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Physical Condition Differences between Semi-professional and Amateur Soccer Players

Yiannis MICHAILIDIS
Aristotle University of Thessaloniki, Department of Physical Education and Sport Sciences, Thessaloniki, GREECE
Email: ioannimd@phed.auth.gr

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Abstract

The purpose of the study was to examine and compare the physical fitness of Greek soccer players participating in teams of different divisions before the beginning of the preparation period. Eighteen semi-professional soccer players and nineteen amateur soccer players participated. All the tests performed on field (30m sprint, Illinois agility test, counter movement jump, squat jump, YoYo IR test and sit and reach test). The measurements performed before the beginning of the preparation period. Semi-professionals presented significantly faster values in 30m sprint and agility test compared to amateur by 7.6% and 8.2% respectively ($p<0.001$ for both). Semi-professionals jump higher in SJ and CMJ compared to amateurs by 27% and 16.4% respectively ($p<0.001$ and $p<0.05$). Amateurs had 20.6% worst performance at sit and reach test ($p<0.01$). Also, the VO2max for amateurs were 26.5% lower than semi-professionals ($p<0.001$). Semi-professionals performed better on all physical condition tests. These findings can be attributed to more specific training of semi-professionals. Amateur soccer players and their trainers give less attention to physical condition and use their time to play and for technical and tactical exercises.

Keywords: physical condition, amateur, semi-professional, soccer

Introduction

These days' soccer players are characterized by a set of physical and intellectual abilities. The physiological demands of soccer require players to be competitive in several aspects of fitness, like aerobic and anaerobic capacity, muscle strength, flexibility and agility (Ekblom, 1986; Reilly and Gilbourne, 2003). These characteristics are not the same for all players and can vary according to division of players' team and his position in the game (Bangsbo, 1994; Metaxas et al., 2004; Reilly and Gilbourne, 2003). Also, physical characteristics of youth soccer players estimated to help coaches at for choosing a ''talented'' soccer player.

More specifically, power is decisive for soccer5 and depends on the speed and maximum strength of the player. Movements that characterized by power within the field are usually those that play significant role in the result in a soccer match (Faigenbaum and Yap, 2000). Those movements include sprints, directional changes, and jumps. With a sprint or a head, the soccer player can score or shun a goal.

The necessity of good aerobic fitness is easily seen in the statistics of a soccer match where the players cover an average of 12 km. Good aerobic ability allows the player to cope with the needs of a 90-minute game (Impellizeri el al., 2005; Krustrup et al., 2003). It also allows them to relax more easily after a maximal effort inside the field and thus be more ready for the next intense effort. Finally, it allows him to have a quicker recovery after the game and so he can receive faster a new training.

Flexibility for soccer player allows him to move his joints to a full range of motion, performing better technical skills and with greater efficiency. Also had reported (Clark, 2008) that a decrease in musculoskeletal flexibility has been associated with an increase in risk of injury. However the evidence for a relationship between hamstring flexibility and hamstring injuries is conflicting (Arnason et al., 2004; Engebretsen et al., 2010; van Doormaal et al., 2016; Witvrouw et al., 2003).

Finally, another factor is the anthropometric characteristics of the players. At a high level, soccer players are trying to control their body weight and their percentage of body fat.

All of the above attributes can determine the performance of a player, but are the exclusive factors in choosing a player for a higher level? The purpose of the present study was to evaluate all of the above characteristics by field tests in two groups of soccer players of different levels. Field tests were used as they are more familiar to players; the execution is less expensive and more feasible to perform than groups of all levels.

Materials and Methods

Procedure

All the tests except jumps performed on a soccer field in two separate days. On the first day, they make all the anthropometric measurements and tests that have relations with power like SJ and CMJ, 30m sprint test and Illinois test. Second day they performed rest tests like sit and reach test and YoYo IR test. Players performed the tests at the beginning of the training season. The players of each group measured on the same day and the tests were performed in the same order.

Subjects

Thirty-seven male soccer players volunteered to participate in this study. All the participants were involved in organized soccer training for at least 7 years (3-4 practices weekly) before the study. Eighteen of them were amateurs and the rest nineteen were semi-professionals. All testing procedures and any possible risks and discomforts were fully explained in detail to participants before the start of the study. Participants signed a consent form in accordance with Declaration of Helsinki. Participants' characteristics are shown in Table 1.

