

PHYSIOLOGICAL END-POINTS DURING EXERCISE IN THE HEAT.

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During exercise testing, research subjects are frequently encouraged to continue their effort until volitional fatigue has been reached. Typically a core temperature $\geq 39.0^{\circ}\text{C}$ and/or a heart rate ≥ 180 bpm are used as end-of-test criteria. This study investigated the similarity of these physiological end-points with stroke volume as markers of volitional fatigue during exercise in the heat. Eight, heat acclimated males walked approximately 20-min at 3mph and 3% grade every hour (with 40-min seated rest) in 43.3, 50.6 and 57.2 $^{\circ}\text{C}$ ambient air temperatures, for 6 hours or until their volitional fatigue. To provide a comparison environment the above workload and heat exposures were repeated with and without wearing a passive ice vest. Rectal temperature (Tre), heart rate (HR), cardiac output (CO) and stroke volume (SV) were determined each hour during each of the walks. Volitional fatigue was not reached at the 43.3 $^{\circ}\text{C}$ vest condition, therefore, it was not included in this analysis. End exercise Tre, HR, and SV results were as follows:

* p<.05	43.3 $^{\circ}\text{C}$ No Vest	50.6 $^{\circ}\text{C}$ Vest	50.6 $^{\circ}\text{C}$ No Vest	57.2 $^{\circ}\text{C}$ Vest	57.2 $^{\circ}\text{C}$ No Vest
Tre ($^{\circ}\text{C}$) *	38.5	37.6	38.4	38.1	38.6
HR (bpm) *	151	126	147	145	156
SV (ml/beat)	75.7	78.4	68.7	73.5	73.9

It was demonstrated that, regardless of test duration, when stroke volume fell to an average of 70-78 ml/beat, end-of-test volitional fatigue was reached in both vest and non-vest conditions despite Tre and HR values less than 39.0 $^{\circ}\text{C}$ and 180 bpm, respectively. It was concluded that, in the current study, end-point or terminal stroke volume provided a better indication of volitional fatigue than either end-point Tre or HR values.

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