



**PHYSICAL ABILITY AND FITNESS TESTING AND MONITORING FOR
COACHES, TALENT IDENTIFIERS AND DEVELOPERS: A
DESCRIPTION AND APPLICATION ON A SOCCER
ATHLETE
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ABSTRACT

Every sport has its own demands and these demands can be either physical, mental as well as social. Sports followers will always expect more from an athlete without, most of the times, considering the welfare of the athlete rather, always assuming that he or she is fit to bear their colors and keep or build their legacy. Sports administrators, managers and coaches need to understand what is necessary to do for a player to give his or her best as they must know the real reason behind players' success or failure. It is in this regard that, to ensure regular and promising positive achievements, Player development has to be done strategically, purposefully and in a long term process of talent identification and development, respecting the development of all qualities expected from a strong and competent player on all aspects of physicality (Physical Fitness), mentality (Mental fitness) and keeping a positive social image (Social fitness). This article highlights the necessity of physical fitness testing and monitoring, with football taken as a reference, a highlight of basic fitness testing and monitoring practices that are easy to construct, use and assess. It is recommended that every fitness coach or talent identifier and developer chooses a specific test respecting the target physical aspect (Strength, Speed, Weight, Agility) and use a proper intensity measure with respect to age, gender, competition level and lifestyle of athletes. It is also recommended, as science improves, to pick an approved fitness test specific to a sport and remain up to date on improvement and changes that can be made on a certain test.

Key words: Fitness, Soccer, Athletes, Coaches, BMI, Talent, Physical ability.

1. INTRODUCTION

In football, the ability to produce high-intensity efforts and delay fatigue as much as possible in intermittent efforts is very important (**Sillero, Silva-Grigoletto, Montero, & del Castillo, 2015**). Physical fitness is the state expected from every individual to physically perform a task requiring the use of strength, mastery of body movement manipulation skills, demonstration of activity relevant speed and mastery of body control in different situations of the sport. It is the quality of being able to perform; a quality that permits or facilitates achievement or accomplishment of physical activities.

Basic fitness is the ability to demonstrate the required potential to perform a strenuous activity and this fitness is showcased through strength, speed, stamina and flexibility (**Tancred, 1995**). This has been extended to nine to detail the fitness need of all athletes. These are: Strength, Power, Agility, Balance, Flexibility, Local Muscle endurance, Cardiovascular Endurance, Strength endurance, coordination (**Mackenzie, 1997**). Physical ability is an important quality expected from all athletes. For footballers, there are key qualities reflecting their physical potential. These are: body strength, coordination, speed, agility and all assembled together to result in body fitness. The fitness test, preceded by medical checkup, is the common test applied to assess how physically fit is a football athlete. High impact exercise competency is crucial in football, together with anaerobic potential such as fast runs and repeating sprints. All these qualities need to be considered during talent identification and developed in the process of talent development.

Talent identification is the activity of finding athletes presenting a considerable potential in a specific sporting trade. Working on a good explication of Talent identification. **Vaeyens, Lenoir, Williams, & Philippaerts, (2008)** stated that talent identification is the process of recognizing current players that have the potential to excel within a specific sport. This means that the identification process is performed on athletes demonstrating a certain interest and potential in specific sports, exposed to various tasks to test their capacities and involve them in the identified sport development routine to improve their potential. The process of talent identification marks also another stage where key athletes with distinguishable competences are taken and considered for further development which is talent selection considered as the approval of athletes to join identified sports development service centers. This process is multistage and involves selection and de selection, thus according to **Abbot and Collins (2002)**, talent identification involves an attempt to predict the future capacity of performance of an individual (**Abbott & Collins, 2002**), from this prediction, a monitoring process should be put in place to shape these competences, deselect or reorient incompetent ones and even retake some with improved competences.