Table1. Anthropometric Characteristics

	Amateur	Semi-professional
Age	22.7±9.1	23.5±5.6
Height (cm)	173±0.09	177±0.07
Weight (kg)	69.5±8.6	73.2±7.55
BMI	22.9±3.2	23.4±1.97
BF (%)	16.8±5.9	9.8±3.0‡
Years of training	10.3±6	10.8±3

BMI: body mass index; BF: body fat; ‡Significant difference from amateur values ($p<0.05$)

Anthropometrics

Body mass was measured to the nearest 0.1 kg (Beam Balance 710, Seca, United Kingdom) with the participants wearing their underclothes and barefooted. Standing height was measured to the nearest 0.1 cm (Stadiometer 208, Seca). Body fat percentage was estimated based on the sum of four skinfolds thicknesses measured with a Harpenden caliper on the right side of the body. The estimation of body density was calculated according to the Durning and Rahaman (1967) equation. Body fat estimated by the equation of Siri (1956).

Maximal oxygen consumption (VO_2max) assessment.

The VO_{2max} was estimated by using the next equation for the results of YoYo IR1 test

VO_{2max} (ml/min/kg) = IR1 distance (m) X 0.0084 + 36.4 (Bangsbo et al., 2008).

Performance testing

Testing was performed at the beginning of the season, in the field with good environmental conditions. Before testing participants execute a 15-minute warm-up session. The same test order was applied to all testing sessions.

Speed testing

A 30-m speed test was used to measure speed performance. The participants wearing running shoes and performed the test on synthetic grass. They ran in front of 2 infrared photoelectric gates (Chronojump, Barcelona, Spain). The participants began from a standing starting position with the toe of the front foot approximately 0.3 m behind the first gate. Photocells were placed 1.4 m above the ground (approximately to shoulder level). The coefficient of variation for test-retest trials was 3.4%.

Vertical jump testing

The participants performed 2 jump tests SJ and CMJ. At the SJ they performed a maximal vertical jump from a stationary semisquatted position (90^o angle at the knees). At the CMJ they began from an upright standing position, performed a fast preliminary motion downwards by flexing their knees and hips followed by an explosive upward motion by extending their knees and hips. The tests performed with the arms akimbo. The vertical jump height was measured with an ergojump contact platform (Chronojump, Barcelona, Spain). The coefficients of variation for test-retest trials were 3 and 3.5 SJ and CMJ, respectively.

Agility testing

For agility the participants performed Illinois test on the soccer field with soccer footwear). Time to complete the test was recorded with the use of 2 infrared photoelectric gates (Chronojump, Barcelona, Spain). Poles on the ground used to mark the points o change of direction. The coefficient of variation of agility testing for test-retest trials was 4.5%.

Flexibility testing

The participants performed sit and reach test to evaluate the flexibility of the lower back and hamstring muscles. We used Eurofit manual that suggests having 15 cm at the level of the feet. The participants were sitting on the floor with legs stretched out straight ahead without shoes. The soles of the feet were placed flat against the box. Both knees were locked. With the palms facing downwards, and the hands on top of each other or side by side, the subjects were reached forward along the measuring line as far as possible.

Statistical analysis

Data are presented as means ± SD. Data normality was verified with the 1-sample Kolmogorov-Smirnoff test; therefore, a non-parametric test was not necessary. Data were analyzed by an independent t-test. The level of significance was set at $p<0.05$. The SPSS version 16.0 was used for all analyses (SPSS Inc., Chicago, IL, USA).

Results

Anthropometric characteristics of the subjects are demonstrated in Table 1. Significant differences were found; only in body fat ($t_{37}=4.497$, $p<0.001$). The percentage of body fat of amateurs was greater (16.68%) than semi-professionals (9.84%). No differences were found among the two groups concerning all the other anthropometric variables.

At sprint time (Figure 1) the semi-professionals were faster than amateurs ($t_{37}=4.073$, $p<0.001$). They covered the distance of 30m 7.6% faster. Amateurs were also slower at Illinois agility test ($t_{37}=5.416$, $p<0.001$) with 8.2% greater times (Figure 2).

