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Growth, body composition and bone mineral density among pubertal male athletes: intra-individual 12-month changes and comparisons between soccer players and swimmers Daniela C Costa, João Valente-Dos-Santos, Paulo Sousa-E-Silva, Diogo V Martinho, João P Duarte, Oscar M Tavares, Joaquim M Castanheira, Tomás G

Background: Puberty is a period of intense changes in human body and, additionally, participation in sports is viewed as prominent form of physical activity among male adolescent athletes. The current study was aimed to examine the intra-individual changes in body composition and bone tissue during

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from Daniela Costa's PhD co-supervised by the Professor
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years of maximal growth and the effect of 12-month
participation in sports contrasting in mechanical
impact.

Methods: The sample included 40 male adolescent
athletes (soccer: n = 20; swimming: n = 20) aged
12.57 ± 0.37 years who were followed for 12 months.

Stature and body mass were measured, bone
mineral content (BMC), areal bone mineral density (aBMD), lean soft and fat tissues assessed using DXA.
Food intake was estimated using a questionnaires and training sessions individually monitored. Repeated
measures ANOVA tested the differences between sports and 12-month intra-individual variation (time
moments: TM1, TM2). The analyses on aBMD for total body and total body less head were repeated
controlling for variation in stature at baseline.

Results: Soccer players completed 63 ± 31 sessions (95 ± 47 h). Respective values for swimmers were
248 ± 28 sessions and 390 ± 56 h. In general, the analysis of aBMD as dependent variable evidenced
significant effect of sport-associated variation ($F = 5.254$, $p < 0.01$; $\eta^2 = 0.35$) and 12-month increments,
particularly at lower limbs ($F = 97.238$, $p < 0.01$; $\eta^2 = 0.85$). Respective mean values for aBMD were $SCC_{TM1} = 0.885 \text{ g.cm}^{-2}$, $SWM_{TM1} = 0.847 \text{ g.cm}^{-2}$, $SCC_{TM2} = 0.939 \text{ g.cm}^{-2}$, $SWM_{TM2} = 0.880$. Regarding the lean
soft tissue, the magnitude of effects was very large for intra-individual variation ($F = 223.043$, $p < 0.01$; $\eta^2 = 0.92$) and moderate between sports ($F = 7.850$, $p < 0.01$; $\eta^2 = 0.41$): $SCC_{TM1} = 30.6 \text{ kg}$, $SWM_{TM1} = 34.9 \text{ kg}$,
 $SCC_{TM2} = 35.8 \text{ kg}$, $SWM_{TM2} = 40.5 \text{ kg}$. Finally, d-cohen values reporting percentage of intra-individual
changes in aBMD between soccer players ad swimmers were large for the trochanter ($d = 1.2$; annual
increments: $SCC = 8.1\%$, $SWM = 3.6\%$).

Conclusion: Puberty appeared as a period of significant intra-individual changes in lean soft tissue and
bone mineral density. With increasing accumulated training experience, mean difference between sports
contrasting in mechanical impact tended to me more pronounced in particular at the lower limbs.

Keywords: Body composition; Bone health; DXA; Mechanical loading; Youth sport.

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