

## **Abstract.**

**Aim.** The purpose of this study was to examine the effects of soccer training on maximal oxygen uptake, isokinetic muscle strength and anthropometric characteristics in different ages of soccer players and untrained adolescents of the same biological age.

**Subjects.** A total of one hundred and twenty six (n=126) young soccer players and untrained boys throughout the developmental ages of 12 years (soccer players n=22; untrained boys= 22) 14 years (soccer players n=20; untrained boys= 18) and 16 years (soccer players n=22; untrained boys= 22) volunteered to participate in the study. Sexual maturation was classified according to Tanner's stages. Soccer players participated both in their school's physical education program and in a soccer training program, while the untrained participated only in their school's physical education program.

**Methods.** All participants underwent anthropometric measurements and performed a maximal exercise testing on a motor driven treadmill to determine maximal oxygen uptake ( $VO_{2max}$ ) and cardiorespiratory indices. The isokinetic concentric peak torque values of the hamstrings (H) and quadriceps (Q), as well as the conventional strength ratios of H:Q, were measured on an isokinetic dynamometer (CSMI, Humac Norm, Cybex II) at angular velocities of 60, 180, and 300°·s<sup>-1</sup>.

**Results.** The trained group showed significantly higher  $VO_{2max}$ , in absolute and relative values ( $p<0.001$ ),  $BL_{max}$  ( $p<0.05$ ) and  $RER_{max}$  ( $p<0.05$ ) compared to the untrained group. Resting HR and systolic blood pressure were significantly lower ( $p<0.05$ ) for the trained compared to untrained. The isokinetic muscle strength (absolute and relative) was significantly higher ( $p<0.001$ ) in the 12 and 16 years old trained group, compared to untrained, for the knee extensors and knee flexors. However, no significant differences were found between the 14 years old trained and untrained, for the muscle groups of Q and H.

**Conclusion.** The results showed that systematic soccer training (intensity and duration) has a positive effect in the central cardiovascular system expressed as  $VO_{2max}$ , HR and blood pressure, as well as in the peripheral system, expressed as an increase lower limb muscle strength; specifically, agonist - antagonist (Q and H). The results provide important information and knowledge for more effective training programs not only for soccer but also for any other sport training.

**Key words:** isokinetic muscle strength; hamstrings; quadriceps; H:Q strength ratio; maximal oxygen uptake; biological age; youth soccer players; exercise testing; developmental ages, untrained adolescents