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PHYSICAL STRUCTURE AND PERFORMANCE OF YOUNG SOCCER PLAYERS

A. Kosova, S. Hlatky, W. Lilge, H. Holdhaus

IMSB Institut für Medizinische und Sportwissenschaftliche Beratung, Maria Enzersdorf, Austria

Abstract: *The purpose of this study is to present the results concerning body size, growth, proportionality, body composition and somatotype of 371 young austrian soccer players in relation to their performance. They were compared with non-athletic young males. There have not been found any significant differences in body weight, height and circumferences of the extremities between investigated players and non-athletes. The body composition has been found to correspond to this sports' branch: Body fat is significantly lower and lean body mass is higher. A characteristic body feature of these players is shorter length of the lower limbs. The most favourable somatotype with following component 2–5–3 is situated in the ectomorphic mesomorph category. According to the Somatotype Dispersion Index the young soccer players are classified as a hetgerogeneous group. Approximatively two thirds of all players dispose of the advantageous somatotypes correlating to the best performance.*

Key words: *Body dimensions; Body composition; Somatotype; Performance; Soccer players.*

Introduction

The aim of this project was to study some of the anthropometric variables and the level of physical capacities of young soccer players. The knowledge of our analysis should help during selection of the adept for this sports speciality. On the other hand conclusions concerning performance parameters can positively influence training process of investigated probands.

Material and Methods

In 1990 the number of 371 players ranging from 13 to 19 years of age, participants of Young Soccer League who are the members of 14 Austrian Sports Centers were tested.

With the help of standardized measurement techniques (Martin/Saller 1957) the following body dimensions and indices were obtained:

Basic Parameters: Body mass (kg), Body height (cm); *Body Composition:* Body fat (%), Lean body mass (kg); *Circumferences:* Upper arm girth flexed (cm), Thigh girth gluteal (cm), Calf girth maximum (cm); *Body indices:* Quetelet-Bouchard's Index, and Manouvrier's Index.

The body type was estimated according to the Heath/Carter method (1967). The homogenity, respectively heterogenity of each age group was determined with the help of the Somatotype Dispersion Index (SDI) according to Ross/Wilson (1973).

All collected data were statisticly calculated. A part of measurements, carried out at the occasion of the Czechoslovak Spartakiade 1985 (Blaha 1985) has been used as material for comparison . The following physical capacities were tested: *Speed/Capacity to accelerate:* 10 m, 20 m Sprint (sec); *Elastic Strength:* Standing Long Jump (m); *Speed-Endurance:* 180 m Shuttle Run (sec, mmol); *Aerobic Endurance:* 2x2000 m (m/sec); *Flexibility:* Trunk Flexion (cm), and Leg Split (degree°).

Results and Discussion

Anthropometric variables and indices

In general no significant differences in body weight and height between Austrian socces players and non-athletes have been found (*Fig. 1, 2*). The relationship between body weight and height of foregoing conclusions expressed by Quetelet-Bouchard's index has ascendent tendency with the factor of age. Young Austrian soccer players aren't significantly heavier than normal population.

Body composition results respond to the requirements of this sports' branch. Except of the group aged 16 the percentual part of body fat (9%–11%) is significantly lower in comparison to the non-athletic sample. On the other hand lean body mass of each age group is generally significantly higher.

To express body proportionality the Manouvrier's index has been used, which informs us about the proportionality of the length of upper and lower body segment. The level of this index has a descending tendency during observed period of growth and development. A relatively shorter length of lower extremities in comparison to non-athletes is a very important body feature of young soccer players.

The circumferences of the extremities, upper arm girth flexed, thigh girth gluteal and calf girth maximum are not significantly different from a normal population. Upper arm girth flexed is a little bit smaller, but thigh girth gluteal is a little larger. Calf girth maximum corresponds to the norm. According to the above results the young soccer players could be classified as light displastic types, because of their unequal muscle distribution.

Somatotyp

From a somatotype point of view the investigated sample is evaluated as heterogeneous. The most heterogeneous group from all age groups has been found in players aged 13. The heterogenity of these players correlates to a large variability of body parameters, typical for a period of puberty. On the other hand the most homogeneous group were boys aged 16.

