Matthew Jeffries

FITNESS TESTS FOR FOOTBALL

As with most team sports, there are many components of fitness that are important for success. Aerobic fitness would be one of the most important attributes, closely followed by anaerobic fitness and running speed and agility.

Fitness Component	Example tests	Comments
Cardio-Vascular Endurance	The shuttle run (beep) test would usually be the most appropriate test for testing a football team.	Aerobic fitness is a very important component of fitness for football.
Flexibility	The sit and reach test can be done for lower back and hamstring flexibility.	Good hamstring flexibility is import for football players in the ball kicking skill.
Strength and Power	The vertical jump test can be performed to measure leg power. Maximal strength tests for specific exercises should be conducted.	Strength (and power tests) should also be done to determine strength levels and to monitor strength changes in conjunction with training programs.
Muscular endurance	Abdominal Endurance Tests Sit-up Test Pull-up Test Push-up Test Squat Test	This is the ability to repeat a series of muscle contractions without fatiguing. It is different from cardiovascular endurance because it involves the muscle fatiguing rather than a limitation in the amount of oxygen being supplied or utilized by the muscles.
Body Fat	Body fat can be measured using the Skin fold method. If this is not available, monitoring body weight changes would give an indication of body fat changes, assuming no change in muscle mass.	Excess body fat would affect the football player's ability to move freely around the field, and the extra weight will increase fatigue.

All the tests in the above table can be found below:

The Bleep Test

So what is the bleep test?

- It is a multi-stage fitness test in which you must do 20 metre shuttle runs in time with the bleeps until the bleeps get too quick for you.
- It is a maximal test which means it will take you to your fitness limit.
- The shuttle runs are done in time to bleep sounds on a pre-recorded audio cassette.
- The time between the recorded bleeps decreases every minute as the level goes up.
- The test usually consists of 23 levels.
- Only elite athletes can expect to reach the top three. Cyclist Lance Armstrong and footballer David Beckham are two of the few people who can manage it.

What purpose does the bleep test serve?

The bleep test is used by sports coaches to estimate an athlete's VO2 Max (maximum oxygen uptake). The test is often recommended for players of sports which involve a lot of stop-start sprinting, such as rugby, football or hockey.

The Multi-Stage (Bleep) Fitness Test

Equipment: 20 m measuring tape, prerecording of test, tape player, markers, scoring recorders.

Target Population: Sports teams & school classes. Health screen first!

Advantages: Large groups can do test together.

Disadvantages: Audio tape can stretch, high motivation needed for accurate score, scoring can be subjective.

Procedure: Subjects run between two lines 20m apart trying to keep up with a set of pre-recorded bleeps on a tape or CD. Roughly every minute the level changes (and the bleeps get closer together) and the running speed gets 0.5 km/h faster (start speed is 8.5 km/h).

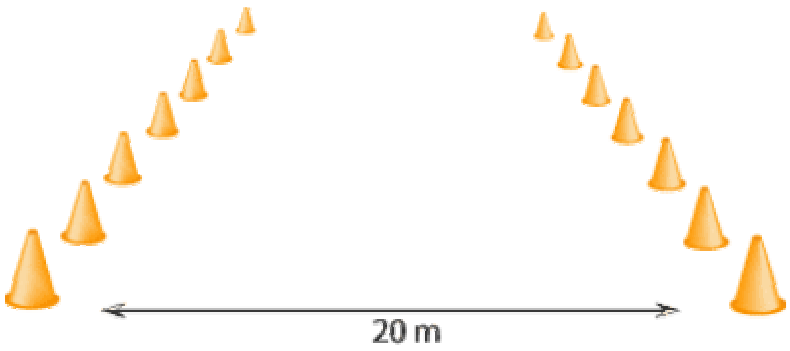
The athlete tries to keep up with the recording getting as many levels and shuttles into the test as possible.

The results below are not predictions for Max VO2 but are indicators for aerobic fitness. Each score implies the test level and the number of shuttles completed successfully (e.g. 4/6 = level four and six shuttles completed).

Gender & Age (yrs)	Excellent	Good	Average	Fair	Poor
Males 14-16	12/7	11/2	8/9	7/1	<6/6
Females 14-16	10/9	9/1	6/7	5/1	<4/7
Males 17-20	12/12	11/6	9/2	7/6	<7/3
Females 17-20	10/11	9/3	6/8	5/2	<4/9
Males 21-30	12/12	11/7	9/3	7/8	<7/5
Females 21-30	10/8	9/2	6/6	5/1	<4/9
Males 31-40	11/7	10/4	6/10	6/7	<6/4
Females 31-40	10/4	8/7	6/3	4/6	<4/5
Males 41-50	10/4	9/4	6/9	5/9	<5/2
Females 41-50	9/9	7/2	5/7	4/2	<4/1

20 Metre Shuttle Run Test (Multistage Fitness Test)

The multistage fitness test, also known as the 20m shuttle run test, beep or bleep test among others, is a very common test of aerobic fitness.



