ORIGINAL ARTICLE

Monitoring the performance and technique consolidation in youth football players

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Abstract

Introduction. The monitoring of the skills development data is especially important in youth soccer players. It should be important for the trainer in order to properly plan the training and achieve the highest possible adaptation of the individual athlete. **Aim of Study.** After an initial qualitative and quantitative testing phase, carried out in previous works, the aim of this study was to choose adequate tests to evaluate the overall performance in the young players. **Material and Methods.** After an initial review of the literature, the research team chose three types of tests with the technical components: T-drill Test (shooting), Loughborough Soccer Passing Test (passage), Hoff Test (conduction). The first two tests focus only on the agility component, while the third also evaluates resistance and agility. Tests were performed in 15 boys between 13 and 14 years of age practicing in an amateur football school. **Results.** The overall average time in the T-drill Test was 15"53 without corrections for scored goals and 14"79 with such corrections. The average time achieved in the LSP Test was 56"47 in the first attempt and 58"53 in the second attempt. Finally, in the Hoff Test, the boys covered an average distance of 1512.8 m. **Conclusions.** By comparing the results obtained from the sample with the reference data in the literature, it is possible to examine the performance and the level of basic skills. These tests can also be used to identify talent in youth groups.

KEYWORDS: agility, Loughborough Soccer Passing Test, T-drill Test, Hoff Test.

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Introduction

The evolution of the football game in the last twenty years has been remarkable, especially concerning playing time and the transition. In football, there are two phases of play: the ball possession phase and the non-possession phase. Between two phases, a "third phase" or "transition" playing time is recognized. It is "the time frame for changing from an individual attitude to a collective attitude between the ball possession phase and the non-possession one" [1]. This change has led to several negative aspects, linked to the almost total disappearance of the football technique in football schools [14]. All this is worrying since, as stated by Castelo and Matos [7] "without a good command of the technique there can be no football". It is known that the lack of domination – and therefore of the familiarity in controlling the ball – inhibits both the technical-tactical growth and the acquisition of a player's tactical and decision-making skills, and therefore the formation of the personality [6, 38]. As soon as the coach tries to plan the training session, he must necessarily try to introduce both individual and collective exercises and situations, proceeding from simplified to complex, from simple to difficult, with the knowledge that the nature of the proposals must have technical, tactical, physical-athletic but above all mental objectives [28]. Looking at the importance of these components in the formation of the young football player, it is clear that the technique is a driving force and the priority element to train [5]. Each training session must include primary and secondary objectives. The primary objectives are essential of a technical nature (such fundamentals as

a passage, conduction, shooting) but also strategic-tactics (such as the 1 vs 1 and two-three-player collaborations both in the possession and non-possession phases). The secondary objectives, on the other hand, are always in "manifestation regime", where both the coordinative and the organic-muscular components are present [11, 26, 43]. It must be considered that the football technique helps to improve coordination skills but, at the same time, coordination skills also help to improve the technique. The technique is a skill or a set of skills – it is a series of actions performed without conscious control, which allows the player to carry out the movements required by the sporting discipline practiced with great confidence and ease [17]. From a didactic point of view, the improvement of the player from a technical-tactical point of view (the development of his dexterity) cannot be separated from the position and attitude of the comrades, as well as from the location and behavior of opponents [37]. However, in analytical form, the technique of the movements with the ball, which is called "fundamental technique", is of crucial importance. Although the training is mainly oriented towards exercises, closely related to the game situations, it is a mistake not to work on the execution of different gestures, i.e. without the presence of the opponent, to improve the man-ball relationship, which is essential in managing the ball in the game situations. Therefore in the youth sector, it is necessary to train memory, perception, concentration skills and situation analysis [31]. Trainers need to recreate actions that are more likely to appear in the game but stimulate reasoning as a training factor. The player, once gained experience, will automatically know how to use it in the game [40].

