

Anaerobic Threshold Is Not Different Among Young and Healthy Adults Regardless of Gender, Athletic Status, and Sport Type

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ABSTRACT

Anaerobic threshold (AT), occurring while Respiratory Exchange Ratio (RER) ≥ 1 , is detected when an individual's energy metabolism shifts from aerobic to anaerobic, indicating an individual's ability to sustain a prolonged exercise before lactate accumulation. While $\dot{V}O_2\text{max}$ and agility have been shown to be different in gender, athletic status, and sport types, AT has not been studied between these groups.

PURPOSE: The purpose of this study is to investigate the differences of AT in different gender, athletic status, and sport type. The differences in $\dot{V}O_2\text{max}$ and agility will also be examined among these groups.

METHODS: Seventy-five healthy, young men (N=52) and women (N=21) performed an agility T-test and a $\dot{V}O_2\text{max}$ test. AT was recorded during the $\dot{V}O_2\text{max}$ test. The participants were categorized by gender, athlete status, and sport types (endurance and power).

RESULTS: There was no significant difference of AT in gender, athlete status, and sport types. $\dot{V}O_2\text{max}$ is higher in males (51.60 ± 1.17) than females ($42.34 \pm 1.64 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) ($P < 0.001$), athletes (50.27 ± 3.03) than non-athletes ($38.08 \pm 1.04 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) ($P < 0.001$), and endurance (51.42 ± 1.13) than power sports ($46.44 \pm 2.25 \text{ mL} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$) ($P = 0.042$). Agility is better in males (10.06 ± 0.21) than females ($12.21 \pm 0.25 \text{ sec}$) ($P < 0.001$), and athletes ($10.35 \pm 0.17 \text{ sec}$) than non-athletes ($12.95 \pm 0.69 \text{ sec}$) ($P = 0.005$).

CONCLUSION: The result of no difference in AT between these groups implies that healthy, young individuals have a similar ability to sustain a prolonged exercise before lactate accumulation regardless of their gender, athletic status, and sport type.

PURPOSE

The purpose of this study is to investigate the differences of AT in different gender, athletic status, and sport type among young men and women. The difference in $\dot{V}O_2\text{max}$ and agility will also be examined among these groups.

BACKGROUND

The maximal oxygen consumption ($\dot{V}O_2\text{max}$) is a good indicator of how well one's cardiovascular fitness and aerobic endurance are. Agility requires the integration of isolated movements involving balance, coordination, speed, reflexes, and power. The quicker a participant can get through the agility test, the better the agility is. Anaerobic threshold (AT), occurring while Respiratory Exchange Ratio (RER) ≥ 1 and expressed by the percentage of maximal oxygen consumption rate ($\% \dot{V}O_2\text{max}$), is detected when an individual's energy metabolism switches from aerobic to anaerobic. Being considered a good measure for deciding exercise intensity for endurance training, AT indicates an individual's ability to sustain a prolonged exercise before lactate accumulation. While $\dot{V}O_2\text{max}$ and agility have been shown to be different in gender, athletic status, and sport types, AT has not been studied to identify the difference between these groups.



METHODS

SUBJECTS

- **75 Participants**
 - 54 Males
 - 21 Females
 - 66 Athletes
 - 51 Endurance-Sport Athletes
 - 15 Power-Sport Athletes
 - 9 Non-Athletes
- **Age:** 18-23 yrs
- **Height:** $173.36 \pm 1.11 \text{ cm}$
- **Weight:** $75.18 \pm 1.25 \text{ Kg}$
- **Groups:** Males vs. Females, Athletes vs. Non-Athletes, Endurance vs. Power Sports

TESTING & MEASUREMENTS

- **$\dot{V}O_2\text{max}$**
 - Bruce Protocol
 - Grade (slope) and speed increase every 3 minutes
 - Perform until exhaustion
- **Agility T-Test**
 - forward, lateral, and backward movements at maximum velocity
- **Anaerobic Threshold**
 - Anaerobic Threshold = $\frac{\dot{V}O_2 \text{ when RER} \geq 1}{\dot{V}O_2\text{max}}$
- **Respiratory Exchange Ratio (RER)**
 - $\text{RER} = \frac{\dot{V}CO_2}{\dot{V}O_2}$
 - Obtained during the $\dot{V}O_2\text{max}$ test