- **Description:** This test involves continuous running between two lines 20m apart in time to recorded beeps. For this reason the test if also often called the 'beep' or 'bleep' test. The time between recorded beeps decrease each minute (level). There are several versions of the test, but one commonly used version has an initial running velocity of 8.5 km/hr, which increases by 0.5 km/hr each minute.
- **Scoring:** The athletes score is the level and number of shuttles reached before they were unable to keep up with the tape recording.
- **Equipment required:** Marking cones, 20m measuring tape, pre-recorded audio tape, tape recorder, recording sheets.
- **Target population:** Suitable for sports teams and school groups, but not for populations in which a maximal exercise test would be contraindicated.
- **Validity:** There are published VO_{2max} score equivalents for each level reached (calculator available here). The correlation to actual VO_{2max} scores is high.
- **reliability:** Reliability would depend on how strictly the test is run, and the practice allowed for the subjects
- **Advantages:** Large groups can perform this test all at once for minimal costs. Also, the test continues to maximum effort unlike many other tests of endurance capacity.
- **Disadvantages:** Practice and motivation levels can influence the score attained, and the scoring can be subjective.
- **Variations:** You will find that there are several different variations of this test, and you should ensure that you have norms relevant to the correct test. Another shuttle type of test that has been pointed out to me is the Aero test, which is like the bleep test but each bleep is 0.05km/h quicker than the last one and it doesn't compromise of levels. It is a 20m shuttle run and each 20m counts as a score of one.
- **other comments:**
    - Tapes and CD's are available for purchase from many national coaching associations. Do a web search.
    - As the audio-tapes may stretch over time, the tapes need to be calibrated which involves timing a one-minute interval and making adjustment to the distance between markers. The recording is also available on compact disc, which does not require such a stringent calibration, but should also be checked occasionally.
    - This test or variations of it can also go by several other names, such as shuttle run test, beep test, bleep test, yo-yo, PACER, Aero, and multistage

fitness test (MST). Some of these may have different protocols, so be wary when comparing results or comparing to norms.

Sit and Reach Test

- **Description / procedure:** This test involves sitting on the floor with legs out straight ahead. Feet (shoes off) are placed flat against the box. Both knees are held flat against the floor by the tester. The athlete leans forward slowly as far as possible and holds the greatest stretch for two seconds. Make sure there is no jerky movements and that the fingertips remain level and the legs flat.
- **Scoring:** The score is recorded as the distance before (negative) or beyond (positive) the toes. Repeat twice and record the best score. The table below gives you a guide for expected scores (in cm) for adults

	men	women
super	> +27	> +30
excellent	+17 to +27	+21 to +30
good	+6 to +16	+11 to +20
average	0 to +5	+1 to +10
fair	-8 to -1	-7 to 0
poor	-19 to -9	-14 to -8
very poor	< -20	< -15

- **Equipment required:** sit and reach box (or a ruler can be used, held between the feet)
- **Validity:** This test only measures the flexibility of the lower back and hamstrings, and is a valid measure of this.
- **Reliability:** The reliability will depend on the amount of warm-up allowed, and whether the same procedures are followed each time. Most norms are based on no previous warm-up.
- **Advantages:** This is the most commonly used test of flexibility, so there is lots of data for comparison. Also, it is a cheap, easy and quick test to perform.
- **Disadvantages:** Variations in arm, leg and trunk length can make comparisons between individuals misleading.
- **Other comments:** Lower back flexibility is important because tightness in this area is implicated in lumbar lordosis, forward pelvic tilt and lower back pain.

Vertical Jump Test

- **Description / procedure:** the athlete stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. The athlete then stands away from the wall, and jumps vertically as high as possible using both arms and legs to assist in

projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the reach height and the jump height is the score. The best of three attempts is recorded.

- **Modifications:** Jump height can also be measured using a timing mat which measures the time the feet are off the mat. From the time, jump height can be calculated. To be accurate, you must ensure the feet land back on the mat with legs nearly fully extended. Other test modifications are to perform the test with no arm movement (one hand on hip, the other raised above the head) to isolate the leg muscles and reduce the effect of variations in coordination of the arm movements.
  The test can also be performed off one leg, with a step into the jump, or with a run-up, depending on the relevance to the sport involved.
- **Scoring:** The jump height Jump is usually recorded as the score in distance. The table below provides a ranking scale for adult athletes based on my observations, and will give a general idea of what is a good score.

rating	males (cm)	females (cm)
excellent	> 70	> 60
very good	61-70	51-60
above average	51-60	41-50
average	41-50	31-40
below average	31-40	21-30
poor	21-30	11-20
very poor	< 21	< 11

There is also a calculation to convert jump height into a power score. This is a formula I have come across, I am not sure about its accuracy or how it is derived. Power= 2.21*weight*root of jump distance.

