A CONCEPT OF FITNESS AND ITS MEASUREMENT IN RELATION TO RUGBY FOOTBALL

R. M. REID

Department of Physical Education, University of Aberdeen

C. WILLIAMS

Department of Physiology, University of Aberdeen

Perhaps not all will agree when we say that as far as we are concerned the most important area of fitness for rugby football is that of the cardio-vascular response to a continual high level of physical output. We know that many people see other component parts as being vitally important. However, whilst being fully appreciative of the many areas and the vital parts they have to play we feel that the highest priority must be given to what we in Aberdeen have termed "runability". This is working on the supposition that if one is unable to get there competently, then one is not really taking part, this being especially true in the coaching environment at a University.

Fitness is probably one of the most poorly defined words in sport, being only understood when taken to mean fitness for a specific task. Central to the meaning of fitness, when it is used in the vocabulary of participants in running games or events, is the ability to deliver oxygen from the air to the tissues efficiently, — cardiovascular respiratory fitness.

In Aberdeen we define fitness

(a) in terms of our understanding

and

(b) to appreciate the need for measuring and quantifying this product.

By being able to quantify fitness we feel that we may be able to justify our various programmes and may also show that fitness may be achieved with greater efficiency, but not necessarily with greater ease. Our recommendations may be more effective than in some of the former hit and miss programmes, but at the same time show that to achieve really high levels of fitness, as Charlesworth and Kidd have shown in humans and Gollnick with animals, "Intensity is important".

To cater for our clientele we have used a 3 tier assessment system.

1. Åstrand sub-maximal test.
2. Cooper 12 minutes walk/run test.
3. Maximum oxygen uptake (Binkhurst and Van Leuwen).

This system can accommodate a wide range of fitness levels, but with the exception of the Aberdeen University Rugby Squad 70/71, the majority of the testing has been confined to the Åstrand and Cooper methods. Most of our testing has to be done at set periods when the students are available, therefore, time is at a premium so a shorter test has distinct advantages. Perhaps the most important feature about tests should be that they will not be of such a nature as to be a deterrent at a future date.

TABLE I

COMPARISONS FROM MAXIMUM OXYGEN UPTAKE TESTS

<table>
<thead>
<tr>
<th>Age range</th>
<th>Mean Max. VO₂ (mls/kg)</th>
<th>S.D. (mis/kg)</th>
<th>Highest Value (mis/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aberdeen University Rowing Club. No. 9</td>
<td>19/21</td>
<td>52.8</td>
<td>5.3</td>
</tr>
<tr>
<td>Aberdeen University Rugby Club. No. 10</td>
<td>18/24</td>
<td>51.0</td>
<td>4.9</td>
</tr>
<tr>
<td>2. Italian Amateur Footballers. N = 16</td>
<td>18+</td>
<td>50.7</td>
<td>3.6</td>
</tr>
</tbody>
</table>


Davis and others have pointed out that predicting from heart rate is only a crude form of estimating maximum oxygen uptake and results should be treated with caution. By the same token Hale, Diament and Goldsmith have suggested that for the majority of people, maximum oxygen uptake tests are not sociably acceptable. We would augment this latter suggestion and add that it is perhaps better that we compromise in predictive precision, rather than have a probable physical activity wastage later, due to unsympathetic handling of subjects in early stages. Whilst we understand that the Åstrand sub-maximal test is really seen at its best in the test/re-test situation, we have to draw a fine line between 'crudity' on the one hand and acceptability on the other.
Factors emerging from Åstrand sub-maximal and Cooper tests suggest that generally the 1200 kps load decides the reasonably well trained from the poorly trained athlete, but with the larger well trained person the 1500 kps load has to be used, whereas with the small lean individuals the 1050 kps load is necessary so that heart rate will be within acceptable limits. These differences are resolved during habituation. Although the Cooper test was initially undertaken by running it in small groups it has become apparent that to obtain the best results on a test/re-test basis it may be necessary for some subjects to undertake the test individually. Cooper seems to see this test primarily as the individual’s battle against himself but because of the competitive nature of the various squads tested many subjects have tended to use it as a scale the mean of which they aimed at beating. It may well be that this is man’s natural competitive urge rearing its head, or perhaps it could be that being a member of one of these groups the individual is motivated to compete and at least attain the known norm of the group.

Saltin and Åstrand point out that the highest maximum oxygen uptake ever recorded is 84 mls/kg by a Swedish cross country skier. Many endurance athletes are in the 70 mls/kg class. Considered in this light, the rugby club maximum oxygen uptake values when set against endurance athletic standards, are not particularly impressive.