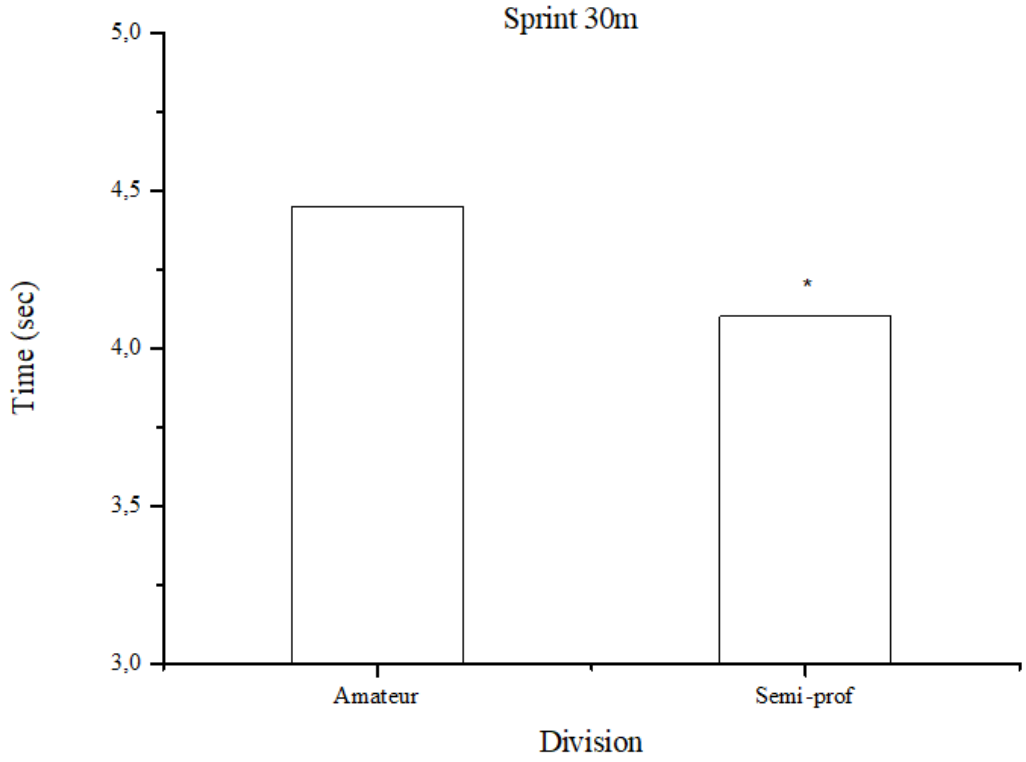

Figure 1. Sprint time at 30m. Values represent means ± SD, *significant difference from amateur values $p<0.001$.

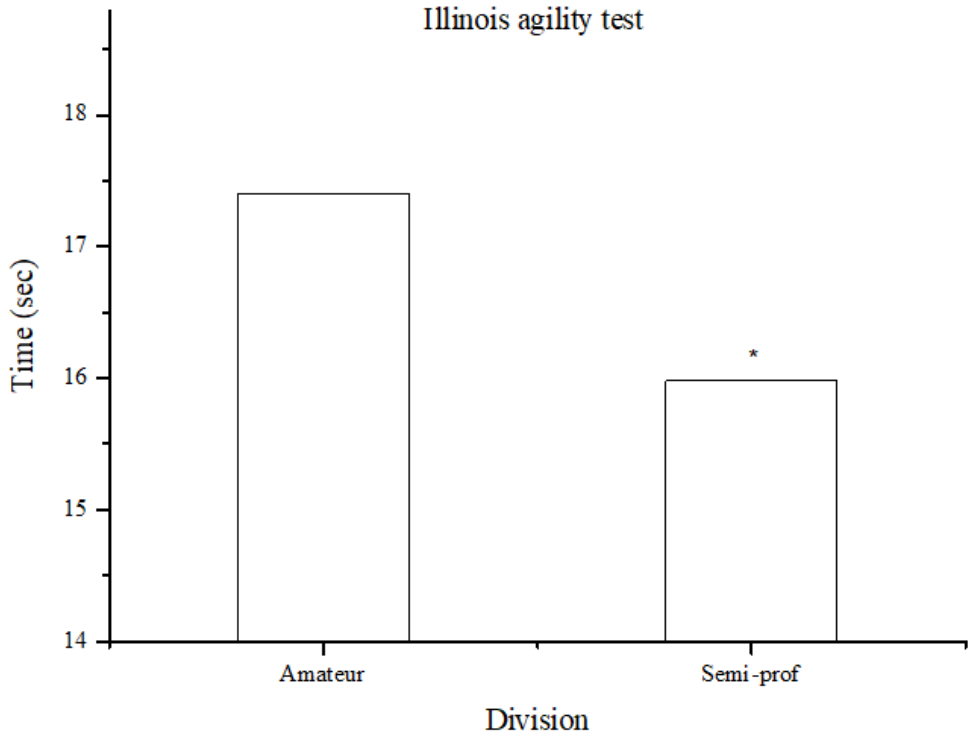

Figure 2. Time to perform Illinois agility test. Values represent means ± SD, *significant difference from amateur values $p<0.001$.

