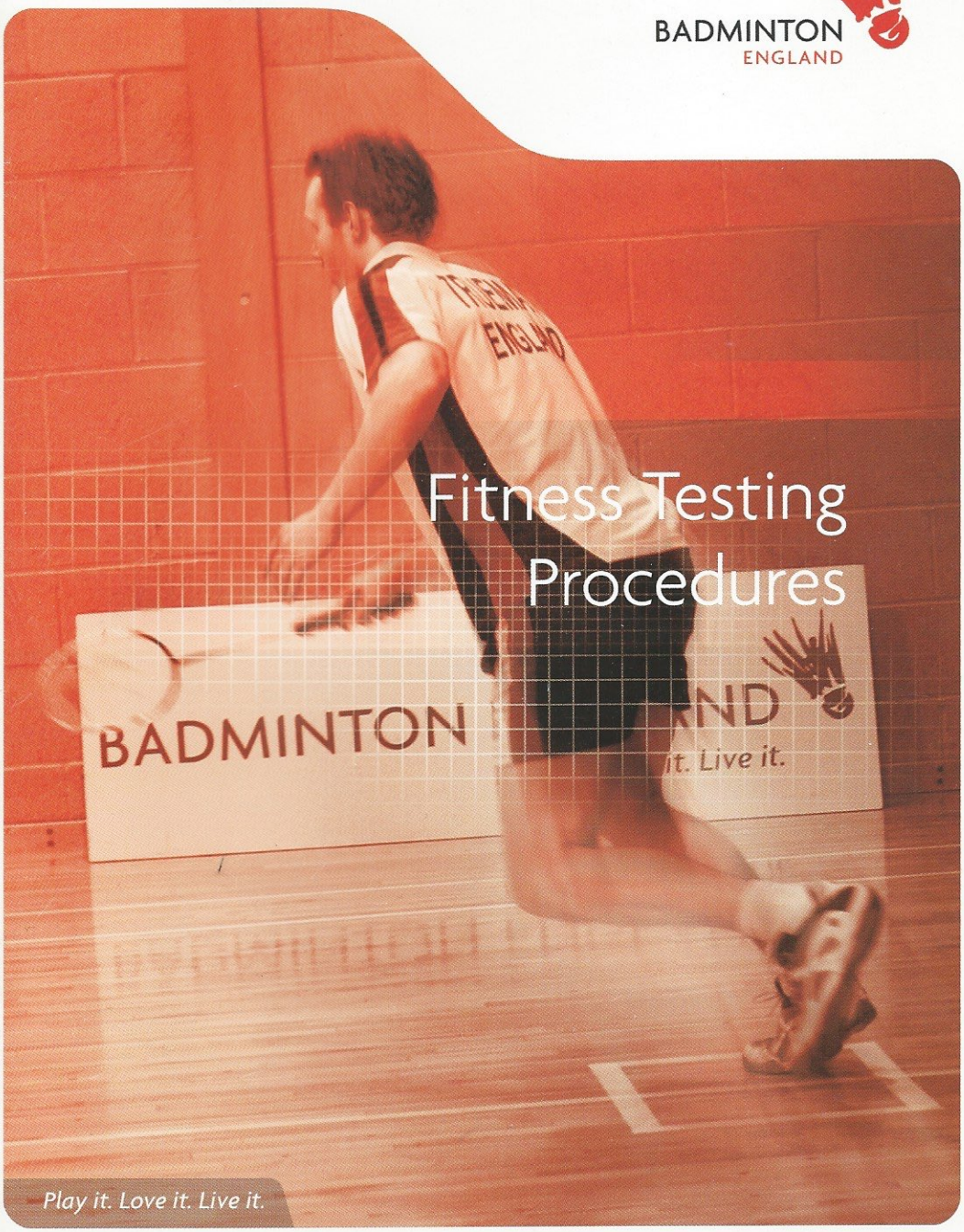
BADMINTON
ENGLAND



Fitness Testing Procedures

Play it. Love it. Live it.

Foreword

Fitness has become an increasingly important part of all sports and badminton is no exception. Developments in Sports Science have led to ever improving methods of training and fitter players at all levels of the sport.

A key element in improving fitness is being able to measure the improvements that training delivers. This allows the player to assess where they have come from and to set new targets to allow even greater achievements in the future. Being able to measure improvement is not only useful but it is also very motivating to know that all of the hard work is producing results.