The mean somatotype 2–5–3 is situated in the ectomorphic mesomorph category (*Fig. 3*). Almost 65% of all boys belong to the most advantageous performance area of somatochart which predicts the best performance. An optimum level of three somatotype components correlated to the performance is following: Endomorphy 1.5 – 2.5; Mesomorphy 4.5 – 5.5; Ectomorphy 2.5 – 3.5.

In spite of the fact that 2/3 of all young soccer players dispose of a relative good level of somatic dimensions, there are almost 35% of players with no-answering body features for this sport. That means that responsible persons for selection should set more importance to the somatic side of the adepts in this sport.

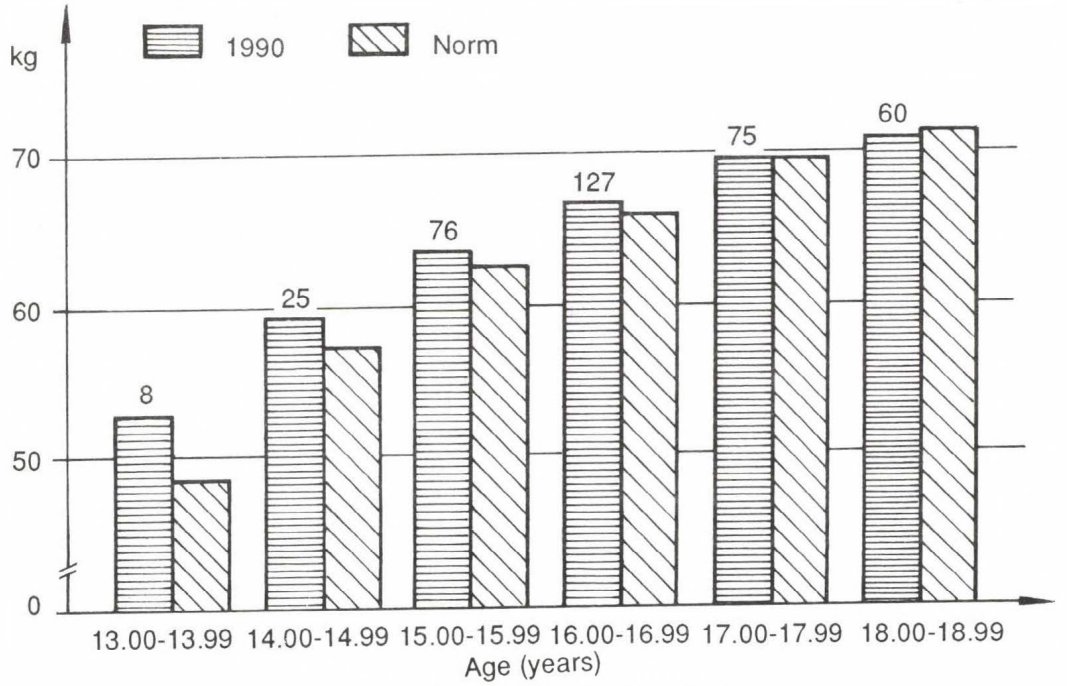

Fig. 1: Body mass of young Austrian soccer players.
1990 = Soccer Players investigated in 1990; Norm = Non-athletes

