

A STUDY OF THE PHYSICAL WORKING CAPACITY OF GAELIC FOOTBALLERS AND HURLERS

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ABSTRACT

The possible contribution of endurance fitness to performance in the Gaelic games, football and hurling, has been investigated. Two groups of 15 players were compared. The first consisted of members of teams reaching inter-provincial finals and the second were similar members of comparable but less successful teams. The measurements taken were: height and weight, skinfold thicknesses on the triceps, biceps, subscapular and supriliac sites, and the physical working capacity at a heart rate of 170 beats per minute (PWC 170). The more successful players were found to be taller and heavier and to have a higher PWC 170. There was no difference in estimated percentage of fat. The difference in PWC 170 of the two groups remained after correction for the difference in body weight. A group of seven of the players who participated in two or more finals was studied longitudinally. In six of these subjects PWC 170 was higher at the time of these matches than before or after. These findings are discussed and it is suggested that endurance fitness is a factor contributing to performance in football and hurling.

INTRODUCTION

The role of the cardio-respiratory system in activities such as long distance running and swimming has been widely studied and the importance of endurance training in these events is well established. Many team games are also of relatively long duration and some authors have suggested that they should be considered as endurance events (Williams et al., 1973). Others consider that the intermittent nature of these activities makes endurance fitness of considerably less significance than many other factors. Although it is frequently stated that endurance fitness or "stamina" is of importance in such team games as rugby and soccer (Evans, 1973, Irish RFU, 1975), there appears to have been few attempts to test this hypothesis empirically. This is possibly due to the considerable difficulties of experimental design, and the probability that any result will be less than definite. Notwithstanding these limitations, a systematic study is likely to be of some assistance to the coach faced with the problem of designing a training programme.

The objective of the present investigation was to study the role of endurance fitness in the Gaelic games football and hurling.

Subjects and Methods

The subjects of the study were two groups of 15 footballers or hurlers aged between 18 and 23. All were actively engaged in these sports and regularly took part in 1 to 3 matches per week, in addition to participation in training sessions. All subjects were free from any significant injury or illness at the time of the study. The subjects included in group B were regular members of county sides that had participated in the appropriate provincial final in the year the measurements were

taken. There were 12 footballers and 3 hurlers in this group and the average age was 21.1 ± 1.1 years. The subjects included in group A were members of other county sides or were members of strong club teams in counties which had reached the current provincial final. The members of this group consisted of nine footballers and six hurlers and the mean age was 20.8 ± 0.9 years.

The measurements taken on each subject consisted of height and weight, percentage of fat estimated from measurement of four skinfold thicknesses and PWC 170. Height was recorded to the nearest millimetre and weight to the nearest 50 g. Skinfold thicknesses were measured on the triceps, biceps, subscapular and supriliac sites and the readings converted to an estimate of percentage of fat using the procedure described by Durnin and Rahaman in 1967.

Physical working capacity was determined as the subject's rate of working at a heart rate of 170 beats per minute (PWC 170). The PWC 170 test was carried out on a mechanically braked cycle ergometer manufactured by Monark Ltd. (Sweden). The force applied to the counterbalancing weight was checked as described by the C.A.H.P.E.R., 1968, and adjustments were made as necessary. The ergometer was fitted with two microswitches, one activated by the pedals, the other by the flywheel. The pedal microswitch operated a visual display which the subject was asked to synchronise with a tape recording of a metronome played at 50 beats min^{-1} . Impulses from the flywheel microswitch were recorded and used to calculate the actual pedalling rate of each subject. The frictional force applied to the flywheel was checked once each minute. The heart rate was determined from the E.C.G. taken via chest electrodes and recorded on a tape recorder. At the start of the test the subjects were allowed to pedal the ergometer

at zero work load for two minutes, in order to "warm up" and to become familiar with the correct pedalling rhythm. The subjects then worked for six minutes at each of three previously determined work loads, the heart rate being taken at the end of the 4th, 5th and 6th minutes. PWC 170 was determined from the regression of work load and heart rate at the end of the sixth minute of each period of exercise.

The reliability of the PWC 170 test under the conditions of the study has been previously reported (Watson and O'Donovan, 1976a and 1976b). Using appropriate habituation procedures and employing suitable precautions to minimise measurement error and anxiety of the subject, the 95 per cent confidence limits of reproducibility of this test were -8 to +6 per cent.