There are several standard tests available to measure fitness but none of them are specifically designed to measure the complex mix of attributes needed to be a successful badminton performer. For this reason BADMINTON England have produced this set of fitness tests with Sports Scientist Michael Hughes to meet the needs of measuring 'badminton-fitness'.

These tests have been designed so that they can be delivered without the need for expensive equipment but can give a good indication of the level of fitness of a player. Many of them are used by the England National Squads.

The information delivered by these tests will be vital for a player and/or coach in designing training programmes to reap the maximum rewards.

Please read the instructions carefully and good luck in becoming a fitter and more successful badminton player.

Happy training!

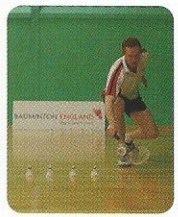
BADMINTON ENGLAND COACHING DEPARTMENT

The Badminton Fitness Tests

Introduction

The assessment of fitness for Badminton is a difficult issue as the sport has a unique movement style and very specific fitness demands. In the past only general fitness tests have been possible with players for all levels. However, we now have specific test procedures that have been tried and tested to great effect with the top players in the country. These fitness tests are the result of extensive development work aimed at producing a series of fitness tests for Badminton that are both easy to administer and specific to the demands of the sport. This type of test has been successfully used on World Class players (aged 14 upwards) in England since 1999.

The tests are designed to require no specialised equipment and, provided the instructions are adhered to and that players are motivated to perform the tests to the best of their ability, they should be valid indicators of the strengths and weaknesses of your players.



Introduction to specific tests

I) JUMP TESTS

These tests are quite basic but are standard indicators of leg power. In this respect the jump tests are probably very good indicators of general athleticism. Leg power is essential for competitive success in the sport.

II) SPEED TESTS

We have adopted the use of two speed tests. One test is more Badminton-specific (the agility test), while the other is more an indication of general movement speed (the shuttle run test). Obviously, these tests give an indication of whether a player has good speed but more importantly, it should be possible (by considering general and specific speed test results separately) to detect players who have good speed due to good technique or general athleticism. For example, a player with a good performance on the shuttle run test who has poor agility test scores is likely to be held back by their movement technique. We have shown that jump test scores relate closely to the shuttle run test performance (i.e. general speed test) but not necessarily to specific agility (Hughes & Bopf, 2005)[1]. This, in itself, justifies the decision to assess for both general and specific speed. To be able to detect the reasons for a player performing in a certain way is a vital outcome from fitness testing.

III) UPPER BODY TESTS

It is very difficult to replicate the highly technical hitting action of Badminton play and the tests proposed here do not intend to do that. The medicine ball test is frequently used as a general test of upper body power.

IV) AEROBIC TEST

Aerobic fitness, leg power and speed, are foundations of Badminton fitness. Aerobic fitness promotes rapid recovery between rallies as well as making the work within rallies less stressful. The Incremental Badminton Aerobic Test allows an evaluation of aerobic performance in a unique way that is highly specific to performance in the sport.

It is essential that any fitness test should come close to the demands of the sport in its design. If Badminton players were tested for their ability to run continuously, we would not be accounting for movement technique or the fact that Badminton is a sport that requires intermittent efforts. Both of these factors make the Badminton aerobic test superior to any other commercially available fitness tests which may be used for participants in Badminton.

The test is the result of much development and we have shown that this type of testing is sensitive to training status (Hughes & Fullerton, 1993)[2] and, that senior elite players can achieve higher performance on this test than is possible using running tests (Hughes et al, 2003)[3].

Finally, remember that fitness testing is a process that should be an important part of a player's development. The wide range of fitness demands for Badminton must be appreciated and, if testing is to be most useful, fitness tests should not be performed in isolation. An understanding of a player's strengths and weaknesses is derived from a methodical, systematic approach to fitness assessment.

REFERENCES

[1] Hughes, M.G., Bopf, G. (2005). Relationships between performance in jump tests and speed tests in elite Badminton players. *Journal of Sport Sciences.* 23 (2): 194-195.

[2] Hughes, M.G., Fullerton, F.M., (1993). Development of an on-court aerobic test for elite Badminton players. *Journal of Sport Sciences.* 11 (6): 544-5.

