TACSM Abstract

Age of Peak Performance In Olympic Events: Insights Into Differences Between Aerobic And Anaerobic Systems

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ABSTRACT

Investigations of elite athletes are often used to understand physiologic potential of various cellular, tissue, and system-level body processes. The age at which elite athletes achieve peak performance though, might be useful in understanding the aging process and physiologic decline of various systems including those of aerobic and anaerobic metabolism. The Olympics, with well-documented performances across a wide range of events requiring differing anatomies, physiologies, and skill sets, provide a unique dataset for analysis of age of peak performance. **PURPOSE:** The aim of this study was to classify Olympic events into aerobic, anaerobic, skill, or a combination thereof, and determine the age of peak performance in each category. **METHODS:** Utilizing data from the 1960 – 2016 Summer and Winter Olympics, individual events of maximal or near maximal effort lasting less than 2 minutes were classified as "anaerobic" (e.g. 100 m dash). Events lasting longer than 5 minutes were classified as "aerobic" (e.g. triathlon) with those between 2-5 minutes classified as "mixed" (e.g. 200m freestyle swim). Other events were not classified based on physiologic parameters, but by skill alone (e.g. archery). **RESULTS:** Age of peak performance was 23.4 ± 4.5 years for anaerobic events, 23.9 ± 4.5 years for mixed events, 26.2 ± 4.7 years for aerobic events, and 27.7 ± 7.1 years for skill events. One-way analysis of variance determined significant differences exist between groups ($F_{(3, 345183)} = 12452$, $p < 0.001$) with Tukey's post-hoc analysis determining that each group was significantly different from all others. **CONCLUSION:** Results indicate that anaerobic systems and processes important for high-level performance likely decline earlier than aerobic systems and processes. Skill-based events likely peak at later ages as they are less reliant on optimal physiology and more reliant on experience and skill refinement developed over years of training. While these results are valuable for athlete development, they also provide an indication of the first sign of decline of various bodily systems and might be useful for a better understanding of the beginnings of the aging process.