Identifying future potential is difficult, as one is trying to make predictions regarding how well a player may develop, rather than just assessing their current ability (**Mitchell J., 2013**). This is the reason why there is a need to adequately measure and monitor different traits and abilities specific to the concerned sport so that identification demonstrate specificity and technicality, avoid failures and selected athletes' inconsistencies. Among traits and abilities to monitor from an athlete, the key ones are Physical Ability, Personality Characteristics, Playing Skill, Performance Ability, Pedigree (Genetics make-up) and Preparation (Family, culture, environment). All these traits and abilities have a tremendous role in insuring that the athletes express the required potential, have adequate mental capacities to cope with that sport and have a good surrounding, background and body build to support him during his development. Each and every one of these traits and abilities have their specific features and variables to apply to selected or identified

athletes to judge if they fit in the sport involved and also once selected, apply these tests to see if they are progressing or not.

Body Mass Index (BMI)

The physicality of a footballer is mainly observed from his or her body build. Excess body fat would affect his or her ability to move freely around the field, and the extra weight will fasten fatigue and limit flexibility hence increases in fat-free mass have a direct correlation to strength, speed and explosiveness (Norton & Olds, 2001). It was shown that there is a relationship between body mass index (BMI) and body fat percent (BFP) as better index predicting the influence of total amount of body weight on mobility and stability among soccer players up to 21 years age (Zerf, 2017). Body Mass Index (BMI) is the ratio of the athlete's weight in Kilograms to the square of his height in meters. A BMI of 18.5 to 24.9 is considered normal; 25 to 29.9 indicate overweight; and 30 or more, obesity.

Flexibility

Good hamstring flexibility is important for football players as it was proven to be a key factor for performing football-specific skills, such as sprinting, jumping, agility, and kicking in young football players (García-Pinillos, Ruiz-Ariza, Moreno del Castillo, & Latorre-Román, 2015). Keeping the hamstring flexible ensures its fitness and limits its injuries as it is the most common injury area for footballers. It was proven that the harm of a hamstring muscle is due to a low hamstring to quadratorion at sixty degrees per second on the side with injury and a low hamstring muscle side to side torsion at sixty degrees per second (Orchard, Marsden, Lord, & Garlick, 1997).

The sit and reach test can be done for lower back and hamstring flexibility (Ayala, De-Ste-Croix, Baranda, & Santonja, 2012). This test was first described by Wells and Dillon (1952) and is now widely used as a general test of flexibility (Katharine & Evelyn, 1952).

1.4 Strength and Power

The strength and power of a footballer is tested via the assessment of the Muscular strength. It is defined as the maximum force exerted, in a single effort, by a muscle against a resistance. This muscle's endurance will be the number of times that muscle can repeat the same effort against that resisting target. There is a proof that there exists a strong correlation between maximal strength in half squats and sprint performance and jumping height in soccer players (Wisløff, Castagna, Helgerud, Jones, & Hoff, 2004). Strength and power tests are done to determine strength levels and to monitor strength changes in conjunction with training programs.

It is important for strength and conditioning coaches to regularly develop and monitor the development of strength and power features, which not only assists on-pitch performance but also in injury risk reduction (Yu, Altieri, Bird, Corcoran, & Gao, 2021). The vertical jump test can be performed to measure leg power assisted by arms in the upward propulsive movement.

1.5 Speed and Agility

Speed is the ability to cover a certain distance in the limited time possible. Agility on the other side, is the ability to shift directions while in a run or fast movement. Agility involves quickness or speed and change of direction. Footballers' need this quality to boost their physique and maintain game temper and control, a reason why coaches need to monitor speed and agility.

1.6 Aerobic fitness

The fatigue index is a method applied to discover the increase in fatigue during anaerobic action (Pavlovic, Idrizovic, Bosnjak, & Pupis, 2016). Anaerobic exercise consists of activities such as sprinting that rely on glycogen rather than oxygen for fuel. One's fatigue index is measured with a series of timed sprints. Players are expected to be on form and full potential for the whole game. To test this ability, a repeat sprint of anaerobic capability, involving 10 x30 m

sprints performed each 30 seconds is suggested. For more advanced and reliant tests, top level professional soccer players must undergo tests for maximal oxygen uptake (VO₂max), velocity at 4 mM of lactate (V₄), velocity at maximal oxygen uptake (vVO₂max) and oxygen pulse O₂-pulse (Karakoç, Akalan, Alemdaroğlu, & Arslan, 2012).

