EFFECTS OF RESPIRATORY EXERCISES ON THE CHEST MOBILITY AND PHYSICAL PERFORMANCE

EFECTELE EXERCIŢIILOR RESPIRATORII ASUPRA MOBILITĂŢII CUTIEI TORACICE ŞI A PERFORMANŢEI FIZICE

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Key words: respiratory exercises, chest mobility, physical performance, intentional apneea, Cooper test

Abstract: It was supposed that respiratory exercises improve the cardio-respiratory endurance. 26 young adults took part in the investigations. We used a questionnaire for mapping the risk factors, and then a series of respiratory exercises were carried out. Before and after the training programme the circumference of chest, the voluntary apnoea time and the results in Cooper test were measured. All of the parameters were significantly improved. We conclude that these exercises are suitable even for patients with contraindication of cardiovascular endurance training.

Cuvinte cheie: exerciţii de respiraţie, mobilitatea cutiei toracice, performanţă fizică, apnee voluntară, testul Cooper

Rezumat: S-a presupus că exerciţiile de respiraţie îmbunătăţesc rezistenţa cardio-respiratorie. Am luat în studiu un număr de 26 de adulţi tineri. Am utilizat un chestionar pentru identificarea factorilor de risc şi apoi am efectuat o serie de exerciţii de respiraţie. Am măsurat înainte şi după exerciţii circumferinţa pieptului, timpul de apnee voluntară şi rezultatele la testul Cooper. Toţi aceşti parametri s-au îmbunătăţit semnificativ. Concluzionăm că aceste exerciţii sunt adecvate chiar şi pentru pacienţii cu contraindicaţii în ceea ce priveşte antrenamentul cardio-respirator de rezistenţă.

Introduction

It is well known that respiratory exercises have many beneficial effects. They improve the abdominal breathing and the function of the respiratory muscles, so the respiration becomes more effective. The more effective breathing provides better oxygen supply for the peripheral tissues. By the way the mobility of the chest as well as the whole respiratory mechanism will be improved. Circulation becomes better by the increase in cardiac output. Altogether the respiratory exercises help to keep a pleasant daily lifestyle, create the vegetative balance. It was supposed that the respiratory exercises can result in the improvement of physical stress tolerance and increase in cardio-respiratory endurance. The aim of our experiments was to examine the effects of respiratory exercises on the chest mobility and aerobic endurance. The circumferences of the chest at three different locations, the voluntary apnoea time [1] and the results in Cooper test were measured 0. If the hypothesis that respiratory exercises have positive effect on the aerobic endurance would be proved, the endurance of patients who are excluded from cardiovascular endurance training on account of contraindication could be improved.

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Methods

26 clients took part in the investigations. The age of participants was 24.7±1.2 years in average (mean±SEM, n=26), the ratio of female:male was 24:2.

We used a self-constructed questionnaire for mapping the risk factors and the knowledge of participants about respiratory exercises. The thoracic circumference of participants was determined at three different levels by using a measuring tape: in the axillary region, at the level of the nipples, and at the level of the rib 10. The difference in circumference at the end of the maximum expiration and inspiration was taken as the measure of chest motility. We also measured the duration of the voluntary apnoea (breath-hold time) as the indicator of the physical endurance. The examiner asked the participants to make a forced expiration, then to inspire at maximum amplitude and hold the air in. The process was repeated three times and the best result was used. To characterize the aerobic endurance the result in Cooper test was also measured, that is the distance performed by running in 12 minutes. Then we carried out a training programme containing respiratory exercises in a 5-week period, twice a week. During the training programme the participants have done common respiratory exercises in different body positions. We used hardened positions, and the movements of the arm aimed to increase the movement of the chest. At the end of the training programme we asked the participants to fill in a second questionnaire about their subjective opinions regarding the whole procedure and we measured the parameters mentioned before again.

Statistical analysis was performed by Microsoft Excel. The significance was evaluated by paired t-test.

Results

We experienced that the average value of BMI (22.6±0.8; mean±SEM, n=26) was in the ideal range (18.5-24.9). There were also obesity and underweight state in the group (the highest value was 33, and the lowest one was as low as 18). It was found that 22.7% of the clients are smokers, the 76.2% of participants do exercises weekly (mainly aerobic activity is performed).

As it is shown in Figure 1, the chest deflection increased considerably in each 3 measuring levels as an effect of respiratory exercises. The change was significant ($p<0.001$).

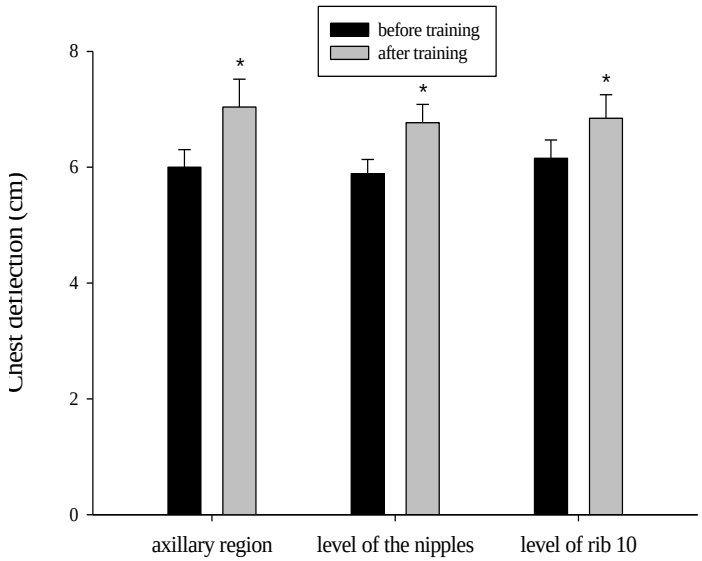

Figure 1: Effect of respiratory exercises on chest deflection. The thoracic circumference was measured in the axillary region, at the level of the nipples and rib 10. The difference in circumference at the maximum expiration and inspiration

was taken as the measure of chest deflection. Columns and bars represent mean±SEM, n=26, * p<0.001 after versus before training.