Eyebrows may be raised when Rugby footballers are compared with endurance athletes but an investigation at Nonington College of Education suggested that players cover in excess of three miles per game, whilst Pohndorf has reported that on average British Rugby Players run almost six miles per match, therefore rugby football can be seen as an endurance sport, especially so at University level. Present evidence in Great Britain suggests that 50 mls/kg is regarded as being reasonably high by Inter-Club “Athletic” standards. We in Aberdeen have based our game on what we have termed ‘runability’ yet the mean of the squad’s uptake level was just 51 mls/kg which was good enough to allow us to be joint Scottish Universities Champions 1970/71."

As Saltin and Åstrand have said, “It seems astonishing that the average maximal oxygen uptake is fairly high for the typical technique – strength events, such as weight-lifting, gymnastics and ski-jumping. It is noticeable, however, that in this type of sport there is a much wider range within the top group of maximal oxygen uptake compared with endurance events. It should be emphasized that today the top athletes in almost all events train hard, not only in special tasks, but also including systematic training of the oxygen transport system”.

To consider this last statement, together with the views of Fred Allen, Murray Halberg and Dr. Leo Walkden about fitness we compare this with recent thoughts in Great Britain.

In his book – ‘Fred Allen on Rugby’ the author says, “The olympian and the swimmer and all the great athletes of any sport succeed because of stamina, which is fitness, which is a careful, sensible, conscious application to a programme designed to make you capable of lasting that last quarter of the game, and, what is more, finishing it with breath and strength enough to go for another quarter”.

Murray Halberg, in the same book says, “You run to play rugby, therefore you have to accustom yourself to running. The indoor exercises of weight-training, press ups, gymnastic work and so forth have some use, but they are at best supplementary. They cannot take the place of running. Therefore fitness for an athletic sport like rugby is best achieved by running”.

*The 1972/73 squad were tested recently. They returned a predicted mean of 58.1 mls/kg (significant difference .01 between 1970/71 and 1972/73) and were outright Scottish Universities Champions.

TABLE II

<table>
<thead>
<tr>
<th>Age range</th>
<th>Mean VO₂</th>
<th>S.D.</th>
<th>Highest Value</th>
<th>Lowest Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mls/kg.</td>
<td></td>
<td>mls/kg.</td>
<td>mls/kg.</td>
</tr>
<tr>
<td>1. Aberdeen University Rugby Club. N = 10</td>
<td>18/24</td>
<td>51</td>
<td>4.9</td>
<td>59</td>
</tr>
<tr>
<td>2. Semi-Professional Football Club. N = 9</td>
<td>19/27</td>
<td>53.8</td>
<td>3.9</td>
<td>61</td>
</tr>
<tr>
<td>2. Aberdeen University Squash Club. N = 7</td>
<td>21/25</td>
<td>56.1</td>
<td>5.6</td>
<td>62</td>
</tr>
</tbody>
</table>

1. Data collected from maximum oxygen uptake tests.
2. Data from prediction.

TABLE III

<table>
<thead>
<tr>
<th>Age range</th>
<th>Mean Distance</th>
<th>S.D.</th>
<th>Greatest distance covered</th>
<th>Smallest distance covered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(yds.)</td>
<td></td>
<td>(yds.)</td>
<td>(yds.)</td>
</tr>
<tr>
<td>Aberdeen University Rugby Club. N = 10</td>
<td>18/24</td>
<td>3224</td>
<td>269</td>
<td>3450</td>
</tr>
<tr>
<td>Semi-Professional Football Club. N = 9</td>
<td>19/27</td>
<td>3470</td>
<td>123</td>
<td>3630</td>
</tr>
<tr>
<td>Aberdeen University Squash Club. N = 7</td>
<td>21/25</td>
<td>3304</td>
<td>170</td>
<td>3500</td>
</tr>
</tbody>
</table>

Distance travelled in 12 minutes (Cooper walk/run test)
In October 1967 John Reason of the Daily Telegraph quoted Dr. Leo Walkden: “Players should train for at least an hour every day. It takes three months to get really fit, not three weeks. The heart-lung capacity of a player can be increased tremendously but I doubt if rugby footballers ever achieve much more than half of what is possible. Training of course is a lonely business and rugby footballers are a sociable lot”.

A recent publication in Great Britain outlined fitness in the following way: “You are as fit as it takes you time to move”. This is illustrated by: “You run a measured 100 yds in 11 seconds. You find it takes you five minutes before you can repeat the distance in the same time. As soon as you can do the 100 yards in eleven seconds with less than five minutes rest you are getting fitter”.

