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# CHANGES IN BODY COMPOSITION AND PHYSICAL WORKING CAPACITY AFTER A HIGH FIBRE DIET AND PHYSICAL TRAINING

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Abstract. The changes in body composition and Physical Working Capacity (PWC) were studied in obese children, 7 to 14 years of age, under ward conditions during 4 weeks. They received a diet of 115 kJ per kg of body weight for the height with a crude fibre content of 12 grams per day, and underwent a controlled physical training. Before and after treatment, work test on a bicycle ergometer was performed with continous ECG recording, $PWC_{170}$ and maximum oxygen uptake were calculated. Significant reductions in body weight and body fat—percentual and absolute — values were obtained ($p < 0.001$) after the treatment, as well as an evident increase in the $PWC_{170}$ of the children. Although the maximum oxygen uptake remains unaltered in our patients when this variable was related to the amount of work performed, significant reductions were observed showing an improvement of their fitness and aerobic capacity.
*Key words:* obesity, fibre diet plus exercise, body composition, physical fitness.

## Introduction

The therapeutic management of obese children is extremely complex and the results obtained have been quite disheartening. Reduction of energy intake in a magnitude that it should not disturb the period of growth and development, and to increase energy expenditure seem to be the most physiological procedure.

Recently several diseases including obesity have been ascribed to an overconsumption of sugar and fine milled starches, further to an underconsumption of crude fibre in the diet (Beyer and Flynn 1978). The authors' purpose was to use a high-fibre diet associated with a physical training program in order to study their effect upon body composition and physical fitness in a group of obese children.

## Material and Methods

Fifteen obese children (8 girls and 7 boys), otherwise healthy, ranging from 7 to 14 years of age were studied under ward conditions during 4 weeks. At the time of admission each of them was subjected to the following examinations.

a) *Body composition*

Body weight and height with an accuracy of 0.1 kg and 1 mm, respectively, were recorded, and the per cent of the ideal weight referred to the height (IW/AH) was calculated. On the right side of the body, the skinfold thicknesses over triceps, biceps, subscapular, suprailiac, and calf were measured with a Holtain caliper at a standard pressure of 10 g/mm$^2$. From them the body fat percent was estimated by the prediction equation of PAŘÍZKOVÁ (PAŘÍZKOVÁ and ROTH 1972).

b) *Work test*

It was performed on a bicycle ergometer with continuous electrocardiographic recording for six minutes at increasing loads (1; 1.5; 2 watt|kg of body weight). The expired air was collected in a Douglas bag and its volume was measured with a dry gas meter. Gas samples were analysed for oxygen in a Godard rapox. The maximum oxygen uptake ($VO_2$ max) and its values referred to the lean body mass (LBM), and to the kilogrammetres of work performed were calculated.

Physical working capacity (PWC) was determined by plotting the heart rate against the workload per minute in watt units on graph paper. A straight line was drawn through three points making the best fit. The estimated amount of work that could produce a heart-rate of 170/min was considered $PWC_{170}$. This parameter was referred to the LBM.

c) *Treatment*

All patients were given a diet of 115 kJ/kg of ideal body weight for the height with a crude fibre content of 12 g per day approximately, using a Hungarian composition table.

The training program consisted in daily two sessions five times a week during a four-week period, following a fixed schedule. Each session lasted 20 minutes and started with an initial warming up by jogging. Thereafter followed a work load about 1.5 watt/kg during 10 minutes, determined individually for each patient depending on their ability. The exercise was finished with jogging gradually decreased up to relaxation.

After the treatment the same investigations as mentioned above were performed again. Student's t-test for paired series was used for statistical analysis (RADHAKRISHNA RAO 1966).

## Results and Discussion

Figure 1 illustrates the variations in body weight and the IW/AH of the obese subjects after treatment, with a significant decrease of $p < 0.001$. Thus since, the changes in body weight certainly do not record the changes in body composition (LEUSINK 1972, PEÑA et al. 1979) the authors studied the variations of the body fat — in per cent and absolute values — and also found significant reductions ($p < 0.01$) (Fig. 2).

