THE EFFECTS OF AN EXERCISE REGIME ON PATIENTS WITH LUNG MALFUNCTION

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People with chronic obstructive lung disease are characterised by exertional dyspnoea and low work capacity. Although physical training is considered beneficial, studies reporting improved work tolerance following exercise regimes are often flawed by weakness in experimental design. Moreover, subjects with a neurotic fear of any physical effort may be highly susceptible to psychotherapeutic aspects of treatment, yet few attempts have been made to relate the physiology to the psychology of training. This study investigated physiological and psychological responses of 19 patients before and after approximately 4 weeks training. The exercise consisted of daily sessions of treadmill walking, but differed in duration and intensity for the experimental and control group.

A. Physiological Variables

The responses to work-tests on treadmill and cycle ergometer were as follows:

1. Experimental Group ($n = 10$)

- duration of exercise increased after 3 days habituation — 12.5% on the treadmill, 9.5% on the cycle.
- post-training exercise time increased 43% on the treadmill ($p < 0.02$), 24% on the cycle ($p < 0.05$)
- symptom limited f_H (pulse frequency), f_R (ventilation rate), $\dot{V}_E$ (rate of expiratory exchange), $\dot{V}_{O_2}$ (rate of oxygen uptake), $\dot{V}_{CO_2}$ (rate of carbon dioxide output), were virtually unchanged on the treadmill; $\dot{V}_E$, $\dot{V}_{O_2}$, $\dot{V}_{CO_2}$ on the cycle increased approximately 10% ($p > 0.10$).
- at standard gradient f_H , f_R , $\dot{V}_E$, $\dot{V}_{O_2}$, $\dot{V}_{CO_2}$ all fell, but only f_R was significant ($p < 0.02$); at standard work on the cycle results were unchanged.

2. Control Group ($n = 9$)

- duration of exercise on the treadmill rose 7%, but fell 5% on the cycle ($p > 0.10$).
- on the treadmill symptom-limited $\dot{V}_E$ and $\dot{V}_{CO_2}$ increased, f_H and $\dot{V}_{O_2}$ remained unchanged and f_R fell; on the cycle f_H , f_R , $\dot{V}_E$, $\dot{V}_{O_2}$ and $\dot{V}_{CO_2}$ fell. None of the changes were significant.

B. Psychological Variables

Responses to the Taylor Manifest Anxiety Scale given at the start of the programme revealed that both groups fell within the normal range, only two subjects from each group were more than one standard deviation above the population mean. Eysenck Personality Inventory scores indicated that both groups had lower Extraversion and Neuroticism scores than normal or average; the training programme increased the Extraversion scores of the experimental group but the change was not significant. Activity patterns before and after the onset of illness, and attitude towards exercise before and after training were obtained by questionnaire. The replies showed that more than half of the whole group did little or no exercise before starting the programme. Only four (1E, 3C) enjoyed exercise, although an additional seven (5E, 2C) considered exercise to be beneficial generally; nine (6E, 3C) avoided situations which made them breathless most of the time.

In spite of the lack of objective improvement in post-training exercise by the controls nine said they felt better as a result of the exercise, seven thought the future outlook had improved; seven said they would attempt activities which they had previously avoided; eight said they intended to continue exercising after discharge, five of them at a greater intensity.

Clearly neither physiological nor psychological factors, taken in isolation can answer the problems of evaluating exercise regimes. Exposure to the minimal levels of activity provided in the habituation and placebo programmes leads to a small but limited increase in exercise time, and in greater confidence. Equally, significant improvement in work tolerance requires training of near maximum intensity: this improvement may be more a reflection of this greater confidence than fundamental changes in physiology, and may include:

- enhanced neuro-muscular co-ordination, peculiar to the training device;
- a diminution of exercise-phobia, similar to desensitisation therapy;
- increased motivation and a willingness to withstand exertional dyspnoea for longer periods.