[3] Hughes, M.G., Andrew, M., Ramsay, R. (2003). A sport-specific, endurance performance test for elite Badminton players. *Journal of Sport Sciences.* 21(4): 237-238.

Instructions for Badminton Fitness Testing

Prior to testing

Some of these tests are exhaustive and maximal. Participants must be in good physical health if they are to undertake the tests. It is important that participants are given permission to take these tests by an appropriately qualified medical practitioner. BADMINTON England accepts no responsibility for any injury or health problem connected with these tests.

Preparation

- Players should not have trained at all in the four hours prior to testing but should be warmed up and stretched as they would be prior to on-court training.
- Strenuous training should not have been performed in the previous 24 hours and players should be well fed and hydrated.
- Players would be well advised to have a drink bottle with them for use during administration of the endurance test.
- If all of the tests are to be administered, the preferred order of testing is as given in the following instructions. If this is not possible, then tests 1-6 should be performed before performing the aerobic test. The aerobic test must be the last test performed.

1.0 | Vertical Jump Test

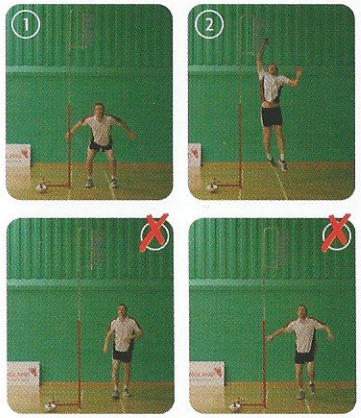
Players to take : 5 attempts at jump for maximal height.

Option 1)
Using BADMINTON England equipment

Equipment
(Use of Vertec equipment is preferred for this test. This allows standardisation of procedure) Vertec equipment, metre rule

Players should stand next to the 'vertec' equipment with their racket hand reaching upwards above their shoulders. Players should stand with both feet on the ground and be standing below the plastic strips on the equipment. The height of the adjustable aluminium support for the plastic strips should then be altered so that the lowest strip is just touching the outstretched tip of the player's hand. This support should then be fixed in place. This procedure allows for standardisation of players with contrasting height and reach.

Jumps are performed from a standing position. Players must not step into the jump and the feet must be in contact with the ground throughout the preparation for the jump. A bending of the knee is required in preparing and arms may also be swung in making the jump.



The result is taken as the highest plastic strip that the player reaches while performing the vertical jump. If the player reaches beyond the highest strip then the height of the aluminium support must be raised further by a measured amount (e.g. 15cm) and subsequent scores adjusted accordingly. The distance from first to last strip is 60cm (24 inches). Unfortunately the equipment is in inches but results must be

recorded in centimetres! There are red strips at 15 cm intervals. The best way to record the scores is to write down (e.g.) 30 cm + 10 strips. This means that the player reached 10 strips above the third red marker (which indicate 0, 15, 30, 45, 60cm). This can be calculated subsequently (42.5cm total jump height).

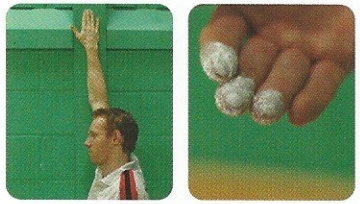
Most players need a few goes to become used to the procedure but most players get stable results within about five good attempts. Around 20-30 seconds rest should be given between each jump.

The single best jump is recorded as the result.

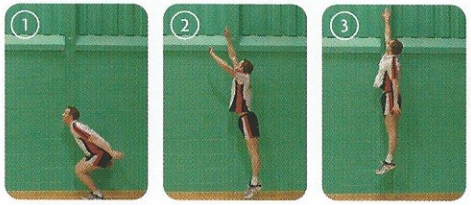
Option 2) Alternative procedure

Equipment
Metre rule, vertical wall, chalk

Player should stand upright against a wall with dominant arm stretched upwards to obtain maximal reach. Mark this point on the wall with chalk.



Player should then mark chalk on fingertips, step away from the wall slightly and then jump maximally according to the same instructions as given above (option 1). At the peak of the jump, players must touch wall, thus leaving a mark on the wall that can be measured.



Jump height result is the vertical difference between the players height with outstretched arm and the height they touch in the jump.

