Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com

Physiology

Effect of Isotonic Exercises on Pulmonary Function Tests

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Original Research Article

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Article History
Received: 28.01.2018
Accepted: 11.02.2018
Published: 15.02.2018

DOI:
10.36347/sjams.2018.v06i02.010

Abstract: Exercises are known to activate the parasympathetic nervous system and can prove to be beneficial in certain lung diseases. We in the present study tried to evaluate the effect of isotonic exercises on the pulmonary function tests of young healthy subjects. The study was conducted in Department of Physiology, Rajiv Gandhi Institute of Medical Sciences Adilabad. 50 Adult and healthy aged-matched male volunteers were chosen and randomly assigned into two equal group of 25 each. Group (I) Test group consisted of 25 males given training for 30 minutes in isotonic exercises for 6 weeks. Group (II) acted as controls they performed their routine activities and data was collected before and after isotonic exercises in both groups and compared. The mean values of parameters of FVC%, FEV1% FEF 25-75%, PEFR% and MVV% in Group I before exercise were 73.52, 87.8, 92.16, 85.0 and 78.96. After exercise were 78.84, 90.68, 90.44, 88.96 and 84.4. Group II values recorded were 69.32, 79.16, 79.04, 75.72 and 72.64. After 6 weeks the values recorded were 74.04, 82.2, 82.32, 76.08 and 70.6. When Group I and Group II values were compared post exercise for p values, the values were found to be significant in all parameters except FVC. Benefits of isotonic exercises depended on the type of exercise and duration of exercise; in the present study it appeared that there is a moderate benefit of isotonic exercise on pulmonary function tests after 6 weeks duration of training in a normal healthy adult male.
Keywords: Isotonic Exercises, Pulmonary Function Tests [PFT].

INTRODUCTION

Exercises are of different kinds and depending on the duration and types exercises effect various body systems in variable manner.

There is general agreement regarding the positive effects of exercises on physiological parameters. There are basically four different types of muscle contractions Isotonic, Isometric, Isokinetic, and Eccentric. All lifting exercises require isotonic contractions. This happens when the muscle shortens as it contracts. As an example of isotonic contractions can be seen when we flex the bicep muscle. Isotonic contractions are the most common contraction during daily activities. In isometric exercise as the muscle contracts against a load which is either fixed or made immovable. [1] Isotonic exercises are considered more near the physiological processes of the body. Although isotonic is the term used to describe fixed resistance variable speed exercise they are sometimes referred as iso-inertial in the more accurate description of this type of movement. [2] Pulmonary Function Tests [PFTs] are considered as reflections of the adaptations of physiological functions to exercise. We in the present study tried to evaluate the effect of isotonic exercises on the pulmonary function tests of young healthy subjects.

MATERIALS AND METHODS

This was a prospective cross-sectional study conducted in the Department of Physiology, Rajiv Gandhi Institute of Medical Sciences [RIMS] and Adilabad. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from each participant after clearly explaining the purpose of the study and method of the study. A total of 50 adult male subjects were included in the study. The subjects were healthy medical Students age group 18-25 years and they did not undergo any training exercises previously for isotonic exercises. Those with any history of chronic illnesses and respiratory disorders were excluded from the study. They were randomly assigned in to two equal groups of 25 each. Group (I) Test group consisted of 25 males given training for 30 minutes in isotonic exercises for 6 weeks under a trained instructor. The isotonic exercises were performed in the morning 7:00 AM to 7:40 AM beginning with warm-up exercises for 10 minutes followed by isotonic exercises including Jogging, Bench press, Chest Press with dumbbells and barbells

for 20 minutes and followed by stretching exercise and relaxing for 10 minutes total duration of 40 minutes. Group (II) acted as controls they performed their routine activities and they were advised not to deviate from routine activities until the end of this study.