A little later appears: “The problem for the coach and for the captain therefore is to discuss just how little each individual player has to do in order to reach his own optimum of physical fitness.

There is no real controversy about the recovery rate example mentioned earlier, for a little later in the text there is a lengthy discourse on Interval Training. However, I’m sure that where we do miss out is in attitude. When we stop to consider the Allen and Halberg approach in the light of what Saltin and Astrand have said, and the figures they quote, one really begins to wonder if in this very vital area of the game — that of attitudes and approach to fitness — we really have got the message.

If fitness is considered to be necessary for rugby football, might it not be worthwhile trying to find out just what levels of cardio-vascular fitness are necessary; together with the aerobic capacities needed for the various positions at the different strata of the game, so that players may have reference points at which to aim?

Perhaps also we could think in terms of the Cooper Test or some refinement of this as an endurance test for rugby players. It would appear that there is a gap existing in this area, and it may well be that we could think of fitness levels, in this case in terms of yardage covered. It is reasonably simple, does not need any elaborate equipment and is fairly quick to run.

One might say that these figures are all very well but are they of any real value to us? We may think, as coaches, and interested individuals, that this type of approach to the game is all wrong and instead we should be tightening up in other areas, before thinking about such quantitative things. I’m firmly convinced that in the end all of this must be related to this aggressively physical game of ours.

At the end of the day therefore we may well ask ourselves, are these test results and comparisons of any real value to us? Are they really worth the commitment of valuable time, which could possibly be spent in other aspects and as some of us may feel with greater benefit? Are the results sufficiently revealing to be used as feed back on training methods.

Even if we reply negatively to this could it be that the time spent on testing is valuable in getting to know our players physiologically and perhaps to some degree psychologically as well?

Whilst I don’t pretend to have all the answers, I do know that in testing some members of the rugby squad, I have been able to confirm my suspicions about at least one of them, and this has perhaps given me a better insight into some of the reasons why he plays and conceptualizes rugby football in the way that he does.

On the other hand one of the squad who was always belittling himself about ‘training and fitness’, a quite nervous individual, surprised himself, the experimenters and the rest of the squad with his result. He appears to have grown in status within the group and in self confidence because of this.

I feel that it is all valuable. I know too, that these results, plus the whole aura of investigation has promoted much debate around this topic. I feel also that the involvement with the rugby squad in this way has helped to initiate much wider thoughts and feelings about this area of the game, games and life in general, than would probably normally have taken place.

I would like to finish my short talk by quoting from Don Rutherford’s book ‘Rugby for Coach and Player’. He reported Ivan Vodanovich the former All Black’s Coach as saying: “Rugby players’ capacities have never been measured, nor are we to judge what they can do by any precedents, so little has been tried”.

REFERENCES


F.I.M.S. RESOLUTIONS 1974

The International Federation of Sports Medicine (F.I.M.S.) met in General Assembly on Thursday, 7th February, 1974 in Melbourne, Victoria.

1. Observing that the age of participants in high performance competition (particularly in some sports) is becoming progressively lower, the F.I.M.S. calls the attention of all sports organisations to the potential dangers of sustained extreme efforts to the health both physical and psychological of pre-adolescent children who are not yet sufficiently mature to sustain them and calls upon sports physicians throughout the world to participate in the study of the effects of intense competitive sport on pre-adolescent children.

2. The F.I.M.S. draws attention to the role of sport and physical recreation in the prevention, amelioration and rehabilitation of cardiovascular, metabolic and degenerative disorders and to the particular importance of sport in counteracting the harmful effects of the sedentary way of life imposed by modern civilisation.

3. The F.I.M.S. stresses the importance of the study of biomechanics as the foundation upon which may be developed not only better physical performance but also the avoidance of injuries. The International Federation of Sports Medicine therefore seeks to encourage the study and teaching of biomechanics in all aspects of sports medicine.

4. The F.I.M.S. has considered all the available evidence relating to tests for the presence of anabolic steroids which are used by some sportsmen in attempts to increase body mass and strength, and concludes that at the present time there is no practical effective method available for the detection and therefore control of these drugs. Further developments and technical refinements must be awaited before a ban in the use of anabolic steroids can effectively be enforced.

5. The programme of the Scientific Commission of the Federation will during the next few years be directed in particular to a study of the role of sport in the prevention and treatment of disease and will involve retrospective multicentre studies of ex-olympic athletes and of physical educationists together with a long term prospective study of physical education students with a control group.

In its work the Scientific Commission will involve research workers from all five continents and will be co-operating actively with the World Health Organisation and U.N.E.S.C.O.