

Letter to the Editor

CHARACTERISTICS OF ELITE AND NON-ELITE YUGOSLAV SOCCER PLAYERS: CORRELATES OF SUCCESS

Dear Editor-in-Chief

During the last two decades, there has been significant accumulation of scientific data regarding soccer physiology and medicine. Previous investigations have evaluated ideal physiological and anthropometric profile of successful soccer players mostly from Western Europe and America (Rhodes et al., 1986; Mangine et al., 1990; Davies et al., 1992), although there is a lack of descriptive data concerning the characteristics of elite soccer players from Eastern Europe, particularly Yugoslavia. The physique of soccer players may be one of the key factors that contribute to the lack of success of Yugoslav soccer teams in international competition. Aspects such as experience, body composition, endurance, balance between anaerobic power and aerobic power, among other factors, are of primary importance in evaluation of elite soccer players (Reilly, 1996). Yet, it is difficult to find *specific* physiological and anthropometric "correlates of success". The purpose of several recent studies (Wisloff et al., 1998; Reilly et al., 2000) was to describe structural and functional characteristics of elite soccer players, and make comparisons with non-elite counterparts to find a relationship between results from the physiological tests and competition level. Understanding the profile of successful players could give coaches, trainers, and exercise scientists better working knowledge of this particular group of athletes. To our knowledge, study by Ostojic (2002) provided the most comprehensive comparison between professional and amateur soccer teams in East European soccer players up to date. Ostojic (2002) indicated that a strong relationship exists between aerobic fitness, anaerobic power and performance results in elite soccer. Ostojic (2002) found that elite Yugoslav soccer players were older and had significantly higher professional experience than their amateur counterparts. Nowadays professional players do seem prepared to stay in the game for longer than was traditional (Shephard, 1999). This is probably due to fact that professional level of game-play requires competent and well-versed players and commercial attractions of maintaining players' career as long as possible. In addition, amateur

leagues are place for young talented players to improve their knowledge and perfect abilities and skills. Yet, correlation between age and learning effects, skills and abilities requires more investigation. The aerobic system is the main source of energy provision during soccer match-play and the average values of VO_2 max for elite soccer players tend to be high, supporting the above statement. While VO_2 max values may be influenced by differences in standards of play, training regimes and the phase of season, team with superior aerobic fitness would have the advantage, being able to play the game at a faster pace throughout (Bangsbo et al., 1991). Higher level of endurance capacity will give elite players a better base for on-field performance regarding intensity and demands of soccer match-play. The estimated maximal oxygen uptake of the elite Yugoslav players was $52.9 \pm 9.1 \text{ ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ (Ostojic, 2002) which is in general agreement with previous data from other elite soccer players. It appears that Yugoslav soccer players generally fall towards the center of the continuum of maximal oxygen consumption of elite soccer players from different countries. The vertical jump height itself is a good measure of specific muscular performance (anaerobic power). For vertical jump heights, Ostojic (2002) found significantly higher results in elite group than in non-elite subjects. Wisloff et al. (1998), proposed that a higher level of anaerobic and strength parameters would be preferable and would reduce the risk for injuries and allow for more powerful jumps, kicks, tackles, and sprints among other factors. It would be reasonable to expect that the elite soccer player have values higher than 50 cm according to the recent findings. Performance of soccer players in vertical jump test tends to show up influences of positional role and training stage, which requires more investigation (Reilly et al., 2000). Muscle performance characteristics of soccer players in many respects are determined by their distribution of different fibre types: fast twitch (FT) and slow twitch (ST). Soccer players demand an ability to sustain physical effort, mostly discontinuous, over 90 minutes, some of which is at high intensity. As the activity profile is compatible with both slow and fast twitch muscle fibre characteristics, a combination of muscle fibre types

(with predominance of fast twitch) would be expected in elite players (Reilly, 1996). Ostojic (2002) found a significantly higher percentage of estimated fast twitch muscle fibres in elite players, which is in accordance with previous investigations. However, any conclusions about fitness level, muscle fibre type and elite soccer play could be incomplete. Method of assessment, position role, nature and intensity of training are, among others, factors that can influence measurement of fibre type distribution and amount. Furthermore, Ostojic (2002) found that height, weight and sum of seven skinfolds were not different between groups of elite and non-elite players. Data on height, body mass and body composition of soccer teams from other studies suggest that players vary widely in body size (Parente et al., 1992). Thus, these parameters are not essential factors for success in soccer; moreover, they might determine the playing positional role. A particular body size may be an advantage in certain match-play situation while disadvantage in other. Values for Hb, Hct, FVC and FEV₁ in the study by Ostojic (2002) were within the normal range of the male population and not significantly different between squads neither from values reported from studies of soccer players by other investigators (Biancotti et al., 1992). In conclusion, more research work has to be done before definitive inference can be made; however, the results of recent studies demonstrated strong relationship between aerobic and anaerobic power and level of performance in soccer. Such qualities are prerequisite and advantage for playing soccer at the elite level. From a practical standpoint, this information is important for coaches and trainers to adjust training regimes and concentrate on the variables that are specific to improve performance and achieve success in soccer.

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