

# Objective Reference values for Assessing Functional Recovery after Injuries in Amateur Soccer Players

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## Introduction

Soccer is the most popular team sport in Italy. The injury incidence is also high. For top level teams (20 players) the incidence of injury is 0.2 injuries/training session, 1 injury each five sessions. After an injury soccer players need to return to competition quickly but safely. Subjective or strength criteria are usually used to monitor progress during rehabilitation and to decide when patients can return to competitions after soccer injuries (1). According to "The team physician and return to play issues: a consensus statement" published by ACSM in 2002 (2), functional healing and restoration of sport specific skills should be confirmed prior to return to play.

The aim of this study was to provide reference data of healthy Italian amateur soccer players for consequently setting objective criteria. These have to be fulfilled in order to state the functional and sport specific skills recovery and the time for a safe return to competitions after injury.

According to Balsom (3) and Rosch et al. (4), the individual physical profile of the injured player, may be compared to mean values for same age group and technical level, helping physicians and therapists in objective evaluation of the state of recovery after an injury. Our aim was also to compare physical and technical test results between different playing roles.

## Methods

During the regular season (2004-2005) we tested 108 healthy male players, aged  $23.7 \pm 5.5$  years (range 17-37), involved in 6 Italian amateur soccer teams. Among them 9 were goalkeepers, 37 were defenders, 38 were midfielders, 24 were forward players.

We selected 7 test for their validity as measures of fitness, strength, coordination and technical skills, for their simple application in a soccer field or in a gym, and for their close relation to soccer player normal activity.

Strength was evaluated by single leg hop test (SLHT) and triple hop test (THT) for dominant (D) and non dominant (ND) limbs, and by a countermovement height jump test. Single leg hop test was performed with player standing in a stepping position behind a take off line and taking an hop landing on the same leg as far as possible (Figure 1).

Attempts for each leg, measuring distance in centimetres from the rear most mark and the take off line. Same procedure was used for triple leg hop test (Figure 2), taking three consecutive hops on the same leg for both dominant and non dominant limbs and measuring the best of them for each side. Height jump test consisted in a two-footed explosive vertical jump with hands on the ilei, countermovement of the lower limbs reaching 90 degrees of knee flexion (Figure 3) and landing with straight legs. The vertical displacement of the body centre of mass was calculated in centimetres, from the flight time (0.001 s precision) between take off and landing of a jump performed on an optometric platform (Optojump, Microgate, Bolzano, Italy).

Speed has been evaluated with a shuttle run test consisting in a distance of 6.1 meters to run four times as fast as possible between two line traced on the field (Figure 4). Players had to touch with a foot the lines before change direction. Time between the "Go" signal and crossing the last line was taken with a hand-held stopwatch by the examiners and measured in units of 0.1 seconds.

For technical skills we used two tests from F-MARC (FIFA - Medical Assessment and Research Centre) test Battery that was used also by Rosch et al. (4): the long passing test and the speed dribbling test. Details are described in a specially developed manual (F-MARC Test Battery Manual, 1997).

The long passing is a passing accuracy test over a long distance. The player passes the ball from its dead position on the line into a circle (2 meters radius, distance 36 meters) that constitutes the target (Figure 5). The circle is in the centre of a square area,  $10 \times 10$  m. After a trial attempt, the player has 5 attempts. Each ball that lands in the circle means 3 points, 1 point if it lands in the square and no point if out of the square. Examiners measure total points amount after five attempts for each player.

Speed dribbling test consists in a dribbling among 7 posts and around two blocks in a 50 m long field (Figure 6). Examiners measure total time in 0.1 seconds unit with a stopwatch from the "Go" signal until the player passes through the end line and stops with the ball under his foot.

The anaerobic threshold was assessed by the Mogroni test (MATT) consisting in capillary blood lactate sampling immediately after a 6 minutes run at 13.5 km/h (5). The players run the distance in groups of 4-5 people (Figure 7). Examiners check the running speed continuously in order to keep it constant. At the end of 6 minutes blood capillary samples were taken from the earlobe and immediately analyzed with a sport Pro lactate analyzer YSO 1500 (Yellow Spring, CA, USA).

Before the testing session the players were informed in detail about the aims and methods used, in order to have their consensus and positive motivation in doing the tests. Statistical analysis was performed using Student's *t*-test, assuming a  $P < 0.05$  as significant value.

## Results

Means and standard deviations are showed in Table 1, divided by playing roles. The goalkeepers showed significant differences from the other roles in MATT (Student's *t*-test:  $P < 0.001$ ), Height jump ( $P < 0.05$ ), and Speed dribbling tests ( $P < 0.001$ ). There were also significant differences between the performances of the dominant and the non dominant limbs in SLHT (Student's paired *t*-test  $P < 0.01$ ), but only considering the whole cohort of players.

## Conclusion

These data could constitute reference values helping to state the functional recovery and the time to return to competitions after injuries in amateur soccer players.

## REFERENCES

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Figure 1 Single leg hop test



Figure 2 Triple leg hop test



Figure 3 Height Jump test with lower limbs countermovement



Figure 4 Shuttle run test



Figure 5 Long passing test



Figure 6 Speed dribbling test



Figure 7 Mogroni test for anaerobic threshold

	GOALKEEPERS	DEFENDERS	MIDFIELDERS	FORWARDS	ALL
N°	9	37	38	24	108
MATT (km/h)	12.1±0.6***	13.3±1.0	13.7±1.0	13.3±0.9	13.3±1.1
SLHT D (cm)	194±15	196±16	189±14	190±15	192±15
SLHT ND (cm)	197±15	200±17	194±13	194±18	197±16**
THT D (cm)	648±4	637±56	615±42	620±46	627±49
THT ND (cm)	637±36	649±73	620±55	613±53	631±62
Shuttle run (s)	6.97±0.71	6.77±0.53	6.77±0.42	6.78±0.56	6.79±0.51
Height jump (cm)	38.4±3.7*	35.5±5.6	35.8±5.1	34.3±5.1	35.6±5.2
Long passing (pts)	5.11±2.42	4.59±2.60	5.62±2.73	4.17±1.90	4.75±2.52
Speed dribble (s)	25.50±0.93***	23.69±1.42	23.39±1.65	23.23±1.11	23.62±1.51

\*\*\*:  $P < 0.001$  \*\*:  $P < 0.01$  \*:  $P < 0.05$   
Means and standard deviations divided by playing role. Table 1