The authors observed, that in their cases, different individual responses to the treatment. They consider that the type of obesity — regarding the number

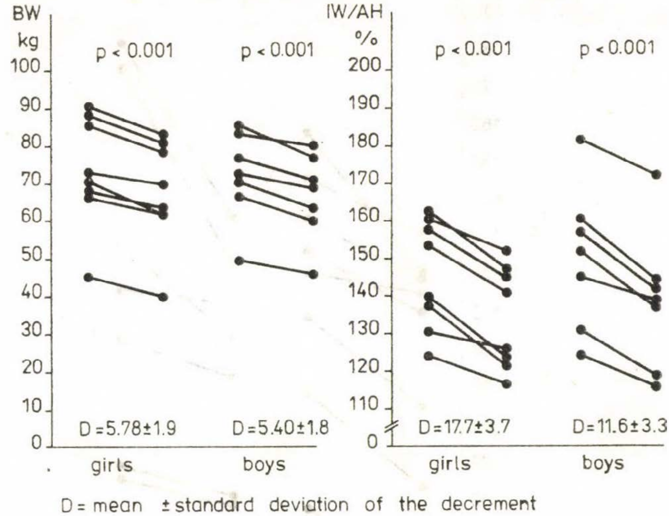


*Fig. 1:* **Changes in body weight and the IW/AH ratio during treatment**

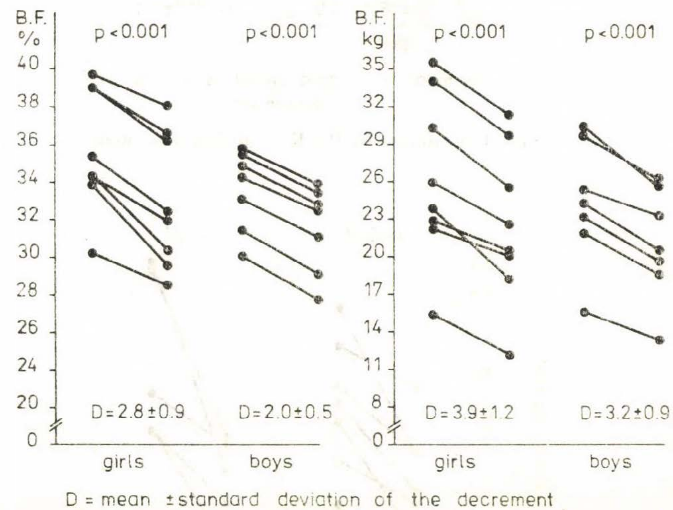


*Fig. 2:* **Changes in body fat during treatment**

of adiposites — plays an important role in these differences as has been stressed by Björntorp et al. 1977).

Significant increase in the $PWC_{170}$ was observed after treatment, which was slightly higher in girls ($p < 0.01$) than in boys ($p < 0.05$) (Fig. 3). The sex difference could be ascribed to the fact, that the work performed by the girls was relatively harder than that done by the boys, considering to the different adaptability of vegetative functions (Pařízková 1977), as well as the difference in lean body mass proportion. Generally the larger LBM, the greater the work-