- **Equipment required:** measuring tape or marked wall, chalk for marking wall (or timing mat).
- **Advantages:** simple and quick to perform.

<u>1-RM Tests (Repetition maximum tests)</u>

- **Description / procedure:** One repetition maximum test (1-RM) is a popular method of measuring isotonic muscle strength. It is a measure of the maximal force a subject can lift with one repetition. The athletes chooses subsequent weights until they can only repeat one full and correct lift of that weight.
- **Equipment required:** Free weights (barbells, dumbbells) or other gym equipment.
- **Advantages:** the required equipment is readily available in most gymnasiums.

- **Comments:** The test results will be specific to the equipment used and the technique allowed, so is best used for test-retest measures. Also sometimes used is a 3-RM or other numbers. These greater reps would require less weight and may be considered less dangerous.

Abdominal Endurance Tests

Description / procedure: The athlete lies on their back with feet flat on the floor and knees at right angles. With fingertips at the temples, the athlete curls up so the elbows touch the thighs. The shoulders must return fully to the floor. The number of complete sit-ups is counted in the prescribed time, ranging from 20 to 60 seconds (the technique used may vary).

Equipment required: timer, floor mat.

other comments: The exact technique may vary between variations of this test, so you must ensure the technique being used is the same as used for the norms being utilised, and is documented with the results.

Sit up test

SIT UPS

How many sit-ups can you do in 1 minute? Count how many you can do in one minute and then check the chart below for your rating.

Starting Position: Lie on the floor with your knees bent, feet flat. Your hands should rest on your thighs.

Technique: Squeeze your stomach, push your back flat and raise high enough for your hands to touch the tops of your knees. Don't pull with you neck or head and keep your lower back on the floor.

1 Minute Sit Up Test (Men)

Age	18-25	26-35	36-45	46-55	56-65	65+
Excellent	>49	>45	>41	>35	>31	>28
Good	44-49	40-45	35-41	29-35	25-31	22-28
Above average	39-43	35-39	30-34	25-28	21-24	19-21
Average	35-38	31-34	27-29	22-24	17-20	15-18
Below	31-34	29-30	23-26	18-21	13-16	11-14

Poor	25-30	22-28	17-22	13-17	9-12	7-10
Very Poor	<25	<22	<17	<9	<9	<7

1 Minute Sit Up Test (Women)

Age	**18-25**	**26-35**	**36-45**	**46-55**	**56-65**	**65+**
Excellent	>43	>39	>33	>27	>24	>23
Good	37-43	33-39	27-33	22-27	18-24	17-23
Above average	33-36	29-32	23-26	18-21	13-17	14-16
Average	29-32	25-28	19-22	14-17	10-12	11-13
Below Average	25-28	21-24	15-18	10-13	7-9	5-10
Poor	18-24	13-20	7-14	5-9	3-6	2-4

Pull-Up Test

Description / procedure: Grasp the overhead bar. Palms can be facing inwards or outwards, but the same each time (depends on the technique used previously or what was used for the norms). Pull up until the chin clears the top of the bar, then lower again to a position with the arms fully extended.

Scoring: The total number of correctly completed pull-ups is recorded.

Equipment required: Horizontal overhead bar

Target population: sports in which upper body strength is important, such as rowing.

Advantages: equipment readily available, and testing easy and quick to perform.

Disadvantages: as the scoring is subjective, it is difficult to standardise the results.

Other comments: Check for improper technique such as legs swinging or kicking, and failure to fully extend the arms or get the chin over the bar.

Push-Up Test

Description / procedure: Can be the total number of push-ups completed or the number completed in a set time period. The starting position is with the hands and

feet touching the floor, the body and legs are in a straight line, the arms extended and at right angles to the body.

Modifications: Modifications of this procedure are to have the knees on the ground or to have the hands resting on a chair. The athlete then lowers themselves until the chest touches the floor, then extend the arms back to the starting position.

Scoring: The number of correctly completed push-ups is recorded.

Equipment required: floor mat, timer

Target population: sports in which upper body strength is important, such as rowing.

Advantages: testing easy and quick to perform.

PUSH UPS

How many can you do? Men should use the standard "military style" pushup position with only the hands and the toes touching the floor. Women have the additional option of using the "bent knee" position. To do this, kneel on the floor, hands on either side of the chest and keep your back straight. Do as many push ups as possible until exhaustion. Count the total number of pushups performed. Use the chart below to find out how you rate.