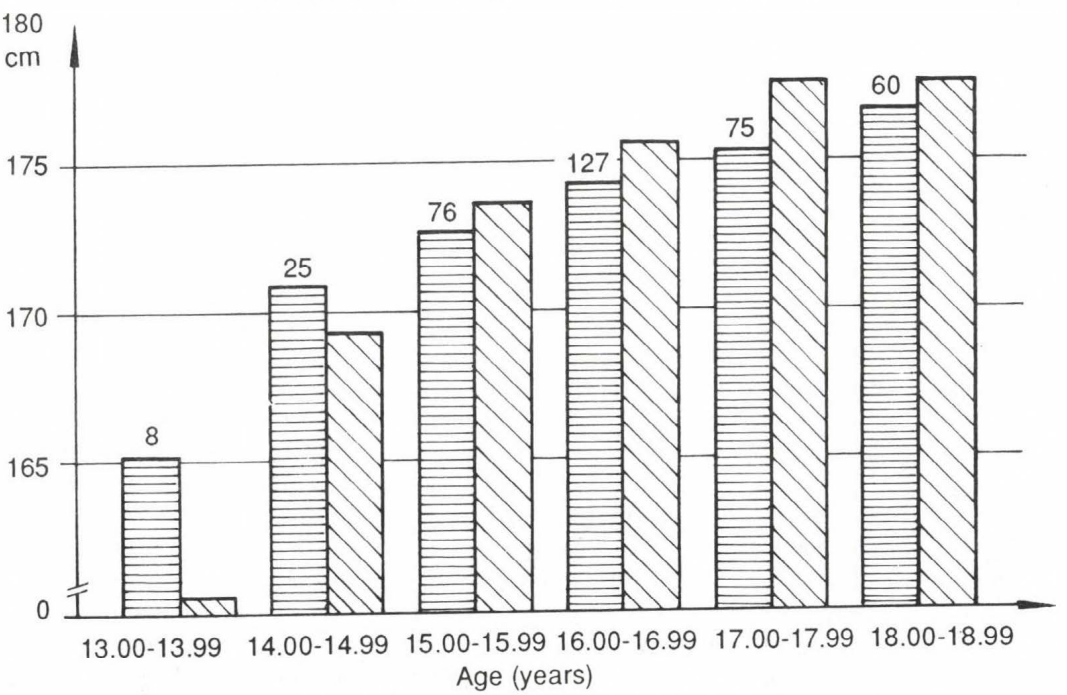

Fig. 2: Body height of young Austrian soccer players.
1990 = Soccer Players investigated in 1990; Norm = Non-athletes

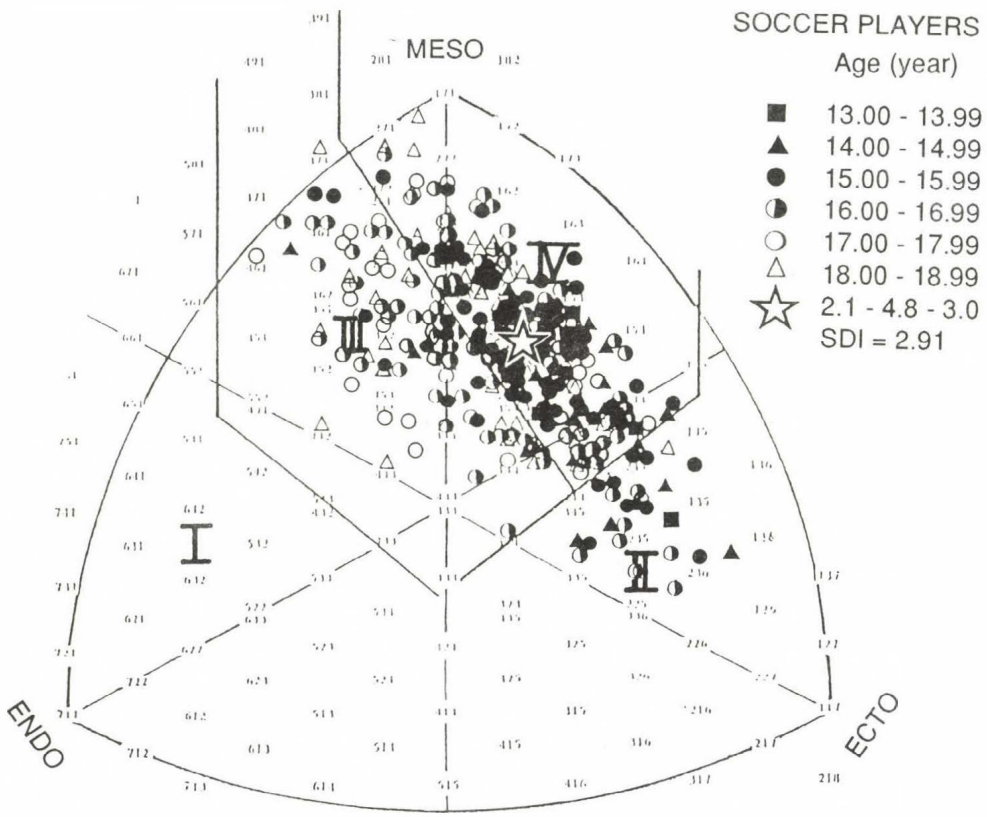

Fig. 3: Somatotypes of young Austrian soccer players.
☆ = Mean Somatotyxpe of Total Group; SDI = Somatotype Dispersion Index