Agility, acceleration, deceleration, change of direction, and sprint are all considered critical technical skills and main components of soccer training [13, 41]. Very often, these movements are performed in exercises that involve ball usage [2, 16, 41], with agility in kicking, anticipating the direction of the ball with the right timing being crucial issues for success [12, 39]. Football requires the execution of skills in a dynamic context. A player with good (technical) movement patterns, when not performing them at the right time (skill), becomes almost a "useless player" [33]. In order to investigate the greatest possible amount of factors that determine the performance, various approaches are used. In this case, attention has been paid to functional evaluation, which is the prerequisite for training control. It is a fundamental moment for every player, sportsman, team and an indispensable help for the coach even at the youth sector level. Using specific tests allows

coaches to measure certain variables, such as a physical condition or technical-tactical performance [34], and later to improve the qualities of the young player, and help to define the purposes of the training program. In assessing the results of young peoples' tests, it must be remembered that some variables change during growth as a result of body changes, while others are the result of adaptive changes in physiological functions.

Several validated tests are currently in use to assess the players' performance and technical qualifications [3]. Among these, it is worth mentioning the Bosco test used to evaluate the elastic reactive component of the extensor force of the lower limbs [4], the Cooper test which is certainly the easiest endurance test [35], and the Léger test which allows determining the maximum speed [42]. Yet, based on literature evaluation T-drill Test (shooting), Loughborough Soccer Passing Test (passage), and Hoff Test (conduction) seems to be the most appropriate for football players. Therefore to this study aimed to evaluate the overall performance of 15 amateur players and to compare the results to reference values inherent to the youth elite categories [8, 9, 10].

Material and Methods

Fifteen U14 (age: 13 ± 0.3 yrs; height: 166.4 cm; body mass: 62.92 kg; training experience: 3 ± 0.3 yrs) participated in this study. All participants were free from musculoskeletal injuries, participated in $\geq 95\%$ of training sessions per year, and were not early or late matures. Experimental procedures and potential risks, discomforts, and benefits were fully explained to all boys and parents/guardians prior to participation. Signed informative consent forms were provided by subjects' parents and/or legal guardians.

Three types of tests with technical components fundamental for football were used in this study: T-drill Test (shooting), Loughborough Soccer Passing Test (passage), and Hoff Test (conduction). The first two tests focus only on the agility component, while the third test covers resistance as well as agility. The tests were carried out individually on different days. Results were obtained after a 2-week familiarization with the test procedures.

T-drill Test

The T-drill Test is one of the most used tests in the world to measure agility: it measures the ability to accelerate, decelerate and change the direction in a short space. In this case, a variant of the classic Test T proposed by Kutlu et al. [22] was proposed, where kicking the ball instead of touching the cones was performed. The

components of technique and ones related to decision-making as well as cognitive skills specific to kicking on goal were added to classic elements like speed, acceleration, and change of direction (Figure 1).
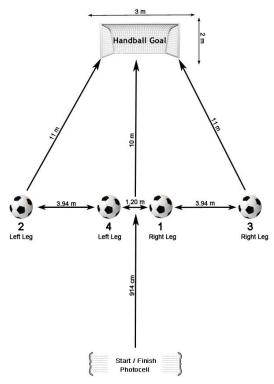

Figure 1. The T-drill Test scheme [22]

Figure 1 shows the path of the T-drill Test where initially the player is standing with his feet behind the starting line, and at a start signal, he runs accelerating forward to reach the line set at 9.14 m distance, kicks a ball with the right foot to 0.6 m on the right, trying to center the Handball Goal 10 m away. Immediately afterward, the player moves with side steps to the left, towards another ball at 5.14 m distance from the first one, and shoots with the left foot in Handball Goal, which is 11 m away. Then with lateral steps, he moves to the right reaching the third ball, placed at 9.08 m from the second. He also kicks it into the goal with his right foot and moves with side steps 5.14 m to the left and scores the fourth ball with the left foot. Finally, he runs backward covering the 9.14 m that separates him from the start/finish line. The precision of scoring is granted by subtracting the adequate part of one second from the total time of test performance:
- − 1 sec, when all four balls end up in the net;
- − 0.75 sec, when the player scores 3 goals;
- − 0.50 sec, when the player scores two;
- − 0.25 sec, when the player scores only one.

