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Hematological, hormonal and fitness indices in youth swimmers: gender-related comparisons

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Objective This study was to evaluate gender differences in hematological, hormonal and fitness parameters among youth swimmers and to explore relationships between erythrocyte indices and aerobic and anaerobic capacity.

Methods 308 youth swimmers including 137 girls and 171 boys aged 8 to 16 volunteered to participate in this study, and they were divided into three (Beginner, intermediate and advanced) groups based on their training experiences. Blood samples were obtained to determine red blood cell counts, hemoglobin concentration, hematocrit, and serum erythropoietin and testosterone levels. $VO_2\max$ was assessed using a submaximal cycle protocol. 76 girls and 102 boys also undertook a Wingate test to determine their peak anaerobic power. One-way analysis of variance (ANOVA) was used to compare gender differences in hematological indices hormonal indices and aerobic and anaerobic capacities. Two-way (gender \times training) ANOVA was used to analyze the interactive effect of gender and training on hematological variables.

Results Boys had higher ($p < 0.05$) means than girls for all hematological variables except for erythropoietin and values demonstrated an increase with training in boys. The average $VO_2\max$ in $l \cdot \min^{-1}$ and peak anaerobic power in watts were also higher in boys (2.91 ± 0.08 and 547 ± 28 , respectively) than girls (2.25 ± 0.07 and 450 ± 26 , respectively). Modest but significant ($p < 0.05$) correlations were found between $VO_2\max$ and red blood cell counts ($r = 0.252$), hemoglobin concentration ($r = 0.345$), or hematocrit ($r = 0.345$) and between peak anaerobic power and red blood cell counts ($r = 0.304$), hemoglobin concentration ($r = 0.319$) or hematocrit ($r = 0.351$).

Conclusions This study revealed relatively lower yet age- and gender-appropriate hematological, hormonal and fitness indices in youth swimmers. The gender-related differences in erythrocyte indices seems unrelated to erythropoietin and may be explained by the higher testosterone levels seen in boys. Erythrocyte indices may be used as part of talent identification for sports.