STATISTICS

- Independent Sample T-Test
- IBM SPSS 25

CONCLUSION

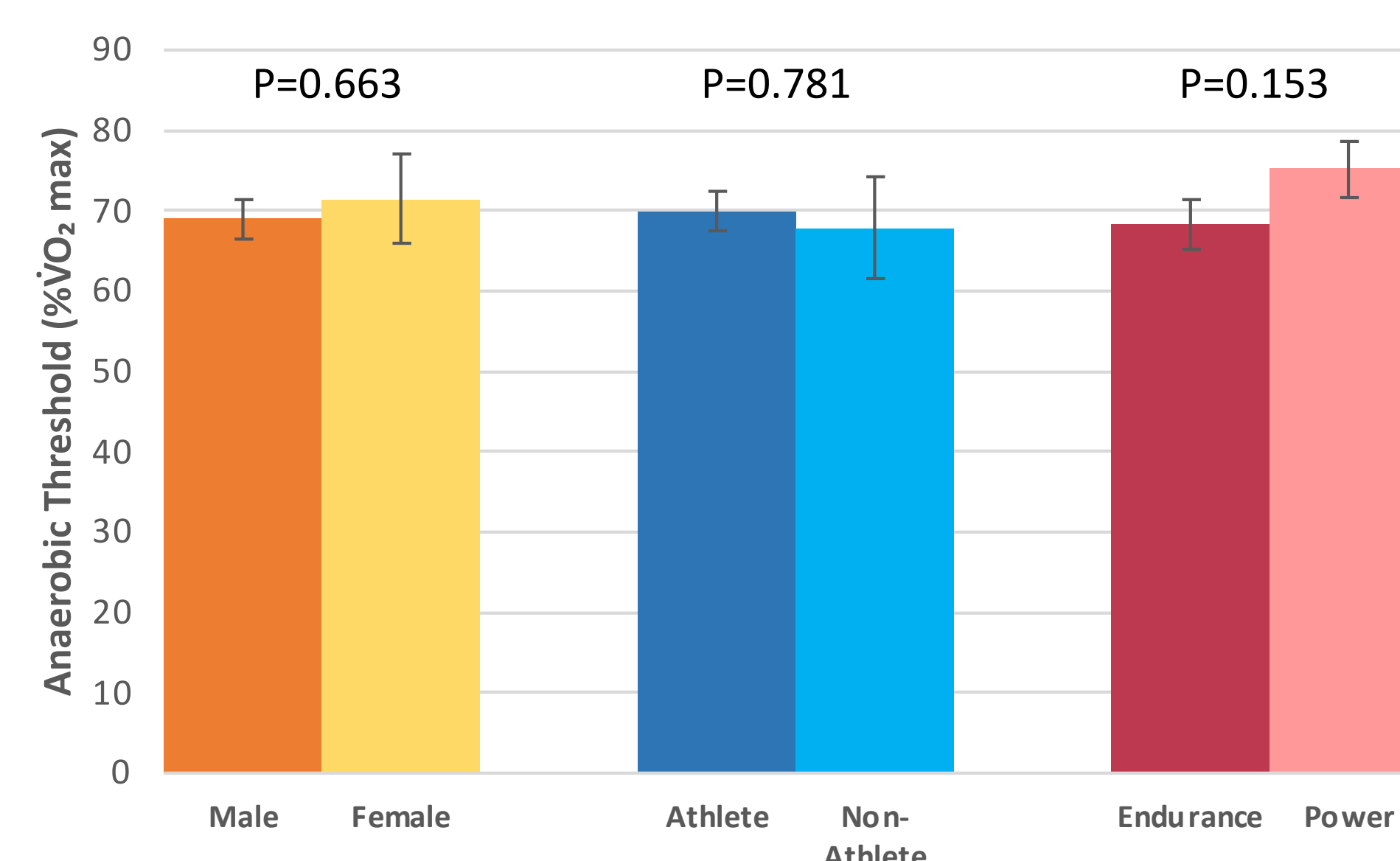
Our results reflect the collective understanding that $\dot{V}O_2\text{max}$ is higher in males than females, athletes than non-athletes, and endurance athletes than power athletes. While results of agility follows the tendency of $\dot{V}O_2\text{max}$ in these groups, it is not different between power and endurance athletes, possibly due to the superb muscular fitness and cognitive function in our college-age athlete participants. The result of no difference in AT between these groups implies that healthy, young individuals have a similar ability to sustain a prolonged exercise before lactate accumulation regardless of their gender, athletic status, and sport type.