Taking the example of football, as it is required in other sports, talent identification process follows various procedures usually based around a number of areas, these being physical attributes, physiological build, technical skills, psychological status, cognitive and social skills (Williams & Reilly, 2000). In this context, I relied on the requirements of football to summarize measurements that can be used to test and monitor the physical ability of young and developing football players.

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The aim of study was to identified physical ability tests to competing youth team to verify its application. Ample contact was made to the University of Ibadan Football team management so that an experimental day can be arranged to administer prepared test to their Athletes.

Permission came from the UI sports chairman, the Director of Sports and Football coach to insure the use of good and fit athletes with medical certificates and background of physical tests.

2. METHODOLOGY

2.1. Selection of Subjects

A total number of five football players ranging between 18 and 23 years old were used and exposed to five tests as planned.

2.2. Selection of Variables

The Height, Weight, BMI, Body fat, Flexibility, Speed, Agility and Aerobic fitness of the subjects were selected for the present investigation.

3.3. Selection of Tests

The Flexibility, Strength and Power, Speed, Agility and Aerobic fitness were measured by Sit Reach Test, Vertical Jump Test, flying 30m Sprint Test, Illinois Agility Run Test and Sprint Test respectively. Body Mass Index was calculated by height and weigh to the subjects.

3.4. Description and Administration of Tests

3.4.1 Body Mass Index tests

Body Mass Index {BMI} is the ratio of the athlete's weight in Kilograms to the square of his height in meters. A BMI of 18.5 to 24.9 is considered normal; 25 to 29.9 indicate overweight; and 30 or more, obesity. To perform this test, Weight and Height scales are needed. The analysis will compare the measurements taken to the normal standards. Other advanced tests requiring technology for body fats are: Calipers, Bioelectric, Impedance Analysis, DEXAS can and Muscle Sound (Rehman, 2016). Below are BMI Normal results and verdict are presented in Table 1.

TABLE 1
RATING OF BODY MASS INDEX FOR FOOTBALL PLAYERS

S.No.	Classification	BMI Scores
1	Underweight	less than 18.5
2	Normal Weight	18.5 – 24.9
3	Overweight	25 – 29.9
4	Obesity (Class 1)	30 – 34.9
5	Obesity (Class 2)	35 – 39.9
6	Extreme Obesity (Class 3)	40+

2.4.2 V-Sit Reach Test

Test Description: With reference to **Wood (2008)**, A tape for marking the ground, marker pen, and ruler are needed. A two feet straight baseline is traced on ground using a tape, an estimation line perpendicular to the midpoint is extended to two feet on each side. Every half-inch has to be indicated using a writing material on the estimation line with the last meeting the baseline at point zero. The subject removes their shoes and sits on floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 20.48cm to 30.48 cm apart. The Palms are placed on the estimation line downward with thumbs clasped. The testee smoothly reaches forward as further as possible, keeping fingers on the estimation line with legs flatly stabilized by an assistant. Three warm-up tries are made then the testee performs the fourth and wait a while for recording his or her performance. Jerky movements are avoided and the fingertips remain level and the legs flat. The score is recorded to the nearest half inch (or cm) as the distance before (negative) or beyond (positive) the baseline. The findings should be compared to normal measurements as shown in Table 2.