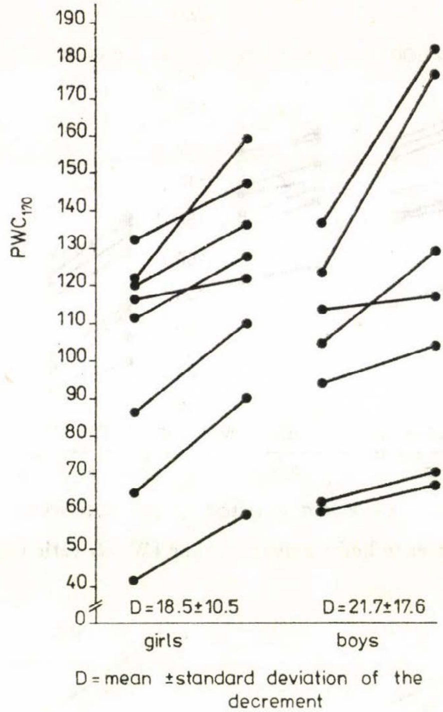


*Fig. 3:* **Changes in $PWK_{170}$ during treatment**

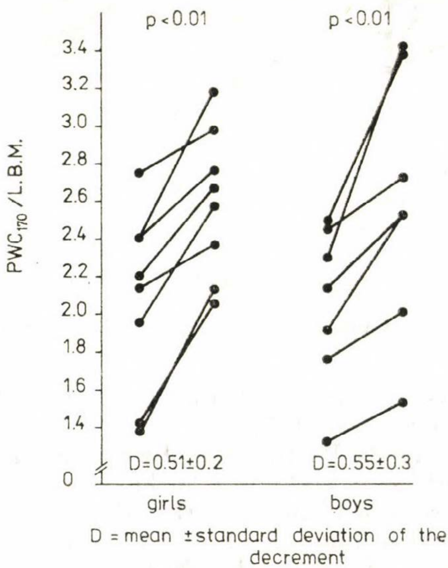


*Fig. 4:* **Changes in $PWC_{170}$/LBM ratio during treatment**

ing capacity — hence, the $PWC_{170}$ was referred to the LBM and the increase in this ratio was also significant ($p < 0.01$), and the sex differences disappeared (Fig. 4).

The absolute values of $\dot{V}O_2$ max and those expressed per kg of LBM remained the same after the treatment; however, when related to the magnitude of work periformed, significant differences were seen ($p < 0.05$) (Fig. 5), reflecting an improvement of their fitness and aerobic capacity. Our results are in harmony with those reported by PAŘÍZKOVÁ (1977), and, as she stated, two factors are involved here: progressive adaptation to increased activity and the reduction of weight which are dynamically interrelated and form an integral part of the adaptation consequence of increased muscular work. These findings suggest that a formal exercise program associated to a reduction of energy intake may complete dietary intervention in the treatment of obesity.

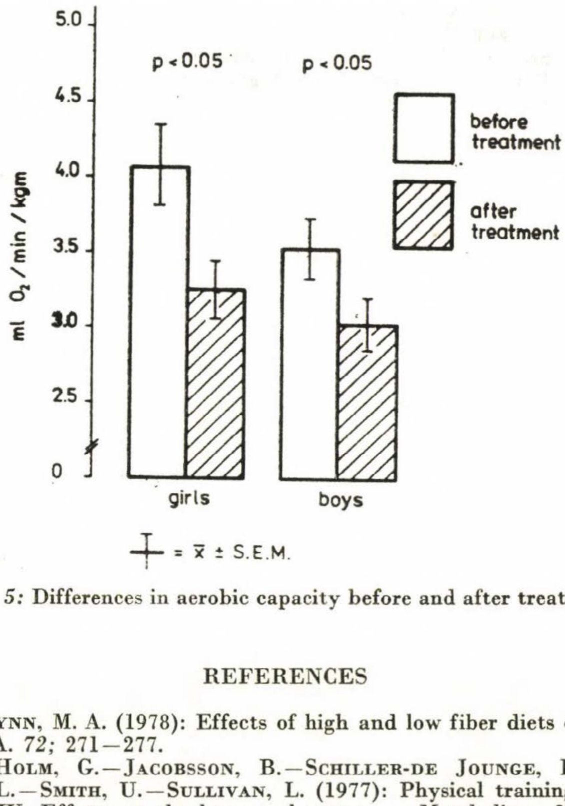


*Fig. 5:* Differences in aerobic capacity before and after treatment

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