ACKNOWLEDGEMENTS

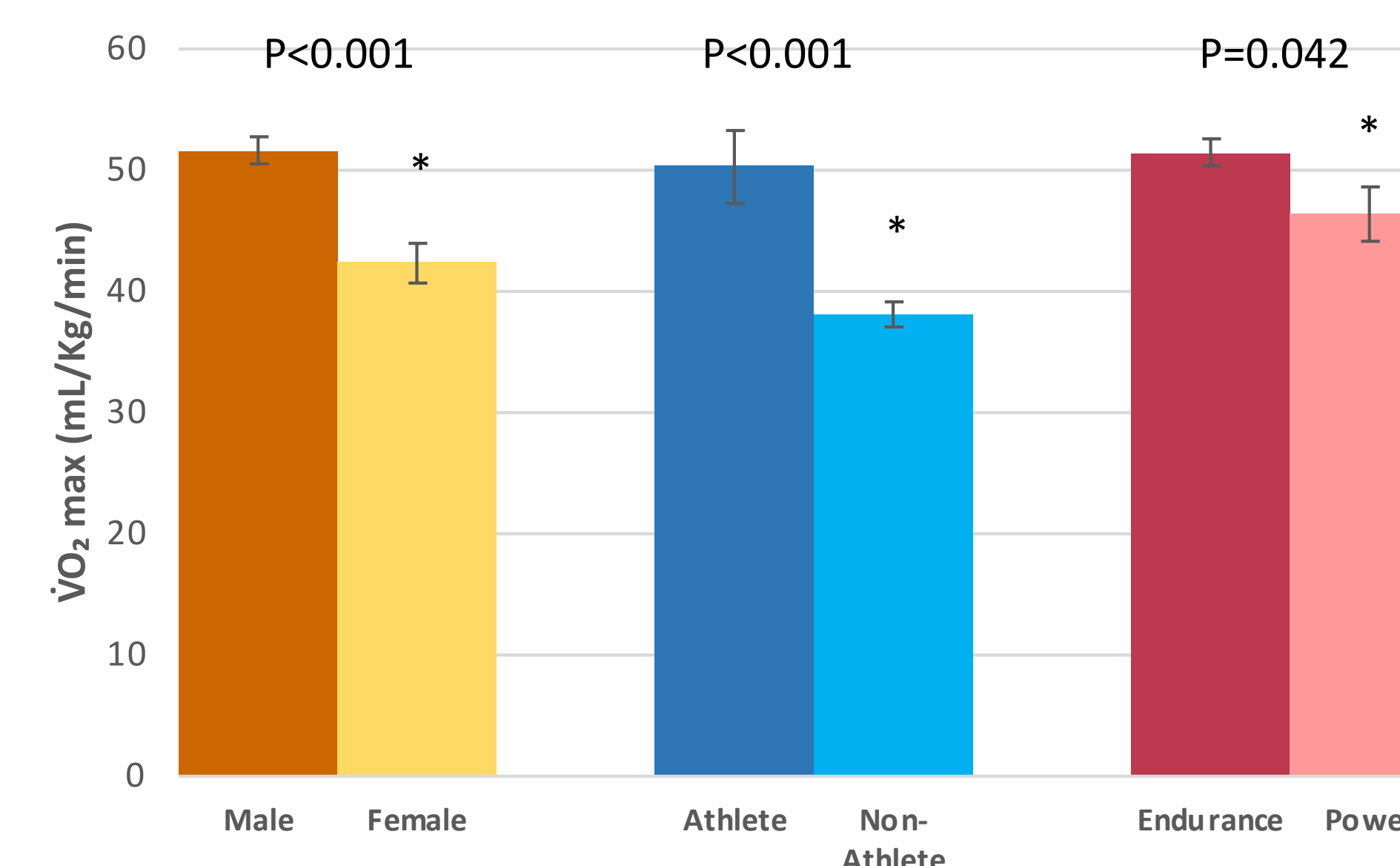
- John Esposito, Kylie Jones, Patrick Morris