TABLE 2
RATING OF FLEXIBILITY FOR FOOTBALL PLAYERS

Sex ►	Males		Females	
	cm	inches	cm	inches
Super	> +27	> +10.5	> +30	> +11.5
Excellent	+17 to +27	+6.5 to +10.5	+21 to +30	+8.0 to +11.5
Good	+6 to +16	+2.5 to +6.0	+11 to +20	+4.5 to +7.5
Average	0 to +5	0 to +2.0	+1 to +10	+0.5 to +4.0
Fair	-8 to -1	-3.0 to -0.5	-7 to 0	-2.5 to 0
Poor	-20 to -9	-7.5 to -3.5	-15 to -8	-6.0 to -3.0
very poor	< -20	< -7.5	< -15	< -6.0

2.4.3 Vertical Jump Test

Description: Vertec or jump mat, marked wall or tape and chalks are needed. The reach and Jump heights are two parameters needed with their difference used to measure his strength and power. To find the reach height, the testee positions straight on the wall and reaches up as possible, keeping feet on floor, then the highest fingertip reach is recorded. The testee goes away of the wall, and tries to reach as high as possible in a vertically leaping motion taking his body in the air with the assist of legs and arms. The jump height is the highest point reached by jumping, using or not using a counter-movement technique. After three attempts, the best is considered. Measures Range is given below in Table 3 (**LaptrinhX, 2021**).

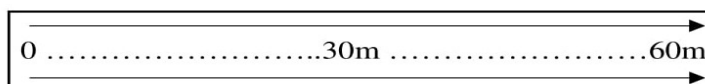
TABLE 3
RATING OF STRENGTH AND POWER FOR FOOTBALL PLAYERS

Sex ►	Males		Females	
	cm	inches	cm	inches
Excellent	> 28	> 70	> 24	> 60
Very good	24 - 28	61-70	20 – 24	51-60
Above average	20 - 24	51-60	16 – 20	41-50
Average	16 - 20	41-50	12 – 16	31-40
Below average	12 - 16	31-40	8 – 12	21-30
Poor	8 - 12	21-30	4 – 8	11-20
Very poor	< 8	< 21	< 4	< 11

Variations: The vertical jump is typically performed with a counter movement, wherever there's bending of the knees instantly before the jump (**LaptrinhX, 2021**). It can also be practiced as a squat by starting with bent knees. Arm movement can also be omitted, with one hand straight up while the other is kept close to the hip, eliminating leg muscles and decreasing the impact of variety in arm motion coordination. This test can also be off-leg, putting a step into the jump or take-off off one or two feet with respect to the sport involved.

2.4.4 Flying 30m Sprint Test

The Speed-flying 30m sprint test was considered to assess a footballer. The purpose of this test is to determine acceleration, maximum running speed and speed endurance, depending on the distance to run. The objective of most speed tests is to use lesser time possible for the required distance.



Speed-flying 30-meter sprint test

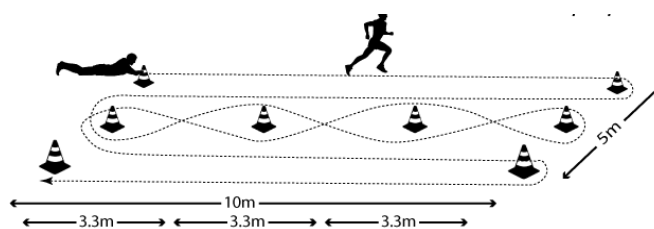
Description: The basic equipment is measuring tape or marked track, stopwatch or timing gates, cone markers. Position cones along a straight line at zero, thirty and sixty meters with stopwatch holders or timings gates at thirty and sixty meters. The first thirty meters are for acceleration to reach the highest speed possible while the last thirty (30 m to 60 m) are for powerful and maximum sprint. To boost their morale and maximize the speed, hint like keep low, use of legs and arms to drive hard drive are used. The timer starts once the runner's torso crosses the first gate or cone (30 m) stopping it at 60 meters mark. Allow two trials with the best one recorded to the nearest hundredth.. The flying 30m time can be used to predict 100m sprint times (**Mackenzie B. , 1999**). Below is normal score for youth, 16 to 19 years old (**Davis et. Al, 2000**) and Elite (**Chu, 1996**) with all timings in seconds.

