

## Metabolic Efficiency During Ramp Test in Collegiate Cyclists

Ross H, Onwubuya K, and Wyatt F

Human Performance Laboratory; Department of Athletic Training and Exercise  
Physiology; Midwestern State University; Wichita Falls, TX

---

Category: Masters

Advisor / Mentor: Wyatt, Frank ([frank.wyatt@mwsu.edu](mailto:frank.wyatt@mwsu.edu))

### ABSTRACT

**PURPOSE:** The aim of this study was to determine trend-line patterns for efficiency in collegiate, competitive cyclists. **METHODS:** Subjects included 17 male and 6 female (n=23). Measures were the following: age (y), height (cm), weight (kg), maximal oxygen consumption ( $\text{VO}_2\text{max}$ ,  $\text{mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ), maximal heart rate (MHR,  $\text{b}\cdot\text{min}^{-1}$ ), blood lactate (BLa, mM) and maximal power (w). Subjects were fit, collegiate cyclists competing for Midwestern State University cycling team. Each subject performed a cycle ergometer test utilizing the Australian Institute of Sport (AIS) cycle ergometer protocol. Blood lactate was determined by removing 10 $\mu\text{l}$  each minute during the cycle ergometer test to volitional fatigue. Oxygen consumption ( $\text{VO}_2$ ,  $\text{mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) per power output (watts) was calculated as metabolic efficiency ( $\text{VO}_2\cdot\text{watts}^{-1}$ ). Trend-line analysis was correlated with metabolic efficiency in response to  $\text{VO}_2$  per work at each stage. Statistical significance was set a priori at  $p \leq 0.05$ . **Results:** Mean (SD) demographic measures were the following: age (y) 22.8 (3.8); height (cm) 169.4 (16.9); weight (kg) 74.6 (5.20); Metabolic efficiency ( $\text{VO}_2\cdot\text{watts}^{-1}$ ) indicated a power curvilinear trend-line. Male data averaged across power output resulted in a mathematical power trend-line with a coefficient of determination of  $R^2=.898$ . Female data averaged across power resulted in a power trend-line with a coefficient of determination of  $R^2=.943$ . **Conclusion:** During the cycle ergometer test, cyclists exhibited an enhanced metabolic efficiency as work increased. However, trend-line analysis indicated a plateau as the subjects neared volitional fatigue.