The performance of two groups in two types of jumps presented in Figure 3. Semi-professionals jump 27% higher (t_{37}=-3.975, $p<0.001$) at SJ and 16.4% higher at CMJ (t_{37}=-2.692, $p<0.05$).

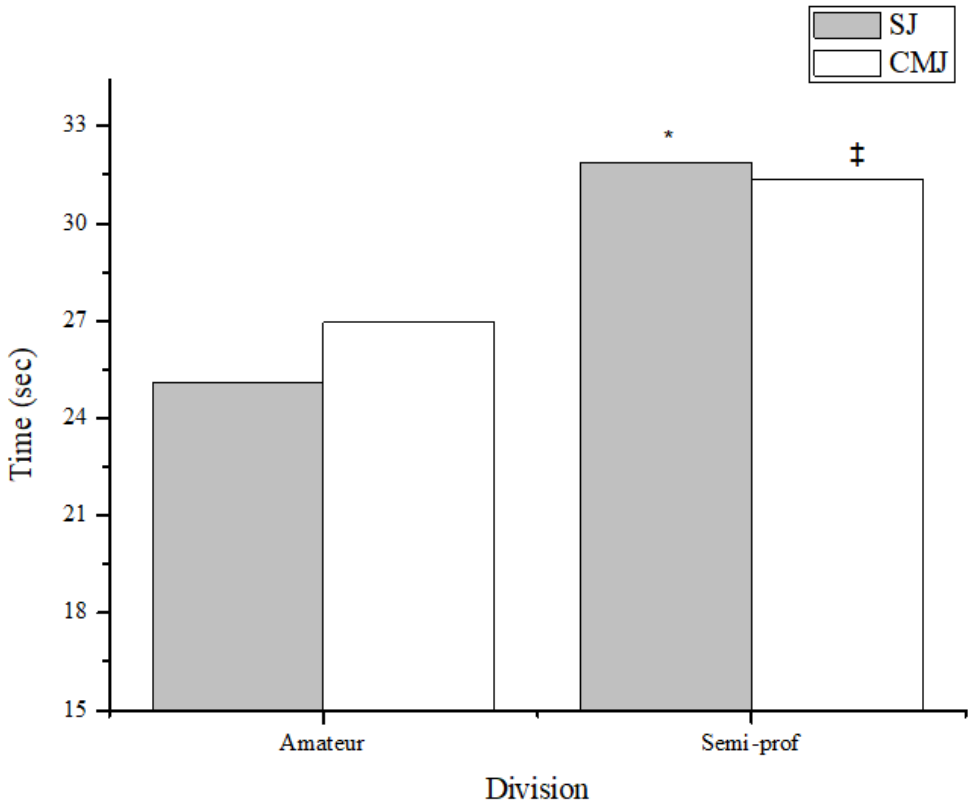

Figure 3. Jumping performance at 2 tests. Values represent means ± SD, SJ - squat jump, CMJ - counter movement jump, significant difference from amateur values *p<0.001, ‡p<0.05.

Semi-professionals performed better also at sit and reach test (t_{37}=-3.396, p<0.01) than amateurs. They had 20.6% better performance (Figure 4). The estimation of VO_2 max showed that semi-professionals had 26.5% better values than amateurs (t_{37}=-14.771, p<0.001) (Figure 5).