TABLE 4
RATING OF SPEED FOR FOOTBALL PLAYERS

Sex ►	Males		Females	
	16-19 Yrs	Elite	16-19 Yrs	Elite
Excellent	<4.0	<2.6	<4.5	<3.0
Above Average	4.0-4.2	2.6-2.9	4.5-4.6	3.0-3.3
Average	4.3-4.4	2.9-3.1	4.8-4.9	3.3-3.5
Below Average	4.5-4.6	3.1-3.3	4.9-5.0	3.5-3.7
Poor	>4.6	>3.3	>5.0	>3.7

2.4. 5The Illinois Agility Run Test

The Illinois Agility Run Test (**Physiopedia, 2021**) has the objective of testing and monitoring the development of the athlete's speed and agility. It is a multidirectional test performed to test and monitor the footballer's ability to outclass an opponent by changing directions.



Adapted image of Illinois Agility test (Getchell, 1979)

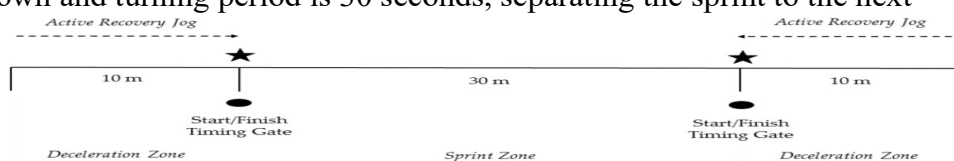
Description: As described by **Kuwdtee (2019)**, the tester needs a flat surface or running track, 8 cones, Stop watch or timing gates. The course is ten meters long and five meters wide. Five lanes might be enough on a track. Four marking cones are placed at the start, the two turning point and the finish with a distance of 3.3 meters between the center cones. The testee goes on the floor lying flat downward, on the starting signal, he/she pushes on his/her feet and executes the course to the finish with high speed and quick movement possible. The time is taken from the starting signal up to the finish with the result aligned with those of last test to discover the progress. Below are expected results and ratings for a 16-19 years old player, with timings in seconds (**Davis & al, 2000**).

TABLE 5
RATING OF AEROBIC FITNESS FOR FOOTBALL PLAYERS

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	<15.2 Sec.	15.2-16.1	16.2-18.1	18.2-18.3	>18.3
Female	<17.0 Sec.	17.0-17.9	18.0-21.7	21.8-23.0	>23.0

2.4.6 Aerobic fitness Test

Description: To perform this test, 2 stopwatches or timing gates, measuring tape, 8 marker cones, at least 50 meter track are required. The distance to sprint on is set between cones and lines 30 meters apart with two more marks set at 10 meters on each end as deceleration and recovery (Slow down and turning) area. At the tester’s command, the subject execute the 30 meters with maximum speed to the finish then slows down in the ten meters and comes back to the finish which becomes the start line of the next trial. Two stopwatches are used, with both started on “go”, one keeps running while the other records the time of the first sprint. The slow down and turning period is 30 seconds, separating the sprint to the next



An adapted Repeated Sprint Ability (RSA) test (**Lockie, et al., 2016**)

To find the fatigue index, Two averages of the first and last three attempts are divided (First average over the last average) yielding a value within 75%-95%. Below are the normal range and performance ratings for fatigue index Sprint test (**PtDirect, 2021**) presented in Table 6.

TABLE 6
RATING OF AEROBIC FITNESS FOR FOOTBALL PLAYERS

S.No.	Rating	Fatigue Index
1	Excellent	> 89%
2	Good	85-89 %
3	Average	80-84%
4	Poor	< 80%