Push Up Test (Men)

Age	17-19	20-29	30-39	40-49	50-59	60-65
Excellent	>56	>47	>41	>34	>31	>30
Good	47-56	39-47	34-41	28-34	25-31	24-30
Above average	35-46	30-39	25-33	21-28	18-24	17-23
Average	19-34	17-29	13-24	11-20	9-17	6-16
Below average	11-18	10-16	8-12	6-10	5-8	3-5
Poor	4-10	4-9	2-7	1-5	1-4	1-2
Very poor	<4	<4	<2	0	0	0

Push Up Test (Women)

Age	17-19	20-29	30-39	40-49	50-59	60-65
Excellent	>35	>36	>37	>31	>25	>23
Good	27-35	30-36	30-37	25-31	21-25	19-23

Average	11-20	12-22	10-21	8-17	7-14	5-12
Below average	6-10	7-11	5-9	4-7	3-6	2-4
Poor	2-5	2-6	1-4	1-3	1-2	1

Squat test

SQUATS

How many squats can you do? Stand in front of a chair or bench with your feet a shoulders width apart, facing away from it. Squat down and lightly touch the chair before standing back up. A good sized chair is one that makes your knees at right angles when you are sitting. Keep doing this until you're fatigued. Write down how many squats you can do. After you work out for awhile, take the test again to see how much your lower body strength has improved.

Squat Test (Men)

Age	**18-25**	**26-35**	**36-45**	**46-55**	**56-65**	**65+**
Excellent	>49	>45	>41	>35	>31	>28
Good	44-49	40-45	35-41	29-35	25-31	22-28
Above average	39-43	35-39	30-34	25-38	21-24	19-21
Average	35-38	31-34	27-29	22-24	17-20	15-18
Below Average	31-34	29-30	23-26	18-21	13-16	11-14
Poor	25-30	22-28	17-22	13-17	9-12	7-10
Very Poor	<25	<22	<17	<9	<9	<7

Squat Test (Women)

Age	**18-25**	**26-35**	**36-45**	**46-55**	**56-65**	**65+**
Excellent	>43	>39	>33	>27	>24	>23
Good	37-43	33-39	27-33	22-27	18-24	17-23
Above average	33-36	29-32	23-26	18-21	13-17	14-16

Below Average	25-28	21-24	15-18	10-13	7-9	5-10
Poor	18-24	13-20	7-14	5-9	3-6	2-4

Skin fold Measurement

Description: This method is the most widely used body composition testing method for assessing percent body fat. Equipment used for this assessment includes a skinfold caliper. A Skinfold Caliper is designed specifically for simple accurate measurement of subcutaneous tissue. Either a 7 or 3 site skinfold may be assessed.

7 site skinfold:

- chest
- triceps
- subscapular
- axilla
- suprailiac
- abdomen
- thigh

3 site skinfold (Men):

- chest
- abdomen
- thigh

3 Site Skinfold (Women)

- tricep
- suprailiac
- thigh

How accurate is it?

If each test is performed correctly according to the recommended guidelines, there is a +/- 3% error. Validity (compared to underwater weighing): 7 site skinfold (r = .90), 3 site skinfold (r = .89).*

Advantages:

- Easy to use once skill has been mastered

- Does not require much time
- Noninvasive method
- Inexpensive way of estimating percent body fat

Disadvantages:

- Technical sources of error
- Mostly concerned with subcutaneous fat (under the skin)
- May not be an ideal measurement for those who are obese and very lean

Body mass index (BMI)

BMI stands for Body Mass Index. It takes a person's weight in kilograms and divides it by their height in meters squared. For instance, if your height is 1.82 meters, the divisor of the calculation will be (1.82 * 1.82) = 3.3124. If your weight is 70.5 kilograms, then your BMI is 21.3 (70.5 / 3.3124)

BMI = Weight / Height^2
Weight in kilograms (pounds x 0.45359237)
Height in meters (inches x 0.0254)

Description / procedure: BMI is calculated from **body mass** (M) and height (H). BMI = M / (H x H), where M = body mass in kilograms and H = height in meters. The higher the score usually indicating higher levels of body fat

Scoring:

underweight	**<20**
healthy range	**20-25**
overweight	**25-30**
obese	**>30**

Equipment required: scales and stadiometer as for weight and height.

Target population: BMI is often used to determine the level of health risk associated with obesity.

Advantages: simple calculation from standard measurements

Disadvantages: BMI can be inaccurate, for example with large and muscular though lean athletes scoring high BMI levels which incorrectly rates them as obese.

Other comments: Other measures of body composition would be preferable if available.

Matthew Jeffries