Loughborough Soccer Passing Test
The Loughborough Soccer Passing Test (LSPT) is a reliable and validated test, which evaluates aspects of football skills including passages, dribbling, control and decision making [24]. Tests' authors observed that elite male and female players achieved significantly better results than their non-elite counterparts, confirming the validity of the test criterion. Because the talent identification process takes place between the ages of 12 and 15 [44] and there are concerns if the LSPT is appropriate for teenage players, O'Regan et al. [29] used a modified version of the LSPT claiming that the original test conditions were not suitable for their players (aged 12 or over). In this study, however, for better comparison and performance monitoring between young and adult players, we have maintained the conditions from the original LSPT.
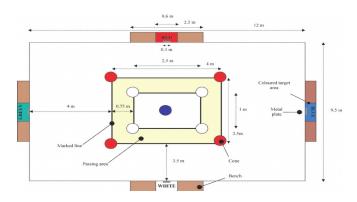

Figure 2. Loughborough Soccer Passing Test scheme [24]

Figure 2 shows the scheme of the **Loughborough Soccer Passing Test**. Initially, a rectangle of 12 m (long side) × 9.5 (short side) is drawn. Inside there are two other concentric rectangles, one of 4 × 2.5 m, the other of 2.5 m × 1 m, so that the smaller rectangle is surrounded by a 0.75 m wide corridor. The cones are placed at each corner of the central rectangles and additionally one in the center of the smaller rectangle. On the outermost perimeter, in the central area of each side, there is a rectangle, 2.5 m long and 30 cm high, with a 1 m long colored area in the middle. A target formed by a 30 cm wide metal plate is inside a target area with 60 cm × 30 cm sides. 16 passages must be made, of which 8 passages of 3.5 m, towards the long sides of the outer rectangle (red and white colors) and 8 passages of 4 m towards the short sides (blue and green colors) trying to hit the metal target. The test requires two operators, one controlling the time, the other indicating the target that the player must hit with the ball, calling a color with

a predetermined sequence, but which is randomly defined so that the player can never know the succession of targets to hit. Passages must be made from the corridor between the two internal rectangles and the return ball, after having bounced off the colored rectangles, must return to the central one, towards the central cone, before being kicked against a new target called by the operator. The test begins with the player entering the corridor and ends after making the 16 passes in a maximum time of 43 sec. The performance is measured in seconds, with the following penalties/bonuses:

- 5 sec if the player does not hit the rectangle or hits the wrong rectangle;
- 3 sec if the player touches the ball with his hands;
- 3 sec if it does not hit the target area (69 × 30 cm);
- 2 sec if the ball is not kicked into the corridor;
- 2 sec if the ball hits one of the cones;
- 1 sec for every second more than the maximum time of 43 sec;
- bonus: 1 sec for each hitting of a metal target.

Players perform two test trials and the average result is calculated. Players' performance is measured through:

1. The total time taken to complete the 16 passages.
2. The time resulting from the calculation of penalties and bonuses.
3. The total time calculated from the difference between the two previous.

Hoff Test

The Hoff Test, proposed by Chamari et al. [9] is an extension of the endurance training exercise, introduced by Hoff. The test assesses agility as well as endurance. The path is traced on the playing field and is 51.5 m long on the side where the ten cones for the slalom and the three obstacles are placed, 55 m from the other and is 35 m wide (Figure 3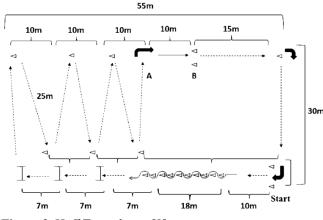). The player continuously covers a 290 m path with technical elements for 10 min in order to reach the maximum possible distance. It's possible to test up to 5 players simultaneously, starting them every 1 min.