3 DATA ANALYSIS & RESULTS

TABLE 7
PARAMETRS OF PHYSICAL FITNESS OF SOCCER ATHLETES

Body Mass Index					
Parameter	A1	A2	A3	A4	A5
Age	23	21	18	20	19
Weight (Kg)	76	66	74	93	73
Height (m)	1.83	1.85	1.79	1.90	1.78
BMI (Kg/m ²)	22.69	19.28	23.09	25.76	23.04
BMI Verdict	Normal	Normal	Normal	Overweight	Normal
Flexibility V-Reach Test					
Reach 1	11	9	8	15	13
Reach 2	12	10	8	16	12
Verdict	Good	Good	Good	Good	Good
Speed-Flying 30m Sprint Test					
1 st trial (Sec)	4.03	4.47	4.28	4.01	4.02
2 nd trial	4.09	4.07	4.2	4.00	4.91
Best Trial	4.03	4.07	4.2	4.00	4.02
Verdict	Excellent	Excellent	Above Average	Excellent	Excellent
Agility: The Illinois Agility test run					
Parameter	A1	A2	A3	A4	A5
1 st Turn (Sec)	15.59	16.49	15.75	15.35	15.94
2 nd Turn (Sec)	16.50	16.87	18.28	15.15	15.59
Average (Sec)	16.04	16.68	17.01	15.25	17.76
Verdict	Above Average	Average	Average	Above Average	Above Average
Fatigue index monitoring Sprint test					
1 st Trial	3.76	3.37	3.06	3.00	3.37
2 nd Trial	3.13	3.13	3.41	3.10	3.37
3 rd Trial	3.20	3.43	3.25	3.85	2.97
1 st Average	3.363	3.310	3.240	2.893	3.236
8 th Trial	3.65	3.56	3.38	3.40	3.12
9 th Trial	3.18	3.63	3.42	3.44	3.41
10 th Trial	3.74	3.66	3.44	3.00	3.69
2 nd Average	3.523	3.616	3.413	3.28	3.406
Fatigue Score	0.954	0.915	0.949	0.909	0.950
Fatigue %	95.4	91.5	94.9	90.9	95
Verdict	Excellent	Excellent	Excellent	Excellent	Excellent
Overall Fitness conclusion					
Verdict	Considerable	Considerable	Need Improvement	Need Improvement	Considerable

4. DISCUSSION

The normal BMI ranges from 18.5 to 24.9. Among the 5 athletes tested, 4 were found with normal weight i.e. their body mass corresponds to their height which is the ideal measurement for a soccer player. The fifth athlete figures in the overweight range with a BMI of 25.76. Once introduced to exercise, he can manage well his eight up to the normal. The V-sit and reach test scores rank into seven levels from Super to Very poor. The score ranges from Super-above 27 cm (>20cm) to Very Poor, Less than negative 20cm (<-20cm). All the five tested players figure in the third level (Good) with the reach distance ranging from 6 cm to 16 cm which is acceptable but not encouraging. The flying speed scores have five variations from Excellent (below 4.0 seconds) and Poor (Above 4.6 seconds). All the tested players managed to excel in this test with four out of five scoring in Excellent and the last scored above average which is next to excellent. The Illinois Agility run test varies from excellent (less than 15.2 seconds) to Poor (Above 18.3 Seconds). 60%

of the tested players are above average while 40 % scored average. This judges their agility not poor but requires to get improved. The Sprint test, the anaerobic test with ten consecutive 30 meters sprint test, has four levels of performance. Excellent, Good, Average and Poor. The highest score is Excellent with the fatigue level above 89% while the least is Poor with less than 80 %. All tested players fatigue index is in the first level which is a promising result. It has to be noted that the all five players tested need more training to boost their fitness.

5. CONCLUSION

The performance of these tests should follow the conventional way of physical training and conditioning in football as well as the principles of training including periodization and the practical considerations of frequency, intensity, time, type, specificity, progressive overload, reversibility, and the player's ability to tolerate training load to ensure fitness development. The body conditioning of a soccer player should respect the physiology and morphology of players, more specifically in aerobic and anaerobic potential boost. It has to be noted that these entire tests can be used to monitor the physical ability of players thus a single trial is not enough to judge a player but a base and a point of reference in monitoring his physical abilities.

6. RECOMMENDATION

It is recommended that coaches apply these tests to test the physical ability of new players, at the start of the new season and monthly repeat these tests to assess the progress as part of physical fitness monitoring practice. The modern sport is also improving thus there are a lot of improved and technological test to measure the identified abilities. Every team or talent selectors, depending on their capacities can easily find possible tests to assess athletes during recruitment and monitor their physical ability progress during the development period.

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