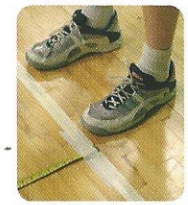
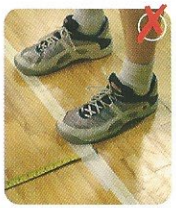
No tuck jumps are allowed but use of arms is encouraged. Players should have sufficient rest to allow at least one other player to perform their jump (i.e. ~30 seconds). The best single jump is recorded as the result.

2.0 | Horizontal Jump (Standing Long Jump)

Players make at least three attempts at jump for maximal distance

Equipment
Tape measure (>3m) parallel with a court line.

Players begin jump with toes just behind a court line.

No counter movement of the foot position is allowed but use of the arms to assist with the jump is encouraged. Distance is recorded from the point where the heel first makes contact with the floor.



If the heels do not contact at exactly the same distance, the shorter distance is recorded as the test distance.

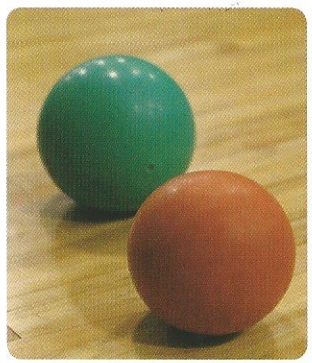

The zero point of the tape measure is the line where the toes are placed at the start of the jump. The best single jump is recorded as the result.

Sufficient rest should be given between jumps (at least 30 seconds) to allow recovery.

3.0 | Upper Body Power (Medicine Ball)

Players perform medicine ball throw with the same action as a football throw-in. Maximal distance of at least three attempts is recorded as final result.

Equipment
Appropriate medicine ball.

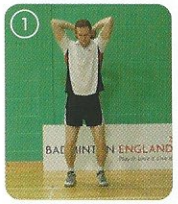


For senior players...
Males use 5kg medicine ball

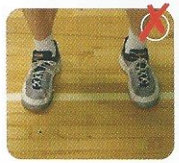
Females use 3kg medicine ball *(these will have to be adapted for juniors)*

Long tape measure (~10m) to be laid parallel to court line.

Players stand with ball in both hands and with feet behind a court line. By keeping feet still and always behind the line, players must throw the ball maximal distance.







The throw must begin from behind the head. Players are not allowed to cross the line in making the throw but players can jump upwards in making the throw if they choose to do so.

The best single valid throw is taken as the test score.

4.0 | General Speed Test (Shuttle Run Test)

Players must make ten movements as quickly as possible across the full width of the court. Five shuttles are placed on the outside line of each side of the court (i.e. ten shuttles total). With racket in hand the players must touch one shuttle – knocking it off the line - for each lateral movement that they make.

Equipment
Ten shuttles and a Badminton court, Stopwatch (to at least 1decimal place)

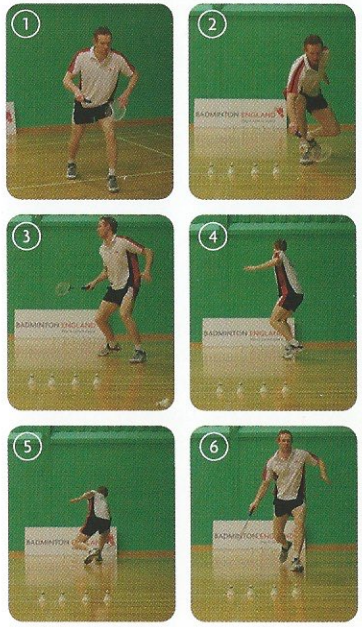
Ten shuttles are placed upright on the outside tramlines of a court. The players must move across the court – racket in hand - touching one shuttle at a time so that, by the end of the test, all shuttles have been knocked off their line.

The movements must be completed with the players facing the net at all times (i.e. must not turn around away from the net).

PLAYER'S BACK FACING THE NET IS NOT ALLOWED!

Players begin the test with feet astride the centre line and facing the net. On the command '3-2-1-Go', the first foot movement initiates timing and the player moves towards one side of the court (it doesn't matter which side). Players can only touch one shuttle for each movement. If they touch more than one, the test administrator must ensure that the 'extra' shuttles are replaced onto the line.

Test time stops when the player has touched all ten shuttles and has then returned to cross the mid-line. At least two attempts are made by each player to perform the test. If desired, a third attempt can be made. At least 1 minute's recovery is required between attempts. The best single valid time is recorded as the test performance.