RESULTS

The height and body weight of the two groups of players are shown in Figure 1.

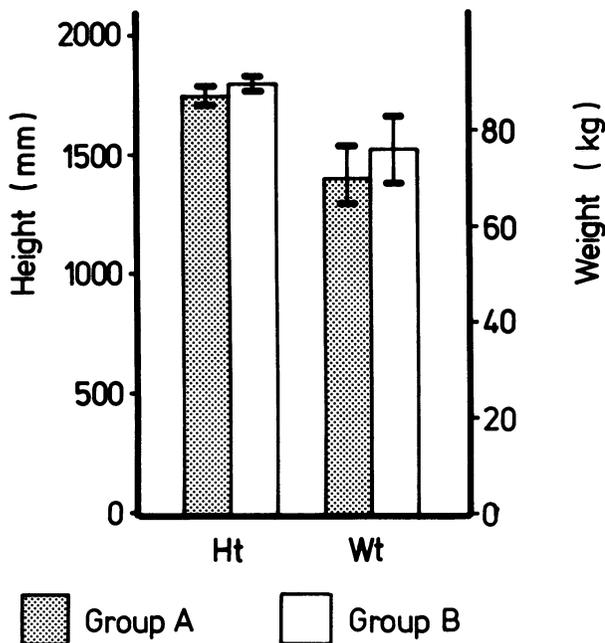


Figure 1: Comparison of height and body weight of members of groups A and B. (Mean ± S.D.).

The more successful players (group B) were taller and heavier than players in group A, both differences being statistically significant ($p < 0.05$). The estimated percentage of fat and PWC 170 of the two groups of players are shown in Figure 2.

There was no significant difference in estimated per-

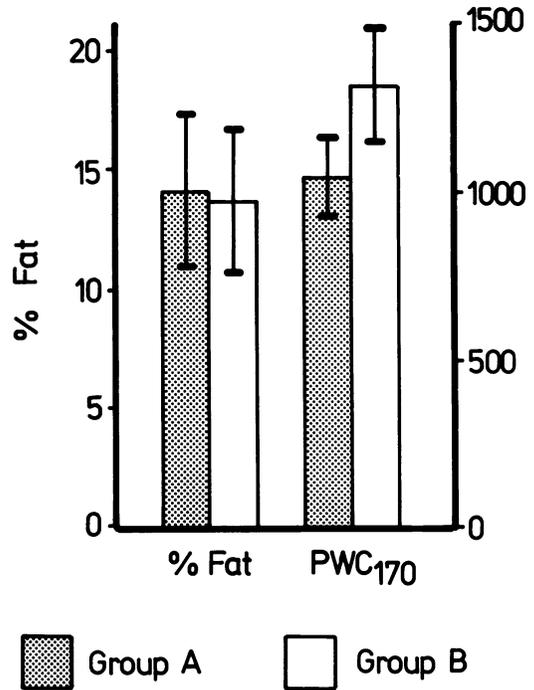


Figure 2: Comparison of percentage of fat (estimated from skinfold thicknesses) and PWC 170 of members of groups A and B. (Mean ± S.D.).

centage of fat, but players of group B had higher physical working capacities than those of group A ($p < 0.01$). The difference in PWC 170 between the two groups of players was about 30% of the mean value for group A.

Since it is well known that physical working capacity is strongly influenced by body size, the weight corrected PWC 170 of each subject was determined and is shown in Figure 3.

There were considerable inter-individual differences in the PWC 170 per kg body weight in both groups, but the subjects of group B tended to score more highly and the difference between the means was statistically significant. ($p < 0.01$).

The changes in PWC 170 with training, for seven subjects of group B who were studied longitudinally are shown in Figure 4.

