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STUDY OF PULMONARY FUNCTIONS IN SWIMMERS OF LUCKNOW CITY

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Abstract: In this study, the pulmonary functions of young swimmers of K.D. Singh Babu Stadium, Lucknow were studied. 20 swimmers of the age group of 15-20 years were chosen along with 15 students as controls. The parameters taken into account were Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV_1) and Peak Expiratory Flow Rate (PEFR). Two sets of readings were recorded. One before the start and the other at the end of the practice season. These readings were compared to each other and also with the values of the controls. The results indicate that swimming has considerable effect on enhancing lung functions of an individual as FVC, FEV_1, PEFR were significantly raised in swimmers after swimming session. Such results suggest that swimming may be induced in the exercise programme for rehabilitation of respiratory patients who have compromised lung functions.

Key words : swimmers lung functions FVC FEV_1 PEFR

INTRODUCTION

We are well aware of the fact that any sort of exercise done regularly, is beneficial to the body. Swimming is no exception. Swimming is considered to be a very good exercise for maintaining proper health and also has a profound effect on the lung function of an individual. The purpose of choosing swimmers instead of any other sportspersons was that previous studies have shown that swimming produces the maximum effect on the lungs compared to any other sport (1). Regular swimming practice should produce a positive effect on the lungs by increasing the pulmonary capacity and thereby improving the lung functions.

METHODS

For this study we chose 20 swimmers from K.D. Singh Babu Stadium, Lucknow. All these swimmers were males of the age group 15 to 20 years. These swimmers had a swimming history ranging from 2 to 5 years. 15 students of the same age group, who were not engaged in any kind of sport, were chosen as controls. The subjects chosen were residents of Lucknow district and their social and dietary habits were more or less the same. All the subjects were apparently healthy. The pulmonary tests were recorded with the help of a MEDSPIROR, which is a dry type of spirometer. The subjects were made familiar to the machine and were taught its usage. After repeated practice of using the machine,

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their pulmonary function tests (PFT's) were recorded. The subjects were instructed to inhale and exhale normally and then after taking a forced inspiration they were asked to expire forcibly into the nozzle of the machine. Three readings of all the tests were recorded and the best of the three was taken into account.

The parameters taken into account in this study were Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1) and Peak Expiratory Flow Rate (PEFR). The swimmers were asked to report at least 4 hours post prandially.

The same subjects were summoned at two different occasions for the recording of their pulmonary function tests. The first readings were taken just after the winter season at the start of the swimming session. At this time, these swimmers had not practiced for a few months. So these readings were of swimmers who were out of practice. The second set of readings were recorded 5 months later, during which the swimmers were under vigorous practice for their selections in the national and state team. The PFT's of the controls were recorded while recording the first set of readings of the swimmers. All the data collected was statistically analysed by applying the Student's 't' test (paired and unpaired).

RESULTS

In the table given below, the pulmonary functions of the controls have been compared to that of the swimmers before and after the practice session. The baseline value of the swimmers i.e before exercise, is supposed to be the cumulative effect of their previous years swimming. Comparing this value to that of the controls, we find that the swimmers have a higher value of PEFR and the difference is highly significant (P value < 0.005). Regular swimming for a couple of months brought about a spurt in all the three parameters of lung functions as indicated in the table.

The values suggest that such exercises produce a long-lasting effect on the PEFR while the FVC and FEV-1 are temporarily improved. Thus, this study indicates that such exercises have a positive effect on the lungs.

DISCUSSION

It is a well known fact that Pulmonary Function values are influenced by race, age, sex, height, weight and other unknown variables having a wide range normal values (2). Athletes have larger lung volumes and capacities, but it is controversial whether it is due to genetic adaptation or it is due to training (3). The results obtained in our study suggest that better lung functions in

TABLE I : Comparison of pulmonary function tests of controls (n=15) and swimmers (n=20) before and after exercise. Mean ± SD.

Parameters	*Control*	*Swimmers before session(a)*	*Swimmers after session(b)*	*P value comparing a& b*
FVC (Lit)	3.08 ± 0.92	3.38 ± 0.74	3.69 ± 0.72	0.000
FEV-1 (Lit/sec)	2.56 ± 0.88	2.95 ± 0.63	3.33 ± 0.66	0.000
PEFR (Lit/sec)	6.9 ± 1.18*	8.37 ± 1.58*	9.46 ± 1.59	0.000

*P value < 0.005

sportsmen could be attributed to their training as it has a positive effect on the lung functions of the swimmers.

Earlier studies have shown that in young swimmers, values of lung volume were higher than those of controls of same age and height, which is similar to our findings in this study. Higher values for lung volumes and flow rates in swimmers also have been reported by other workers. (4, 5, 6, 11). This change could be attributed to the ventilatory stress that the swimmers have to endure. A. K. De has also reported higher values of Pulmonary Functions in swimmers, but his subjects were of a younger group (7). Studies have clearly shown the among various groups of footballers, hockey players, swimmers wrestlers and boxers, the swimmers have a higher value of vital capacities and FEV-1 (1). It was presumed that athletic training has no ventilatory stress in the form of external pressure acting on the lungs as in swimming, and so it is not associated with detectable improvements in these lung functions as compared to swimming (8). Regular swimming practice may tend to alter the elasticity of lungs and chest wall which lead to an improvement in the lung functions of the swimmers (9). It could be presumed that during swimming the external pressure is high, therefore the respiratory muscles along with the diaphragm have to develop greater pressure for respiration (1). This may lead to the improvement in the functional capacity of these muscles as it has been reported that specific training of ventilatory muscles increases the muscle endurance and also the capacity to sustain high levels of ventilation (10). Hypoxia may also have a role to play. This intermittent hypoxia faced by the swimmer due to restricted ventilation may lead to alveolar hyperplasia, thereby increasing the lung capacity (11). Certain studies have also indicated that in rats, kept in hypoxic conditions, there is an increase in the total lung weight and lung capacity (12). Also there is an increase in the number of alveoli in exercise-trained rats (13).

Thus it can be concluded that swimming is the best exercise for the respiratory system. Such helpful exercises in milder form, might help for rehabilitation of patients with compromised lung functions.

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