Physical capacities

To evaluate the physical capacities the norm values of the specific group were used. The results of the 10 m sprint test of our investigated players are under the norm. In comparison to the 10 m sprint test the results of the 20 m sprint test are poor. This seems to be caused by an insufficient level of coordination, especially inadequate development of running technique. Identical results were found in elastic strength (Standing Long Jump), too. A reason for the low level of physical capacity could be an inadequat strength. The speed-endurance is at a very good level but the aerobic endurance is only at an average level. The flexibility tests showed a clear deficiency in this field. That means in particular that gymnastic elements during training are not present sufficiently.

The technical and tactical abilities of our players were evaluated by a questionnairy completed by responsible coaches. *Fig. 4* shows differences in all the tested performance parameters among the 10 best and the 10 weakest young soccer players. These results have exposed a coincidence between the level of physical capacities and a high score in the questionnairy. The best players according to the coaches have obtained the best results in sports tests.

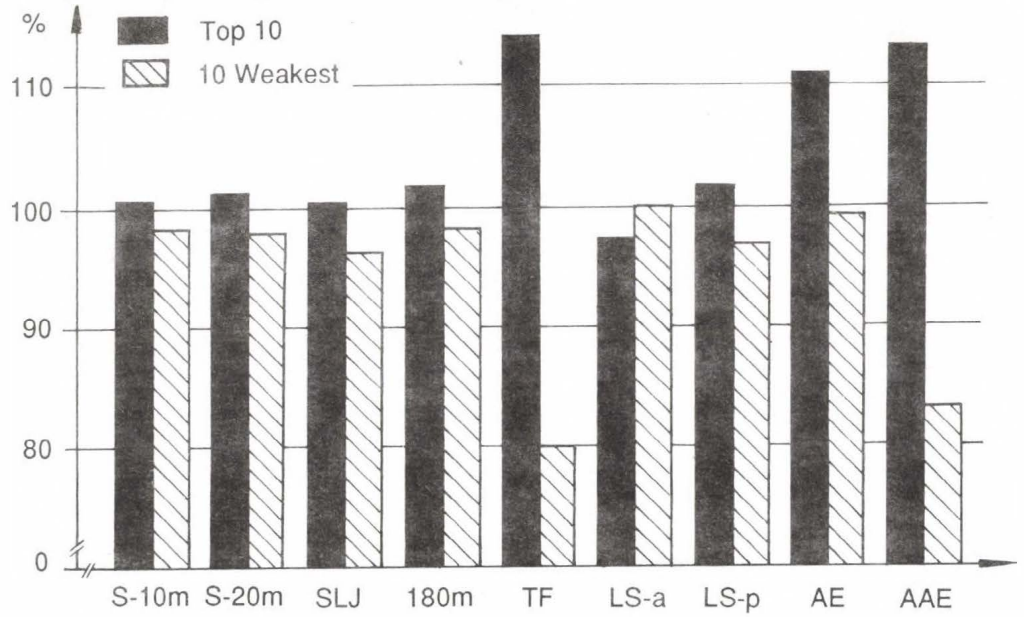

Fig. 4: Comparison of the top 10 and the 10 weakest players (judged by the coaches): Physical capacities, in percent of the total average. S–10 m = 10 m Sprint; S–20 m = 20 m Sprint; SLJ = Standing Long Jump; 180 m = 180 m Shuttle Run; TF = Trunk Flexion; LS–a = Leg Split active; LS–p = Leg Split passive; AE = Aerobic Endurance; AAE = Anaerobic Endurance; Top 10 = the 10 Best Players; 10 Weakest = the 10 Weakest Players