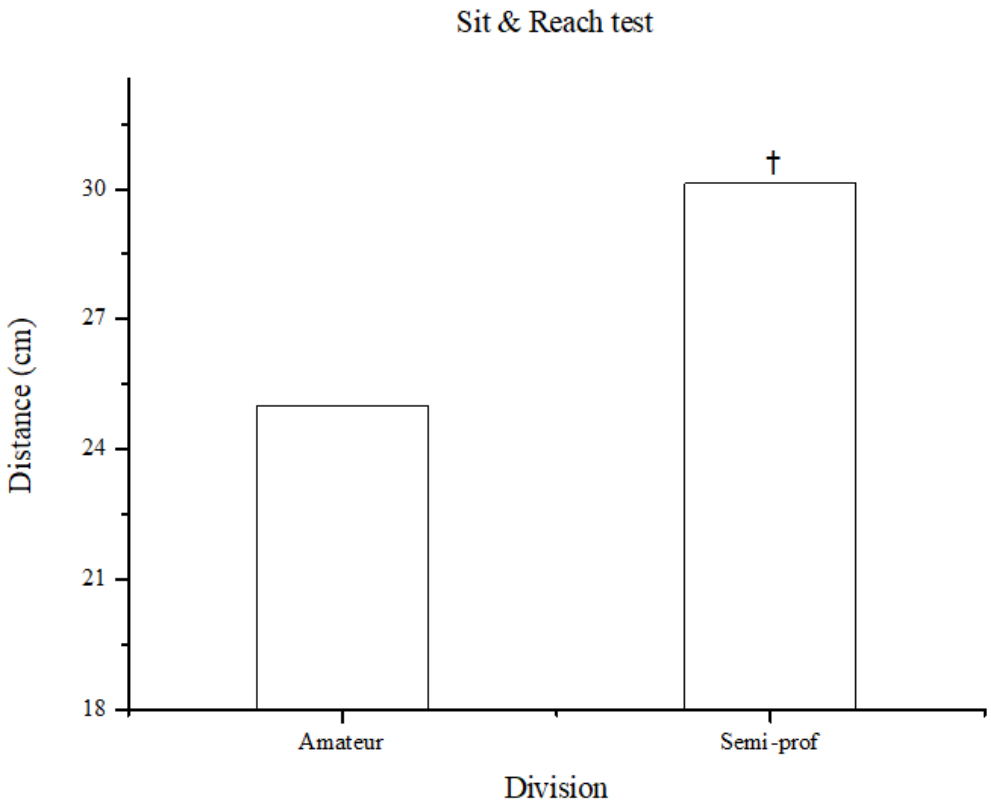

Figure 4. Sit and reach performance. Values represent means ± SD, †significant difference from amateur values $p<0.01$.

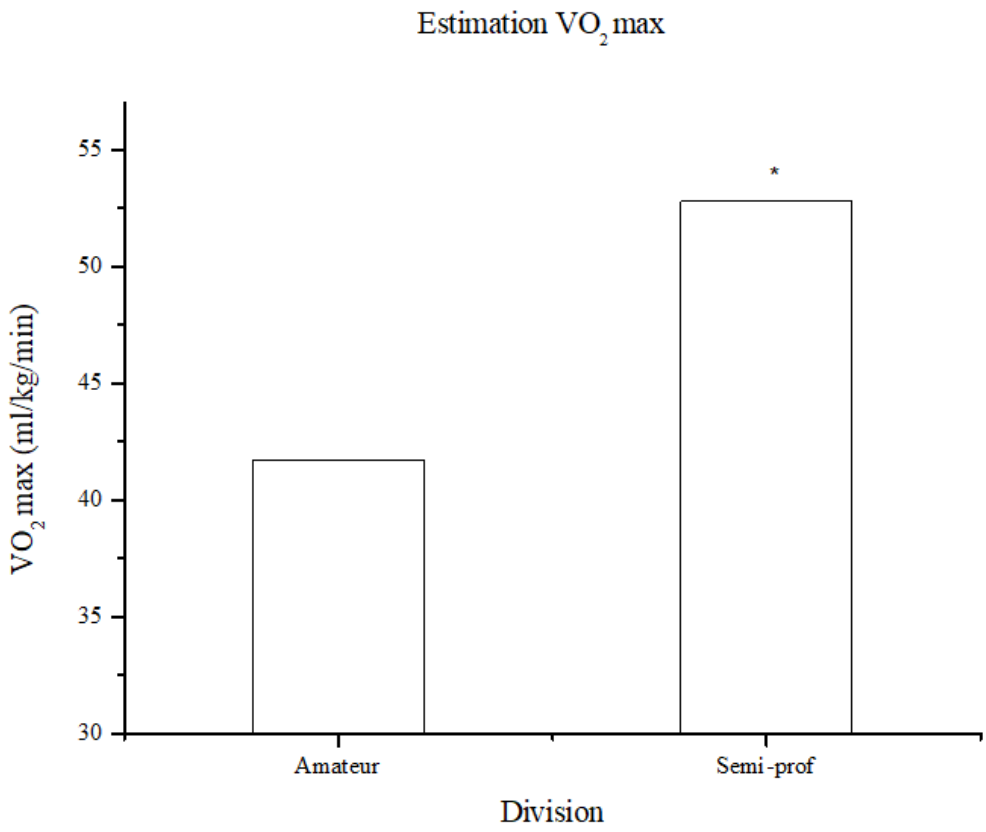

Figure 5. VO_2max estimation. Values represent means ± SD, *significant difference from amateur values $p<0.001$.

