory quotient, HR peak - heart rate, PPO - peak power output

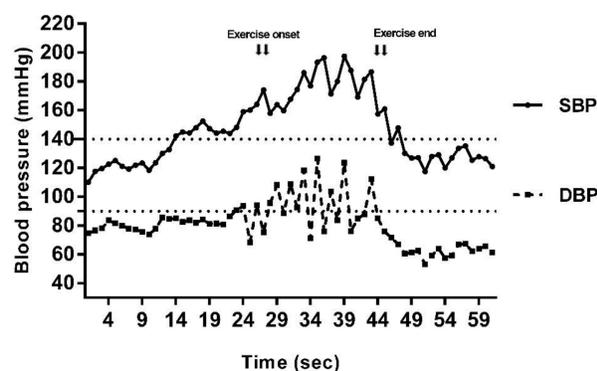


Figure 2 Typical trace of the BP response to FW exercise ;



Figure 3 Typical trace of the brachial artery dilatation following cuff release

Table 1 Cardiorespiratory fitness of the participants

CONCLUSION

- The variable load exercise (FW) set at 0.075 kg cm² level of inertia imposes a substantial burden to the cardiovascular system during exercise, with average SBP readings reaching ~ 230 mmHg in both groups.
- There were no significant differences observed between the two groups in their SBP or DBP response throughout FW exercise.
- The interplay between muscle loading, and the subsequent blood pressure response during the FW exercise is important to consider and fully quantify in further studies.