RESULTS

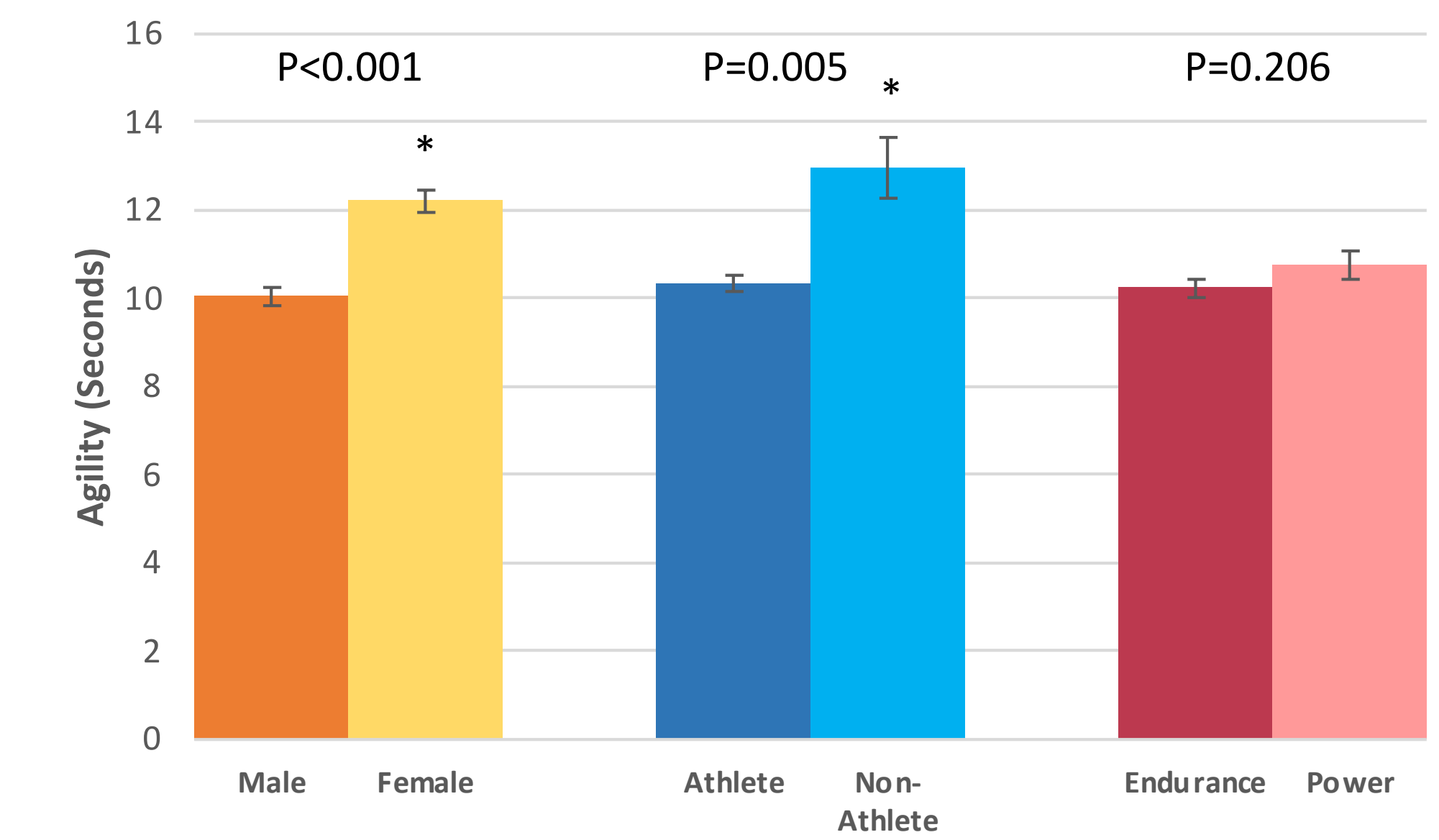
Comparing Anaerobic Threshold between Groups



Comparing $\dot{V}O_2\text{max}$ between Groups



Comparing Agility between Groups



Data are Mean \pm SEM.