Discussion

In the present study compared anthropometric and physical characteristics of two groups of soccer players in different divisions. Semi-professionals played at III division of Greek championship and amateurs participated at V division of Greek championship (local character). Our data support that semi-professionals had a significant lower percent of body fat. The other anthropometric characteristics didn't differ between the two groups. Nowadays we can observe first-class soccer players with big differences in anthropometric characteristics (Reilly, 1996; Shephard, 1999), so those elements are not essential factors for success in soccer.

Speed is regarded by many soccer coaches as one of the most important aspects of soccer performance. This ability mentioned as a genetically determined factor, but it can be improved with an appropriate training program (Jeffreys, 2007). A lot of teams and coaches choose their players by the level of this ability. In our study amateur soccer players were significantly slower than semi-professionals. In parallel with these results a lot of studies reported that players from more elite levels have better results than players than nonelite levels (Cometti et al., 2001; Dunbar and Power, 1995) but some other studies mentioned that the differences between the groups observed only to small distances (10m) and at 30m there was no statistical significance between groups (Cometti et al., 2001). This disadvantage of amateur players maybe was the reason for which amateur players played at this division.

Also, this difference may be was the result of the different training of the two groups, because higher level training is more effective. Trainers of semi-professionals pay a lot of attention to improve speed.

Agility characterized by the ability of player to start and stop quickly and change direction (Gambetta, 1996). A soccer player makes over 1.000 changes of direction during a game (Davids et al., 2000) and it is very important for soccer players' performance. Strength, speed, and technique are significant elements for a good agility performance (Sheppard and Young, 2006). As we mentioned above semi-professionals were faster than amateurs, so maybe this is one of the reasons that they had better performance on agility test.

Power development is a key component of soccer performance. Semi-professional soccer players performed higher jumps compared to amateur players. Our results are in accordance with the results of other studies (Papaevangelou et al., 2012). As we mentioned above power is strength and speed combined. The training of amateur soccer players are focused more on technical and tactical elements and less on physical condition abilities. So the strength and speed of those players are less developed than semi-professionals. In our study, we observed big differences at the height of the Jump between the groups (Figure 3).

Another one big difference between the two groups of soccer players was the result of the estimation of VO_2max (Fig. 5). The values for semi-professionals were 52.8 ml/kg/min and for amateurs were 41.7 ml/kg/min. The values of semi-professionals belong at the range (50 to 60 $ml*Kg^{-1}*min^{-1}$) that mentioned before by others investigators (Metaxas et al., 2006; Reilly et al., 2000) at the beginning of the season. Amateur players had lower values that corresponding to sedentary men. The test performed at the beginning of the season and amateurs had bigger period for vacation and also they care less about their physical condition at this period.

Joint flexibility is important for an optimal execution of technique (Reilly and Stirling, 1990). Also, flexibility and sport performance are inter-connected and suboptimal flexibility increases the risk of injuries (Hawkins et al., 2001). In our study semi-professionals had better performances at sit and reach test (Figure 4) and maybe this is the result of their training. As we mentioned above at higher level trainers are more informed and they try to make more effective training. On the other hand soccer players at a higher level are more ambitious and they give more attention to their physical training.

In the present study, the semi-professionals showed better performance in all fitness tests than amateurs. The level of amateur was two divisions lower than semi-professionals. Amateur soccer players and their coaches give less emphasis to physical fitness and are more involved in their workouts on technical and tactical issues. Semi-professionals training are more in line with those of professional soccer players with a high frequency of training, and beyond the technical skills, they place a particular emphasis on improving all physical capabilities.

Conclusion

Physical fitness measurements cannot be a unique marker for selecting a player in a higher category. His performance is also dependent on the player's technical training and his psychic and mental capabilities. The training at higher levels is more complete because the trainers are more educated. Also, amateur soccer has a nature of pleasure. Players after their jobs participate in this sport to feel better. At higher level the incentives are different; players try to play as higher level as they can so they are more focus to improve their shelves.

Conflict of Interest

The author has not declared any conflicts of interest.

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