PLAYER'S SIDE FACING THE NET IS ACCEPTABLE AS IN PICTURE NO.2

5.0 | Specific Speed Test (On-court Agility Test)

Players must move from a central base at maximal speed to the extremities of the court using Badminton movements and simulating shots at set positions as detailed below.

Equipment
Tape measure. Masking tape (or similar) to mark out the court as specified. Four shuttles. Three shuttle tubes (for 12 shuttles) taped end to end.

To prepare the court, mark the following onto a **singles** court (see figure 1).

- Place a line at the rearcourt (forehand side) 75 cm from the sideline to complete a box also formed by the outside of a singles court and the doubles service line (labelled '1').
- Fix (with tape) the three shuttle tubes on the forehand sideline at a point 150cm from the front service line (labelled '2').
- Place a shuttle on the net cord 50 cm in court from the backhand side line (labelled '3'). This point is best marked by a small piece of tape for ease of replacement.
- Place a shuttle on the backhand side 150 cm from the short service line (labelled '4'). This point is also best marked by a small piece of tape for ease of replacement.
- Mark a rectangle (the 'central base') 150 cm back from the short service line centred on the mid-line. The box must be 75 cm wide (side to side) and 50 cm deep (front to back).

COURT DIAGRAM

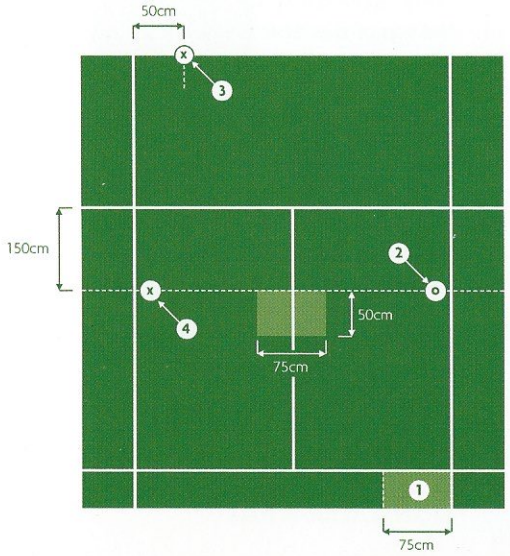


FIGURE 1: LAYOUT OF COURT FOR AGILITY TEST – RIGHT HANDED PLAYER

(reverse these positions for left handed players).

'**o**' indicates 3 shuttles tubes taped together end to end and taped to the floor at point shown.

'**x**' indicates position of upturned shuttles to be placed on ribbon of net (point 3) or on floor at point shown (point 4).

Shaded boxes indicate where feet must be placed either in central base or in rearcourt during performance of the test.

Important note for marking of courts for these field tests

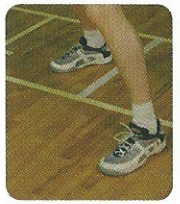
In these on-court tests, the line applied by masking tape is considered to be 'in'. So, when marking out the court, the outside of the tape should be the point to which measurements are made. In this way the thickness of the masking tape will not influence dimensions of the court.

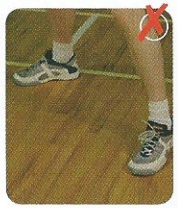
Please note that the markings above are nearly all used in marking the court for the aerobic test (test 6).

The player must move from the central base to the extremities of the court in the order 1 – 4 and repeat the same sequence to complete 8 movements in all. After each movement the player must return to the central base and place at least one foot in the box prior to moving off to the next point.

Shot 1

The player must play an overhead shot and place at least one foot in the rear box.



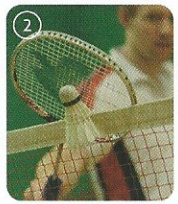


Shot 2

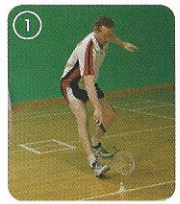
The player must touch the top of the tube of shuttles.

PLEASE NOTE:
RACKET MUST TOUCH TUBES

Shot 3



Shot 4

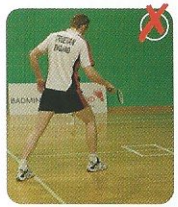


Shot 3 & 4

The player must play a net kill and for 'shot 4' the player touches the shuttle on the floor.