As shown in Figure 3, in the beginning, the player must bring the ball from the starting point between 10-cone slalom arranged in a straight 12 m line (2 m every each cone). Then he continues to run and jumps above three 30-35 cm high obstacles, placed 7 m from each other. After the third obstacle, the player turns about 90° to the right and heads 30.5 m towards a cone, after which he starts another slalom, with 25.5 m distance between cones. After the seventh cone player turns in order to run 10 m backward, with the ball, in the right direction. Once he reaches a gate (made of two cones) he turns around and continues to run forward. After 15 m, he turns 90° right and runs the last 30 m to the starting gate.

Statistical analysis

Data obtained from the tests showed a normal distribution and were presented as average and standard deviation (SD). The analysis refers to the following variables: T-drill Test, to detect the ability to accelerate, decelerate and change the direction in a short space (sec), Loughborough Soccer Passing Test, to detect the passages, dribbling, control and decision making (sec) and Hoff Test, to detect agility and endurance (m). A paired sample t-test was conducted to combine the results obtained from the test and re-test. The t-test was selected as the analytical method to verify the presence or absence of a significant difference between two sets of data. The significant level has been set at $p < 0.05$. Statistical analyses were carried out with the software IBM SPSS Statistics 23.

Results

Table 1 shows the results of the T-drill Test. The significant difference ($p < 0.05$) was observed between the two data series.

Figure 3. Hoff Test scheme [9]

Table 1. Results obtained in the T-drill Test

Players	Time taken without correction for goals scored	Time taken with correction for goals scored
Player 1	17.98	17.23
Player 2	16.05	15.05
Player 3	15.45	14.70
Player 4	13.83	12.83
Player 5	13.05	12.80

Player 6	15.23	14.48
Player 7	17.24	16.24
Player 8	15.88	14.88
Player 9	16.23	15.73
Player 10	15.49	14.99
Player 11	16.27	15.52
Player 12	13.37	12.62
Player 13	15.76	14.76
Player 14	16.34	16.09
Player 15	14.82	14.07
Average	15.53	14.79*
SD	±1.34	±1.32

* denotes significant correlation at $p < 0.05$

Table 2 shows the results obtained by the sample of Pontecagnano boys in the Loughborough Soccer Passing Test. There were no significant differences between the two series of the test in trial time, penalty time and global performance.

Table 2. Results obtained in the Loughborough Soccer Passing Test

Players	Trial 1	Penalty time 1	Global performance 1	Trial 2	Penalty time 2	Global performance 2
Player 1	45.24	6	51.24	49.46	12	61.46
Player 2	48.42	8	56.42	49.48	13	62.48
Player 3	46.96	9	55.96	47.32	9	56.32
Player 4	49.74	11	60.74	51.84	15	66.84
Player 5	49.93	7	56.93	48.21	10	58.21
Player 6	50.51	8	58.51	48.98	12	60.98
Player 7	48.96	14	62.96	49.83	8	57.83
Player 8	45.17	9	54.17	47.03	11	58.03
Player 9	46.70	7	53.70	46.24	5	51.24
Player 10	47.08	6	53.08	48.02	10	58.02
Player 11	49.60	12	61.60	47.23	8	55.23
Player 12	47.53	8	55.53	49.85	11	60.85
Player 13	48.62	7	55.62	48.15	10	58.15
Player 14	46.15	7	53.15	46.90	8	54.90
Player 15	49.55	8	57.55	49.45	8	57.45
Average	48.07	8.40	56.47	48.53	10	58.53
SD	±1.73	±2.26	±3.34	±1.48	±2.47	±3.67

Finally, Table 3 shows the results obtained by each boy in 10 min of the Hoff Test. The average distance covered by the analyzed group during the test was 1512.8 m.