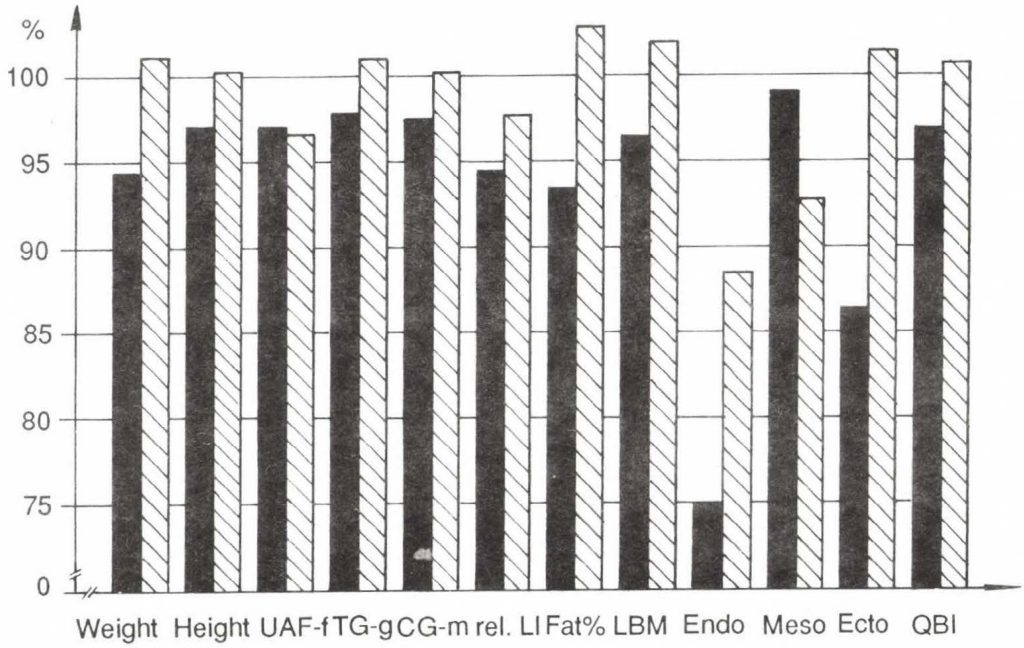

Fig. 5: Comparison of the top 10 and the 10 weakest players (judged by the coaches): Body dimensions, indices and somatotype, in percent of Norm (age 16.00–16.99 year). Weight = Body Mass, Height = Body Height, UAG–f. = Upper Arm Girth flexed; TG–g. = Thigh Girth gluteal; CG–m. = Calf Girth maximum; rel.LL = relative Length of Lower Limbs; Fat% = Body Fat in %; LBM = Lean Body Mass; Endo = Endomorph Component; Meso = Mesomorph Component; Ecto = Ectomorph Component; QBI = Quetelet-Bouchard's Index; Top 10 = the 10 Best Players; 10 Weakest = the 10 Weakest Players

What are the differences between the best and the weakest players?

Fig. 5 shows that the best players are significantly smaller but not lighter in comparison to the weakest players and the norm sample, too. They dispose of a significantly lower part of body fat, but mesomorphy of the best players is at a higher level. There are no differences in upper arm girth flexed, but circumferences of lower extremities are weaker in the best group. A deficiency of muscles is given by a lower level of body mass. There is an evident difference in body proportionality. The best players dispose of a significantly shorter length of their lower segment. That means their center of gravity is located a little bit lower in comparison to the weakest players and non-athletes. This could be the reason for the better mobility and speed of the best players. Nevertheless the lower level of body fat plays a very important role, too. As far as the length of lower extremities is concerned those of the best players are classified as "middle long", those of the weakest players as "long".

Conclusions

What about a somatic model of a successful young soccer player?

The successful young soccer player should dispose of the following somatic features:

- average body weight and middle growth
- lower level of body fat, about 10%
- solid level of lean body mass in comparison to body height
- somatotype 2–5–3 situated in the ectomorphic mesomorph category of somatochart
- relatively shorter length of lower extremities in comparison to non-athletes

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Mailing address: A. Kosova,
S. Hlatky,
W. Lilge,
H. Holdhaus
Joh. Steinböckstr. 5.
A–2344 Maria Enzersdorf
Austria