The player must then return to place one foot in the central base once more and then go on to complete the sequence again in exactly the same way. To begin the test, players must begin with two feet placed in the central base and to stop the test, players must place one foot in the base after successful execution of the 'shots' described.

FURTHER NOTES



Players are not allowed to turn away from the net (especially an issue when moving from '4' to '1' at the start of the second lap).

A run is considered invalid if a player gains an advantage by not placing a foot in the central box. For example, if a player moves from point '2' to '3' and they do not go through the box, this will make the run invalid.

Upon completion of the last movement, taller players may be able to reach the shuttle at point '4' while still keeping one foot in a central box. If a player does this the time will not be taken until they transfer their weight back into the central base.

Two attempts are made and a third can be made if a player wishes to do so. A test is invalid if the 'shots' are not performed correctly. At least 1 minute recovery is required between attempts. The single best time is recorded as the test time.

6.0 | Incremental Badminton Aerobic Test

Players must move from a central base to extremities of the court using Badminton movements. Movement speed (controlled by audio signal) is controlled but increases after each of the 17 stages of the test. The test is maximal and exhaustive : players must keep going as long as they can.

Equipment

Tape measure. Masking tape (or similar) to mark out the court as specified. Six shuttle tubes (for 12 shuttles). Two sets of three tubes must be taped end to end to form two high tubes.

To prepare the court, mark the following onto a **singles** court (see figure 2).

Place a line at the rearcourt (forehand sides) 75 cm from the sideline to complete a box also formed by the outside of a singles court and the doubles service line (labelled '3').

Repeat above for backhand side (labelled '4').

Fix (with tape) the shuttle tubes on the forehand and backhand sides in the forecourt area at a point 50 cm from the net (i.e. centre of whole court) and 50cm in from the singles sideline (labelled '1' & '2').

Mark a rectangle (the 'central base') 150 cm back from the short service line centred on the mid-line. The box must be 75 cm wide (side to side) and 50 cm deep (front to back).

COURT DIAGRAM

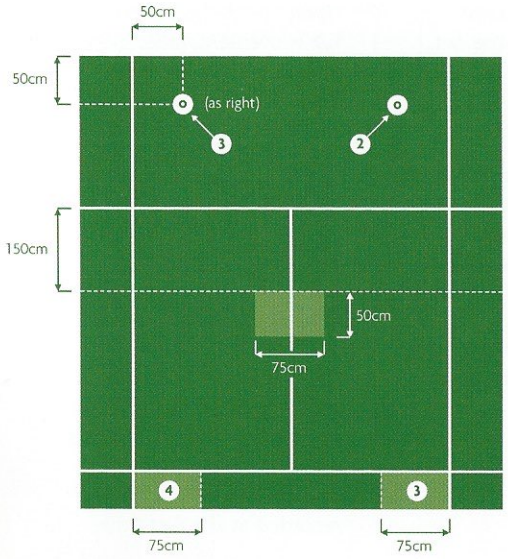


FIGURE 2: LAYOUT OF COURT FOR ENDURANCE TEST

'**o**' indicates 3 shuttle tubes taped together end to end & taped to floor at points shown.

Shaded boxes indicate where feet must be placed either in central base or in rearcourt during performance of the test.

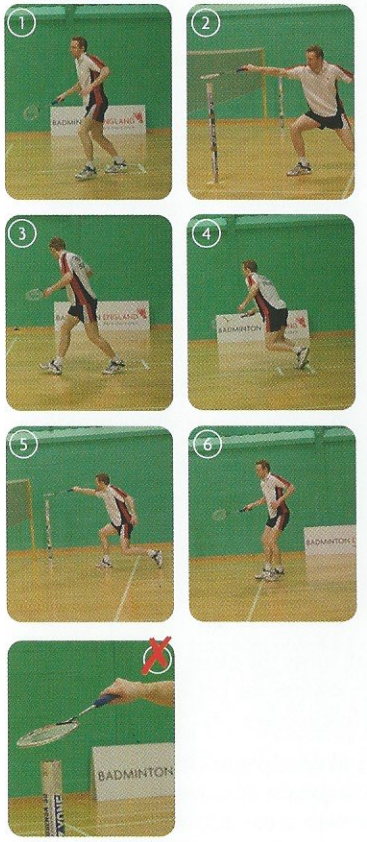
TESTING CHECK LIST :

