

## Abstract

**Thesis:** Influence of Cardiorespiratory Fitness on Ventilatory Threshold

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**Background:** Reference standards for percentage of ventilatory threshold (VT) to  $VO_{2max}$  have been determined by the Fitness Registry Importance of Exercise National Database (FRIEND) registry based on age and sex. The reference values show that on average, VT occurs at 51-74% of  $VO_{2max}$ . The reason for variability in these values is unknown and may be influenced by fitness level. **Purpose:** To examine the impact of fitness level on the percentage of VT to  $VO_{2max}$  in apparently healthy men and women. **Methods:** Participants included 1,784 self-referred male and female participants from the Ball State Adult Fitness Longitudinal Lifestyle Study (BALL ST) cohort between 1992 and 2020. Resting health measurements and cardiopulmonary exercise test (CPET) variables derived from the first available test were used. Percentage of VT to  $VO_{2max}$  was determined by dividing the confirmed VT by the confirmed  $VO_{2max}$  derived from the CPET. Fitness level was determined by using the FRIEND registry and percentiles of  $VO_{2max}$  by age and sex. An ANCOVA and pair-wise comparisons were performed to determine the differences between fitness levels and compare for age and sex. **Results:** The mean percentage for VT to  $VO_{2max}$  was significantly higher in the low fit ( $65.2 \pm 10.4\%$ ) than the average ( $61.3 \pm 10.9\%$ ) and high fit populations ( $60.8 \pm 10.9\%$ ) ( $p <$

0.05). A significant difference in BMI ( $p < 0.05$ ) between all groups was seen, with an inverse relationship between BMI and fitness level (low fit:  $32.0 \pm 6.6 \text{ kg/m}^2$ ; average fit:  $26.9 \pm 4.1 \text{ kg/m}^2$ ; high fit:  $24.1 \pm 3.1 \text{ kg/m}^2$ ). **Conclusion:** Low fit populations have a higher VT when expressed as percentage of  $\text{VO}_{2\text{max}}$ , and thus likely a higher range for moderate exercise than the other, more fit populations. Exercise physiologists should consider this when prescribing exercise.