In general, measurements of PWC 170 taken within one month of a provincial or All-Ireland final were higher than those taken at other times. In the case of six subjects, PWC 170 was highest at about the time the finals matches were played and was lower at other times. The sequence of these changes suggests that the higher

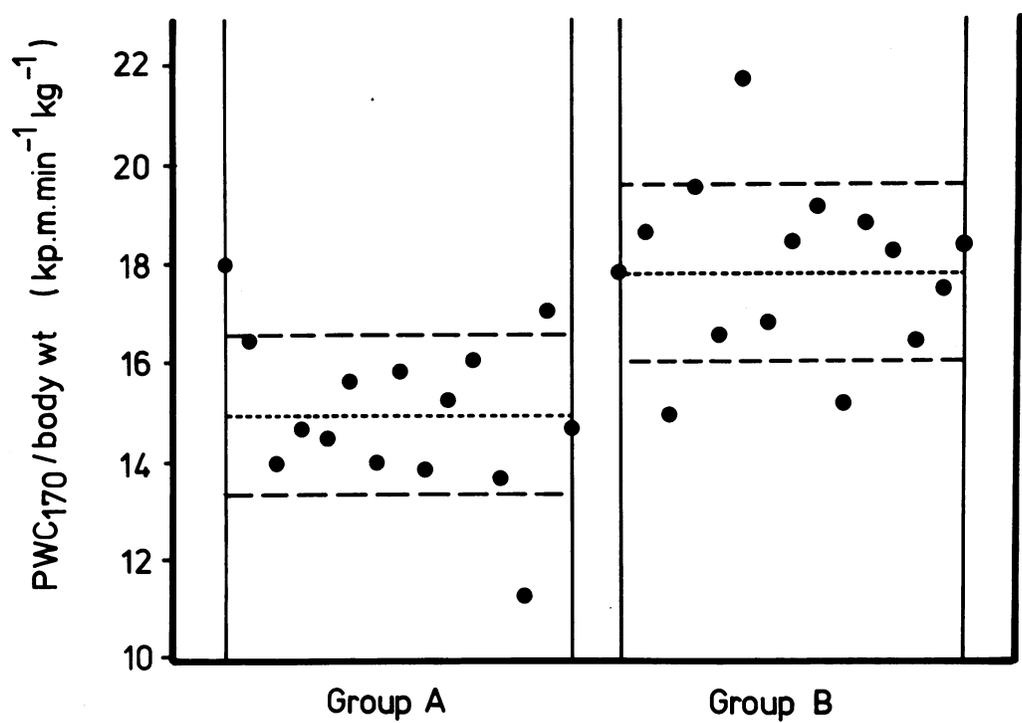


Figure 3: PWC 170 per kg body weight of individual members of groups A and B, the mean \pm S.D. for each group is indicated.

levels of PWC 170 may be associated with the preparations for provincial or other finals.

DISCUSSION

It is extremely difficult to make a meaningful study of the influence of one single factor on performance in any team game. This is partly due to the difficulty in quantifying performance, and partly due to the large number of variables which cannot be controlled. If the investigation is not to be totally artificial and removed from the constraints applicable in the game situation, there are probably only two possible approaches. In the first, changes in team performances are followed as the factor under consideration is varied. In the second, the factor is examined in individuals of different levels of overall performance. The chief disadvantage of the first approach is that performance is influenced by the opposition as much as by the team studied. The main disadvantage of the second method is that selection for particular teams is made on a subjective basis and is not always free from the bias and prejudices of the selectors. These difficulties probably mean that studies of team sports can never be as rigorous as those of such activities as athletics or competitive swimming. However, they do not preclude such studies providing useful information, and such investigations appear to be necessary if training

programmes are to be developed and improved.

In the present investigation the subjects were placed into high or low achievement categories according to the record of the teams for which they had played. Although this classification was based on objective criteria it is subject to any error or bias shown by the selectors and to the fact that individual members of successful teams may be weak, and vice versa. Such errors ought to occur on a random basis and be equally applicable to both groups, so that it is considered that the present groups of subjects are representative of good and outstanding players of Gaelic games.

Part of the 30% difference in PWC between the two groups (Figure 2) is undoubtedly due to the difference in body size. However, the difference remains highly significant after correction for the differences in body weight of the two groups (Figure 3). It has been shown that PWC can be influenced by parameters of body size other than body weight (Davies, 1972; Mayhew and Gifford, 1975; O'Donovan and Watson, 1977). However, the variance in PWC accounted for by these parameters would appear to be too small to account for the 19.5% difference in PWC per kg between the two groups. It has also been suggested that PWC may be influenced by body shape in addition to size (Cotes et al., 1969).

