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**ALLOMETRIC MULTILEVEL MODELLING
OF AGILITY AND DRIBBLING SKILL IN
YOUTH SOCCER PLAYERS**

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The main purpose of this study was to estimate the longitudinal contributions of chronological age (CA), training history, body size and composition, and skeletal age (SA) to developmental changes in the agility and dribbling performances of youth soccer players between 10 and 18 years of age, considering playing position as an additional source of variation. In addition, multiplicative allometric model structures were explored for the derivation of developmental curves for agility and dribbling performance. It was hypothesized that the prediction of longitudinal changes in protocols without the ball (agility run) and with the ball (dribbling test) would require different models

Eighty-three players [defenders ($n = 35$), midfielders ($n = 27$), forwards ($n = 21$)] were followed annually over five years (average: 4.4 observations per player). Skeletal age (SA; Roche et al., 1988), anthropometry (stature, body mass, triceps and subscapular skinfolds; Lohman et al., 1988), agility (Council of Europe, 1988) and dribbling speed (Federação Portuguesa de Futebol, 1986) were measured annually. Body composition was estimated from the two skinfolds (Slaughter et al., 1988). Annual training volume was estimated from weekly participation forms.

It was possible to predict agility from two multiplicative allometric models (Model 1: aligned by SA; Model 2: aligned by CA). Predictors in the multiplicative allometric models were $\ln$ stature ($P < 0.01$), $\ln$ FFM ($P < 0.05$), SA ($P < 0.01$) and playing position ($P < 0.05$), for model 1; and $\ln$ stature ($P < 0.01$), $\ln$ FFM ($P < 0.05$), CA ($P < 0.01$), CA^2 ($P < 0.01$), annual volume training ($P < 0.05$) and playing position ($P < 0.05$) for model 2. Model 1 required fewer parameters ($n = 10$) than Model 2 ($n = 12$). The AIC criterion provided stronger support for Model 1 [$AIC = (-2 \cdot -613.20) + (2 \cdot 10) = 1246.40$] compared to Model 2 [$AIC = (-2 \cdot -629.07) + (2 \cdot 12) = 1282.14$]. The best fitting model (Model 1) for DF is: $-0.288 \cdot$

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$\ln \text{stature} - 0.077 \cdot \ln \text{FFM} + 4.716 - 0.007 \cdot \text{SA}$. Predicted agility (from 12 to 18 years of SA) and dribbling speed (from 13 to 18 years of SA) differed significantly among players by playing positions (midfielders > forwards > defenders).

The present results provide developmental models for the interpretation of intra- and inter-individual variability in agility and dribbling speed among youth soccer players across adolescence, and may provide a framework to develop and evaluate individualized training protocols.

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