SHORT INTERVAL TRAINING AND ITS USES IN THE LATE PHASE OF
REHABILITATION OF THE INJURED

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In introducing short interval training and suggesting its possible uses in the late phase of rehabilitation, it should first be made clear that this is not intended to represent a detailed account of a piece of research, duly documented, and embracing appropriate numbers of patients, controls and trials, but it has a functional bias and describes work during the last ten years or so. This work has consisted of the development of a conditioning procedure of a cardiovascular nature, determined in the main by the findings of such men as A.V. Hill, Jokl, Brouha, Christensen and others. The method described here appears to have a valuable contribution to make towards the patient's total recovery.

The procedure was developed originally to meet what was thought to be a need in fitness for association football, and the practical demonstration which follows this communication indicates the approach adopted to bring about such cardiovascular adaptations as were thought necessary and desirable.

The term "short interval training" was coined by Walter Winterbottom as an alternative to "circulatory - respiratory fitness technique," and is a form of physical activity in which the performer is required to participate in large muscle work of a somewhat strenuous nature for periods of time, say 30, 40, 50 or 60 seconds of work interspersed with equally brief, or even briefer periods of rest in which he attempts to recover from his previous efforts. Progression is a simple matter of:

- a. Increasing the duration of the exercise stint, e.g. from 30 to 40 seconds.
- b. Decrease the rest period between repetitions.
- c. Increase the number of repetitions in a complete work-out.
- d. Increase the number of repetitions and decrease the rest periods.
- e. Increase the duration of the exercise stints and decrease the rest periods.

Whatever form of exercise stints may take, they must involve the performer in large muscle group work, and be of a strenuous nature, if they are to produce the physiological effects desired.

2. The main effect of short interval training is to bring about those cardio-vascular adaptations as are necessary for the organism to meet the demands of muscular work of a largely anaerobic nature. The procedure is geared, therefore, to induce oxygen debt in the performer by exposing him to bouts of strenuous exercise with periods of rest necessarily curtailed to prevent any significant degree of recovery. In this way,

a tolerance to high lactic acid and carbon dioxide build-up is brought about; there is an increased ability to endure the discomforts of near-intolerable breathing; and the further adaption associated with the maintenance of a thermal equilibrium, the heat stresses of such a procedure being not inconsiderable. Short interval training is inevitably associated with high pulse rates, and as Jokl states, in the majority of present-day occupations the heart is seldom trained effectively, so there is a necessity of raising the pulse rate to high counts in order to train the heart. He also observes that in industrial occupations the work remains a secondary determinant of the exercise tolerance. If a sedentary worker takes part in some vigorous recreational activity, the exercise tolerance of his heart, determined by step tests, is distinctly superior to that of a man working eight hours a day at a fairly heavy monotonous job. Karvonen also claims that in order to improve the exercise tolerance of his heart, the intensity of training has to be above a high threshold value.

Christensen has produced evidence to indicate that the fatigue associated with the production of lactic acid can be avoided for a long time if work periods are short, - 30 seconds or less; - as they increase in duration fatigue develops quickly if the load is heavy. He postulates the existence of an oxygen store which is built up within the working muscles, but as the work periods are extended, the internal equilibrium is disturbed, work is carried out anaerobically, and the subsequent production of lactic acid prevents further effort. In considering the development of fatigue, he makes the point that in the intermittent work the length of the work period is apparently of primary importance, and the actual work load or the total work output of secondary importance.

Brouha and Radford make the point that for alternating efforts of varying intensity, where periods of rest activity are followed by intervals of rest, the problems of repaying the anerobic debt is of considerable importance. An athlete, who can return rapidly towards his resting state following a period of maximum or near-maximum effort, has an advantage since he can repay the debt quickly, and will be able to produce another peak effort sooner than an untrained man needing longer to recover.

3. In considering the age, constitution and type of patient to be exposed to the rigours of short interval training, one is inclined to confine its use to men in the early forties or under. Chronological age, however, is a poor guide to physical fitness, and perhaps this somewhat arbitrary age limit is too cautious. Nevertheless, one might preclude men over fifty until a valid cardiovascular test has been carried out, and physical education is still awaiting the discovery of a satisfactory test - outside the laboratory - for appraising cardiovascular fitness. Matthews suggests that at present the only way to demonstrate the superiority of one individual over another is to make comparisons during fairly strenuous exercise, when the subject has to use his physiological reserves.

Regarding the constitution of the patient, before undertaking short interval training he should have medical clearance, and particularly no unsuspected defects of heart or lungs. Jokl states that physiological adaptations occur throughout life, and that the normal heart is invulnerable to the demands and stresses of physical exercise and athletic training. Muscular activity never harms a healthy heart. The crucial question confronting the examining physician is whether the heart is normal. When the absence of cardiac disease can be taken for granted, no restrictions need be imposed in respect of the examinees training schedule.

In discussing the type of patient who would be expected to participate in the training under review, are men who have suffered some degree of direct violence, among which may be listed fractures, fracture/dislocations, dislocations and soft tissue damage of various sorts. As Rusk points out, such patients have a tendency to improve from the beginning, - as opposed to the more chronic type which often tend to worsen.

4. The particular phase of rehabilitation with which we are concerned here is the late intermediate, bordering on the final phase. Once a patient has reached this phase, every activity should have a functional bias; what he is called upon to do must relate to the everyday acts of life, and this means leisure time activities as well as work.

5. The reasons for the choice of short interval training as a conditioning procedure is based largely upon personal experience fortified by a strong conviction that current methods based on more traditional forms of exercise therapy have little if any influence in effecting these cardiovascular adaptations under discussion. The test of effectiveness is a high pulse rate of around 140 - 160 beats a minute, and the intensity of work required to bring this about will depend upon the initial state of fitness of the patient.

One approach to the problem is by way of short interval training through the medium of games therapy. If one is to require muscular work from the patient of sufficient intensity to bring about these physiological adaptations we consider so necessary, we are obliged to ensure that the programme evolved is such that the following ingredients are an essential part of it:

Meaningful activities.

Satisfying activities.

Enjoyable activities.

If these are to be met, success is ensured. No other medium in the whole range of exercise therapy holds out as much promise as a properly organised and supervised games session. Man is by nature a playing animal, and the therapist and teacher should not hesitate to cash in on the fact.

Specific remedial exercises, as distinct from remedial gymnastics which embrace the whole gamut of movement, have little or no part to play in this late phase of a patient's recovery. Their usefulness is confined to early and intermediate phases of rehabilitation when movement must be controlled carefully and with progression; indeed at this time they are undoubtedly the backbone of exercise therapy, but to persist in their use when normal function is the criterion is to "miss the boat" completely.

Herbert Spencer put the matter in a nutshell when he wrote: "Granting, as we do, that formal exercises are better than nothing and, granting further, that they may be used with advantage as supplementary aids, we yet contend that they can never supply the place of exercises prompted by nature. For girls as well as boys, the sportive activities to which the instincts impel are essential to bodily welfare . . . The common assumption that so long as the amount of bodily activity is the same it matters not whether it be pleasurable or otherwise, is a grave mistake." These words by this great English philosopher should adorn the wall of every remedial department in the country. Certainly, if their full implications were appreciated and put into practice, our work - particularly in the phase of rehabilitation we have been considering - would take on a new significance.

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