PART ONE

The Nature of Badminton
The Requirements of the Game

In order to write a book on fitness-training and to recommend appropriate and realistic training methods it is necessary to be clear about the nature of the game. The greater one's understanding of the game and its demands, the more accurately can training programmes be devised and the more effective will be the training.

It is very easy to devise training schedules in accordance with general principles of training. The difficulties are to make the training programme appropriate to the game of badminton and, more specifically, to the player being coached. For example, the training schedule of a highly skilled but relatively unfit player would be very different from that of a less skilled but extremely fit player. The coach and the player must have clear indications of their targets with respect to training. Hence the requirements of higher standards of play are analysed and once these are known, particularly from the point of view of work demands, then realistic training programmes can be prepared.

Simple observation provides us with much information about the work demands. From this we can learn that the game requires the player to perform work of the nature of sprints, stops and starts, jumps, leaps, lunges, rapid changes of direction, twists and turns and a variety of strokes. All this work goes on for a period of time and eventually leads to a certain degree of fatigue. Our concern is not so much with these movements as with the work demands of these movements on the player. We want to know how the work affects his body: his heart and lungs, muscles, blood, joints and all the other components of the machine that he is when he performs work. Our main concern is to examine the effect of work on the machine and to devise the means to make that machine more efficient. The greater the efficiency the greater the work load it will be able to take on.

Unless we can gain accurate information of this sort, fundamental errors may occur. For example, a training programme for a county player could include several three-mile runs in a week. It may be that this player does not enjoy running and therefore takes it fairly gently and runs at a jogging pace.
jogging pace. This activity may only have a limited training effect and, as we shall see later, develops an energy system which is rarely used in actual competitive play. It is how to collect information that is the difficulty. Scientific enquiry involves making accurate measurements in realistic conditions. Tournament play is the best situation for investigation but unfortunately this is one occasion when such interference in the game would not be tolerated. However, there are a variety of methods for collecting information which do not interfere with the play. Some of these are explained below.

METHODS OF MEASUREMENT

The method of measurement depends largely on the sort of information to be obtained. The work demands of the game can be measured with various pieces of physiological equipment.

Figure 1.1 shows one of these in use and from this an estimate of the energy expenditure can be made. Results from this equipment have shown that an international bad-minton-player maintains an average level of about 10 kilocalories per minute throughout a 40-minute game with the level going as high as 13.5 kilocalories per minute during periods of intense activity. This makes the game of badminton equivalent in energy expenditure to activities such as soccer, circuit-training and rowing. Together with the knowledge that badminton is a game of the stop/start variety, this information may help us to design the correct form of training.

As can be seen from Figure 1.1, the fact that the player needs to wear a face-mask and carry a small machine on his back is bound to limit his performance. It is possible to substitute this with much smaller equipment which transmits the heart beat to a receiver on the side of the court, although some accuracy is lost thereby. Here the instrument the player wears is only the size of a cigarette packet (see Figure 1.2), and thus interferes very little with the game.
The recordings of heart rates obtained give a very good indication of the work demands of the game. The graph shown in Figure 1.3 shows the changes in heart rate during a game and the quite high rates experienced. These high levels of heart rate are to some extent associated with how energy is provided for the working muscles. An unfit individual who consistently showed very high heart rates would be unlikely to be getting
all his energy supply from the air he is breathing. The explanation could lie in the type of tactical game being played or it could be due to lack of fitness. One thing is certain, the player would not be able to tolerate high heart rates for long without a marked drop in performance level. Training for such a player would be directed at improving the cardiovascular efficiency.

A very fit person who showed high heart rates would similarly be working in excess of the atmospheric oxygen supply. The coach would appreciate the necessity for developing other methods of obtaining energy. The information could then be used directly by the coach to train the correct energy system by a series of intense activities of short duration (below one minute) with adequate rest periods in between.

Although it is accepted that few coaches will have access to equipment that can transmit heart beats, it is possible to simplify the test by teaching the players to record their own. This can be done by locating the pulse beat in the neck (carotid pulse) as in Figure 1.4 and counting the number of beats in 6 seconds. This figure multiplied by 10 is the heart rate per minute. The coach using a stop watch can call out the 6-second interval and the player can call out the number of beats for the coach to record. If this were to be done at the end of each rally while the shuttle was being retrieved for the next one, relatively little interruption of the game would occur.

The graph in Figure 1.5 shows the results of such a series of measurements and it can be seen that it is only occasionally that the heart rate drops below 160 beats per minute. This suggests that for training to be of value the programme must be designed to produce a heart rate for long periods of time in excess of 160. One way of obtaining an accurate measure of the work demands of the game is to examine the movement patterns and this can be done by using a cinefilm and replaying it in slow motion or stopping the film for a sufficient length of time to make a record of the movement of the player. The information coming from such an analysis is quite revealing and shows strengths and weaknesses which are not apparent when viewed under normal conditions. Often only these figures will convince some players that they are consistently following sequences of play which are inappropriate. Cinefilm has the advantage that
there are already some matches available between top players and a little effort
and time spend studying these could produce some very useful data. Unfortu-
nately filming is expensive and videotape, which is re-usable, may be a
satisfactory alternative.

An even cheaper and more accessible recording medium is the tape-recorder. The
speed of badminton is such that running commentaries of stroke sequences are
extremely difficult but by no means impossible. The analysis of stroke sequences
could show that certain players follow set routines which have a high degree of
predictability. Armed with this knowledge it should be possible to develop skills to
upset the sequences and thus play more successfully. This is where the skill
training under pressure (see Chapter 9) would not only develop levels of fitness
but could be conditioned to reduce the effectiveness of an opponent. For example,
an opponent who has been filmed or taped may be seen, after analysis, to

![Graph](image-url)
be making 85 per cent of his winners from a smash to the backhand midcourt. Apart from being aware of this fact, and thus being prepared, the challenger could be conditioned under pressure to be able to cope with that shot and to modify the pace of his game accordingly. This does not imply a slowing of pace, but if the opponent’s rhythm is upset, then changes of pace which are within the player’s fitness capabilities could be very successful.

The following results were taken from slow-motion videotape recordings of international players and give a much clearer indication of the game of badminton:

The average distance run during each rally was 12.2 metres with a range of 1-45 metres.
The average number of hits per rally was 6 with a range of 1-27.
The average playing time per rally was 6.7 seconds with a rest time between rallies of 9.9 seconds.

These results if properly used allow the coach and player to establish a more precise training programme.