Table 3. Results obtained in the Hoff Test

Player	Distance covered (m)
Player 1	1499
Player 2	1512.5
Player 3	1509
Player 4	1532.5
Player 5	1612.5
Player 6	1484
Player 7	1402.5
Player 8	1617.5
Player 9	1417.5
Player 10	1537
Player 11	1484
Player 12	1509
Player 13	1512.5
Player 14	1564
Player 15	1499
Average	1512.8
SD	±58.44

Discussion

We believe that with these tests any coach, even at the amateur level, can draw very interesting information about the group he works with, as they allow a systemic evaluation of the psychomotor area, highlighting the skills, difficulties, and potential of the players close to ones performed in natural environmental situations [32]. In the first test, the ability of the players to perform rapidly repeated sprints with changes of direction and to shot on goal from a standstill position with accurate decision-making ability was assessed. In this case, the attention was not aimed at finding the error in performing the move or in the shot on goal, that is, on the performance model. The players were not forced to kick with the left or right foot or with a certain anatomical part of the foot; they were simply asked to try to execute shots on goal as quickly as possible through lateral displacements. In contrast to Italian teaching methodology, where there is a tendency to focus the player's attention on the correct acquisition of biomechanical elements of

technic, English one focuses on achieving a certain goal by finding an individual solution [21, 25, 30, 36].

Overall, some reasonable run times were achieved during the tests but, in some cases, the inability or difficulty of young players to use the weak foot to shoot on goal clearly emerged. While in the research of Kutlu et al. [22] the average time obtained by his sample was 12"36 in the test without correction for the goals scored and 11"70 in the test with this correction, in this study the examined boys had an average total time of 15"53 in the test without correction for the goals scored and 14"79 in the trail with correction. No significant correlation between the two results is in line with other research findings [22]. Another study focusing on agility, conducted by Little and Williams [23] obtained a slightly faster total completion time compared to the current study. This may be because the participants in that study were soccer players from the first and second division English League.

The second test (LSPT) was aimed at assessing the ability of the players to perform repeated, as accurate as possible, passages in a "stressful"/time-limited situation. Their attention was focused not only at making the passages in the indicated area, but also at good space-time and decision-making capacity. In this test the element of time limitation was significant. The execution of passages in the non-time-limited test was about 12-13 out of 16, and dropped to about 6-7 correct passages when time limitation appeared. The LSPT can distinguish elite players with their counterparts by analyzing various aspects of soccer skill performance (gross motor performance with the time-only score and accuracy using penalty time) [24]. Because of the few studies that have used the LSPT in young players, it is difficult to compare our findings. Impellizzeri et al. used the LSPT with 26 junior soccer players to examine the effects of aerobic interval training on the decline in short-passing ability caused by a short bout of high-intensity intermittent activities [20]. Time scores ranged 44-49 sec and global performance was around 62-68 sec in the fatigued condition.

Finally, the third test (Hoff Test) analyzed the player's aerobic performance with technical exercises through a specific dribbling circuit. In the Hoff circuit, in addition to the physical parameters, specific good technical skills were needed to perform the test in a shorter time. It is clear that, since the maximum distance covered in 10 min of exercise is the dependent variable in this test, the motivational factor also influences the result of the test, hence the use of the ball, which is certainly a fundamental motivational point for performing this test. Previous studies [9, 18, 19] have concluded that players who covered more than 2100 m in the Hoff Test had a VO_2max >200 ml/kg^{0,75}/min, and those that ran <1900 m had <200 ml/kg^{0,75}/min, which was suggested as a minimum value for active soccer players. Therefore, these authors suggested that the goal of the Hoff Test for elite U-15 players should be to run >2100 m distance (about 7 laps of the track) in the 10-min test [35, 45]. In this study, amateur players obtained significantly lower results than indicated by mentioned elite players. As it was previously observed the recurrent execution of this test implies an effective improvement to the running economy and the maximum absorption of oxygen. Hoff et al. [19] suggested that this protocol could be used as a training method to improve VO_2max level, respecting many of the motor actions performed during the football game, which is very interesting for practical application. However, it is necessary to review this assumption in the future.

Conclusions

By comparing the results obtained from the sample with the reference data in the literature, it is possible to examine the performance and the level of basic skills. These tests can also be used to identify talent in youth groups.

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