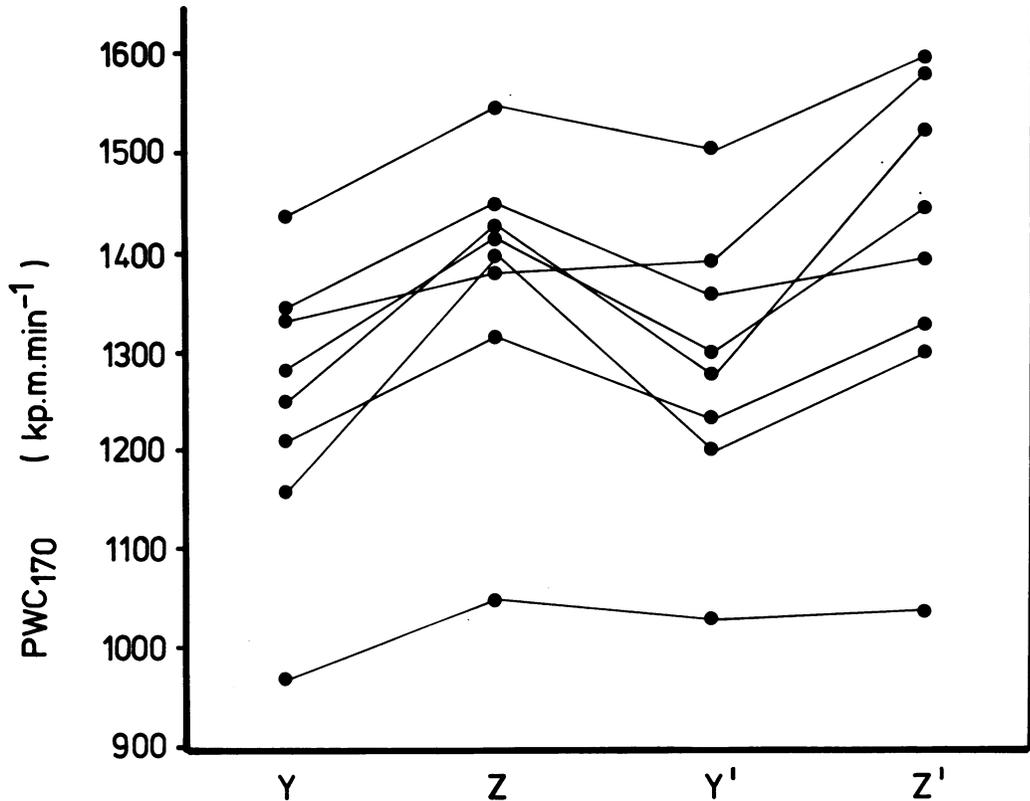


Figure 4: Changes in PWC 170 in 7 inter-provincial finalists with time. The determinations y , z , y' and z' are shown in chronological sequence; determinations z and z' were made within one month of an inter-provincial or similar final.

O'Donovan and Watson, 1977). It is possible that differences in body shape may have had a slight influence on the differences in PWC of the two groups of players, but again, any effect is likely to be very small.

The longitudinal study (Figure 4) indicates that the PWC of participants in interprovincial finals tended to be higher about the time of these matches than at other times. This data suggests that the training programmes undertaken by these subjects were effective in increasing physical work capacity. Five members of group A were also studied longitudinally. In the case of these subjects the changes in PWC with time were generally less marked and in some cases were within the experimental uncertainty of the measuring procedure. This result is surprising since it is known that the effects of training are most marked in subjects of low initial PWC (Åstrand and Rodahl, 1970; Shephard, 1969). It may be due to these subjects having less incentive for intensive training. Alternately the result could be due to the training programmes of these subjects' clubs being less effective in modifying physical working capacity.

The results of this study indicate that members of successful Gaelic football and hurling teams tend to have

higher physical working capacities than members of similar but less successful teams; the more successful teams appear to employ training programmes which increase physical working capacity. There are, apparently no other studies of these sports with which the present results can be compared, and relatively few studies involving other similar team games. Williams et al., (1973) have reported that successful professional soccer players had higher PWC's than less successful footballers and Reid and Williams (1974) that members of a championship-winning rugby team were fitter than the members of a parallel but less successful squad. The present findings are in broad agreement with the results of these workers.

The result of the present study indicate that highly successful Gaelic footballers and hurlers tend to be taller and heavier than the average player. They also have higher physical working capacities, both in absolute terms, and per kg of body weight. The training programmes undertaken by the successful players resulted in increases in physical working capacity and these results suggest that endurance fitness is a factor contributing to performance in Gaelic football and Hurling.

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