- ○ Masking tape *(allow ~10m per full court) 1- 1.5 inch thick*
- ○ 1 tape measure *(ideally 10m in length)*
- ○ 10 shuttles (used)
- ○ 6 shuttle tubes per half-court used
- ○ Aerobic test CD
- ○ Medicine balls *(3kg females, 5kg for males)*
- ○ CD player
- ○ Extension lead
- ○ 1 note pad & pen
- ○ 1 stopwatch (ideally to 1/100 sec)
- ○ Jump test equipment *(see earlier instructions)*

The player must move from the central base to the extremities of the court in the order 1 – 4 etc. as instructed by the audio signal (see note below for left handed players).

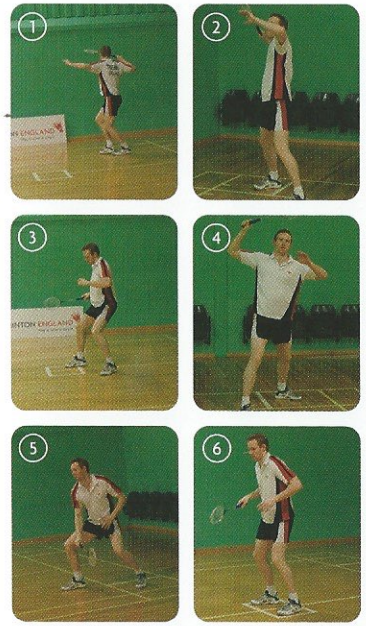
Shots 1 & 2

The player must touch the top of the tubes with the strings of his racket and return to the central box after each shot.



Shots 3 & 4
The player must play an overhead shot and place at least one foot in the rear box. After each shot they should return to the central box.

Note: it is recommended to play a forehand on each side (i.e. round-the-head on backhand side).



At all times the player should face towards the net to ensure realistic movements.

Left-handed players must reverse the sequence of movements so that their order is 2, 1, 4, 3.

The test is made up of up to 17 levels. Level 1 is at a very slow movement speed. The required movement speed increases after each level demanding that the intensity of exercise increases after each level. Each level is made up of three stages representing periods of exercise lasting around 22 seconds. Between each stage is a recovery period lasting 8 seconds and for every third stage this recovery period lasts 18 seconds. Consequently, each level lasts exactly 1 minute, 40 seconds (see table 1). The test is continuous and no additional recovery period is allowed other than that built into the test procedure itself.

TABLE 1: BREAK-DOWN OF WORK AND REST PERIODS FOR ONE LEVEL IN THE BADMINTON INCREMENTAL TEST.

LEVEL						
STAGE 1		STAGE 2		STAGE 3		continue on to next stage...
work	rest	work	rest	work	rest	
22 secs	8 secs	22 secs	8 secs	22 secs	18 secs	

ADMINISTRATION OF THE TEST

Players must become acclimatised to the movements involved before beginning the test. It is recommended that players are given a chance to practice beforehand by performing Level 1 of the test.

All players must begin at level 1. No distinction is made between males and females in the **administration** of the test.

The CD must be played without interruption from the beginning of level 1 every time the test is administered. Failure to do this will invalidate the results.

After each movement the player must return to the central base and place at least one foot in the box prior to moving off to the next point. Each audio signal represents the time at which the player must be at the central base or one of the extremities of the court. Players must not move ahead of/behind the speed of movement dictated to them by the audio signal.

When a player can no longer consistently maintain the required speed of movement, they must finish the test. This is defined as when a player is at least a beep behind the required speed of movement (e.g. is at forecourt, when they should be at central base) on three occasions (either separately or in succession).


PLAYER SHOULD BE IN CENTRAL BOX


PLAYER SHOULD BE IN REARCOURT

ANALYSIS OF DATA

The result of the test is comprised of the level and stage number completed successfully. This is written as the Level first (i.e. from 1 to 17), followed by the stage reached within that level. To standardise data analysis **the last stage that the player performed successfully** is the result of the test – this is not necessarily the stage where they stopped themselves.

General notes on the interpretation of these Ratings

These ratings are based on real data that have been obtained over years of testing with elite players. The decline in standards from rating 1 to 6 is realistic according to results obtained in these players even though the lower ratings (especially 2 and 1) would not normally be seen in senior elite athletes.

