Examining Stroke Volume Changes During Exercise in Healthy Young Adults

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ABSTRACT

Cardiac output is determined by the combination of heart rate and stroke volume. While heart rate is primarily influenced by cardiac autonomic input, stroke volume's behavior is more intricate due to the interplay between myocardial response to stretch (Frank-Starling law) and adrenergic changes in contractility. No consensus exist on its behavior during exercise despite extensive data. **PURPOSE**: The aim of this study was to assess how normalized stroke volume scores (SV) change in young, healthy adult males during a graded exercise test to exhaustion (GXT). **METHODS**: Participants (n=20; age=22.9±2.4; BMI=23.7±2.4) were instructed to abstain from engaging in vigorous exercise for a period of 24 hours before the study, ensure they were adequately hydrated, and maintain a fasting state. Participants completed a graded exercise test to exhaustion in the morning on an electromagnetically braked cycle ergometer. SV was recorded using trans-thoracic bioimpedance device and results were averaged and normalized into five epochs. To determine the effect of GXT epochs on SV score, SV was normalized to percentage of within-subject maximum SV, and mean SV was quantified across 10 equally spaced epochs (10% of trial duration each). A mixed model was used to compare epochs. Assumptions of residual normality and homoscedasticity were visually verified using q-q plots and model predicted scores vs. residuals plots, respectively. SV score was modeled using participant as a random effect, and GXT epochs as fixed effects. Follow-up pairwise comparisons utilized Holm sequential corrections. Alpha was set at 0.05. **RESULTS**: There were no significant differences (p>.05) between epochs 1 (85.2%±5.7) and 2 (86.6%±5.4), epochs 2 and 3 (88.8%±4.1), or among epochs 3 through 10 (91.4%±3.5). There were significant differences (p<0.01) between epochs 1 and 3-10. There were significant differences between epochs 2 and 4-10. **CONCLUSION**: SV exhibited a general increase throught the first 30% of test duration. However, beyond this point, there was no statistically significant increase in stroke volume, indicating a relatively stable pattern after the first 30% of the test. These results in agreement with previous data that have reported a plateau in stroke volume during progressive exercise to exhaustion.