The Figure 2 shows the results of Cooper test and the duration of voluntary apnoea. The Cooper test (12-minute running) showed significantly better results at the end of a 5-week training containing respiratory exercises. The result of Cooper test before the training was 1859.6±59.2 m (mean±SEM), which was increased to 1984.6±44.6 m (mean±SEM) at the end of the 5-week period (p<0.001).

The duration of voluntary apnoea increased from 62.1±5.6 s to 74.3±7.2 s (mean±SEM), the difference is significant (p<0.001).

The results of the Cooper test and the duration of voluntary apnoea show correlation (Figure 3), the correlation coefficient: 0.53602.

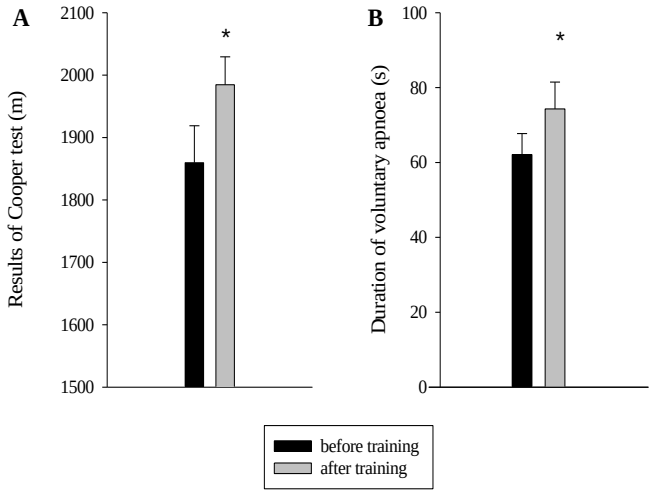

Figure 2: Effects of respiratory exercises on the results of Cooper test performed in running and the duration of voluntary apnoea. Columns and bars represent mean±SEM, n=26, * p<0.001 after versus before training.

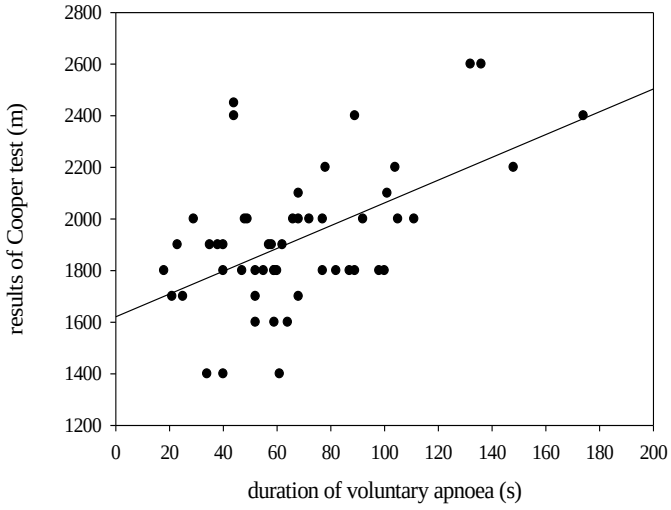

Figure 3: Correlation between the distances performed in Cooper test and the duration of voluntary apnoea. Correlation coefficient: 0.53602.

The evaluation of questionnaires at the end of the intervention programme revealed the positive effects of respiratory exercises not only on the physical but on the psychic status, too.

Discussion

The respiratory exercises used for a long while in the physiotherapy are based on the "pranajama" in the yoga 0. The majority of people get accustomed to inappropriate breathing techniques in spite of the fact that the suitable respiration facilitates other vital processes as the circulation, the neural regulation etc. The right breathing technique improves the function of the diaphragm, decreases the O_2 and energy requirements of the respiratory muscles, so increases the efficiency of breathing. It is supposed that these changes are manifested in the improvement of the aerobic endurance and the physical loadability.

Our data showed a significant increase in the mobility of the chest which could result in an increase in the tidal volume and the vital capacity. The duration of the voluntary apnoea was elongated on the effect of respiratory exercises. The voluntary apnoea can be used as an indicator of aerobic endurance 0, since the better the oxygen consumption, the longer the breath-hold time, the greater the aerobic endurance. The performance in the running Cooper test showed remarkable correlation to the duration of voluntary apnoea. Since the breath-hold time seems to be improvable by respiratory exercises these findings can be valuable in the improvement of endurance in elder age or in the pathological conditions when the intensive endurance improving trainings are contraindicated.

Conclusion

The respiratory exercises can be effective tools for improvement of physical endurance and performance for preventive and also curative purposes.

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