Interpretation of test data is relative to the age of the players and, unless otherwise stated, the comments above apply to players between 20 and 35 years old, who are healthy and active.

Remember that the 'general tests' (i.e., the jump tests, medicine ball throw and perhaps the shuttle run test) are not highly dependent on Badminton skill. These are still vital indicators of potential for the sport but unless these general factors of speed and power are converted into badminton-specific characteristics, they are unlikely, on their own, to be indicators of current badminton success. It is ideal that the two specific (i.e., agility and aerobic) tests as well as the four general tests are performed. This will provide useful information on both the general and specific fitness of the player. The ideal situation is to achieve high values in general and specific tests. Discrepancies in ratings between the two test types can be informative in highlighting issues related to movement technique.

It is important to use this data as an indication of the 'balance' in your fitness profile. For this reason, it is best if you perform all of the tests - not just the ones you like the sound of! Increasingly, high-level badminton requires very high levels of all aspects of fitness from speed and explosiveness to endurance. These aspects of fitness are often conflicting so if you are achieving very high ratings in one test, you should also work on the others because your weaknesses will be the physical factors that stop you enhancing your performance.

The issue of balance also extends to the other areas of preparation for play. It is possible that all fitness characteristics are more developed than technical elements. In that case, emphasis on physical preparation should be sacrificed for technical training.

Finally, remember that the values and ratings opposite are based on average data. All players have their own individual characteristics, strengths and weaknesses. This individuality is not accounted for when providing average data and standard scores. This is especially evident in juniors who are still growing. A tall 15 year old may have great test results, compared to a shorter player who has yet to reach the peak of development. At the highest level, test results are used to optimise future training and are rarely used to set minimum standards. In other words, common sense is needed in the interpretation of tests although it is intended that the above information will allow you to chart progress and provide some interesting comparisons with top players.

Interpretation of Ratings

(the explanatory notes below should be read before interpreting your scores).

Rating 1

These scores are representative of the standard scores achieved by senior elite players. Therefore, this is the ultimate target! If you are achieving these scores, it is likely that you are either extremely talented, gifted or in serious training. Remember that the senior players are usually performing at this level in all of these tests.

Rating 2

These ratings are representative of the average from England squad players around the age of 17 years. Therefore, these represent a very high level of fitness for county / dedicated club players.

Rating 3

These scores represent the average scores achieved by England squad players around the age of 15 years. These scores would represent a target that is suitable for county players and serious club players.

Rating 4

These ratings would be acceptable for good club players. For younger players, this would represent a standard that is similar to that of World Class Potential players of 13-14 years age.

Rating 5

Scores in this range would be typical of healthy, athletic, active club players.

Rating 6

These ratings would be a good target for recreational players looking to establish a good basic level of fitness. Achievement of this kind of score would allow such players to begin to enjoy the sport and would reflect a reasonable level of athleticism.

RESULTS TABLE FOR MALES

RATING	VERTICAL JUMP HEIGHT CM	STANDING LONG JUMP CM	MEDICINE BALL THROW CM	SHUTTLE RUN TEST SECONDS	ON COURT AGILITY SECONDS	AEROBIC TEST LEVEL, STAGE*
1	› 65	› 250	› 750	‹ 14.0	‹ 11.5	13,1
2	63	245	675	14.8	11.7	12,2
3	57	225	600	15.5	12.6	11,0
4	53	215	550	15.8	13.2	10,0
5	49	205	500	16.1	13.8	9,0
6	45	195	450	16.5	14.5	8,0

RESULTS TABLE FOR FEMALES

RATING	VERTICAL JUMP HEIGHT CM	STANDING LONG JUMP CM	MEDICINE BALL THROW CM	SHUTTLE RUN TEST SECONDS	ON COURT AGILITY SECONDS	AEROBIC TEST LEVEL, STAGE*
1	› 52	› 210	› 650	‹ 16.2	‹ 13.0	11,0
2	49	195	600	16.5	13.0	10,0
3	46	185	550	16.9	13.6	9,0
4	42	170	500	17.3	14.3	8,0
5	38	160	460	17.8	15.0	7,0
6	34	150	420	18.3	15.6	6,0

* Each level on the aerobic test is made up of three stages

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