

Reliability and Validity of Determining Ventilatory Threshold and Respiratory Compensation Point by Near-Infrared Spectroscopy

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Abstract : Purpose: This research intends to investigate the reliability and validity of ventilatory threshold (VT) and respiratory compensation point (RCP) determined by skeletal muscle hemodynamic status. Methods: One hundred healthy male (age: 22 ± 3 yrs; height: 173.1 ± 6.0 cm; weight: 67.1 ± 10.5 kg) performed graded cycling exercise test which ventilatory and skeletal muscle hemodynamic data were collected simultaneously. VT and RCP were determined by combined V-slope (VE vs. VCO₂) and ventilatory efficiency (VE/VO₂ vs. VE/VCO₂) methods. Pearson correlation, paired t-test, and Bland-Altman plots were used to analyze reliability, validity, and similarities. Statistical significance was set at $\alpha = .05$. Results: There are high test-retest correlations of VT and RCP in ventilatory or near-infrared spectroscopy (NIRS) methods (VT vs. VTNIRS: 0.95 vs. 0.94; RCP vs. RCPNIRS: 0.93 vs. 0.93, $p < .05$). There are high coefficient of determination at the first timing point of O₂Hb decreased ($R^2 = 0.88$, $p < .05$) with VT, and high coefficient of determination at the second timing point of O₂Hb declined ($R^2 = 0.89$, $p < .05$) with RCP. VO₂ of VT and RCP are not significantly different between ventilatory and NIRS methods ($p > .05$). Conclusion: Using NIRS method to determine VT and RCP is reliable and valid in male individuals during graded exercise. Non-invasive skeletal muscle hemodynamics monitor also can be used for controlling training intensity in the future.

Keywords : anaerobic threshold, exercise intensity, hemodynamic, NIRS

Conference Title : ICAEIA 2017 : International Conference on Aerobic Exercise and Intensity Assessment

Conference Location : Osaka, Japan

Conference Dates : October 09-10, 2017