Pulmonary function Tests were checked in the study using standardized medspiror equipment. Pulmonary Function Tests were measured with medspiror [RMS, Chandigarh India]. The parameters assessed for lung functions included FVC%, FEV_1, FEF 25-75%, PEFR and MVV. Only two maneuvers are required to accumulate all the test data FVC and MVV. For recording FVC on medspiror the subject was made comfortable in a chair, the nose clip was attached and a clean mouthpiece was placed in the breathing tube. The subject was asked to exhale to his maximum effort before removing the mouth piece. This was repeated at least 3 times and the best effort was taken as the final value. The values of peak expiratory flow rate [PEFR] and Forced Expiratory volume FEV_1 was also obtained at the same time. Similarly the MVV was performed first the subject was asked to breathe normally, the subject was asked to breathe as rapidly and deeply as possible for 10 seconds. The processor in the machine calculates the data and displays the actual maximum voluntary ventilation values. The data was recorded in both the groups prior to undergoing training as well as at the end of 6 weeks of training of group I. The values recorded and put in MS Excel format were analyzed using SPSS version 17 software.

RESULTS

Table-1: values of parameters in Group I (Test group) before and after training

		FVC%	FEV1%	FEF $_{25-75\%}$	PEFR%	MVV%
Group I	Initial	73.52 ± 12.51	87.80 ± 14.57	92.16 ± 33.1	85.0 ± 24.16	78.98 ± 16.62
	Final	78.84 ± 13.41	90.68 ± 16.38	90.44 ± 29.77	88.96 ± 24.37	84.40 ± 17.6
P values		> 0.1	< 0.05*	< 0.05*	> 0.1	< 0.1*

* Significant

Table 1 shows the mean values of parameters recorded in the Group I (Test group) before and after undergoing training for 6 weeks in isotonic exercises. The mean values of FVC% recorded initially was 73.52 ± 12.51, FEV1% was 87.80 ± 14.57, FEF 25-75% was 92.16 ±33.1, PEFR% 85.0 ± 24.16 and MVV% was 78.98 ± 16.62. Their same values recorded after training period were 78.84 ± 13.41, 90.68 ± 16.38, 90.44 ± 29.77, 88.96 ± 24.37 and 84.40 ± 17.6. The values of FEV1%, FEF 25-75% and MVV% were found to be significant.

Table-2: values of parameters in Group II (Control group) before and after training

		FVC%	FEV_1%	FEF $_{25-75\%}$	PEFR%	MVV%
Group II	Initial	69.32 ± 16.3	85.16 ± 9.37	89.04 ± 23.3	81.72 ± 17.4	74.64 ± 20.75
	Final	74.04 ± 17.4	82.2 ± 20.9	82.32 ± 23.9	76.08 ± 19.5	70.6 ± 20.49
		> 0.1	> 0.1	> 0.1	> 0.1	> 0.1

Table 2 shows the mean values of parameters recorded in the Group II (control group) before and after 6 weeks. The mean values of FVC% recorded initially was 69.32 ± 16.3, FEV1% was 85.16 ± 9.37, FEF 25-75% was 89.04 ± 23.3 PEFR% was 81.72 ± 17.4 and MVV% was 74.64 ± 20.75. There same values recorded after training period were 74.04 ± 17.4, 82.2 ± 20.9, 82.32 ± 23.9, 76.08 ± 19.5 and 70.6 ± 20.49. None of the values were found to be significant.

Table-3: comparison of values recorded in both groups before training

		FVC%	FEV_1%	FEF $_{25-75\%}$	PEFR%	MVV%
Group I	(Initial)	73.52 ± 12.51	87.80 ± 14.57	92.16 ± 33.1	85.0 ± 24.16	78.98 ± 16.62
Group II	(Initial)	69.32 ± 16.3	85.16 ± 9.37	89.04 ± 23.3	81.72 ± 17.4	74.64 ± 20.75
P values		> 0.1	> 0.1	> 0.1	> 0.1	> 0.1

Table 3 gives the comparison of values recorded in Group I and Group II before the beginning of the study. When the values were compared using‘t’ test all the values were found to be not significant.

Table-4: comparison of values recorded in both groups after training

		FVC%	FEV_1%	FEF $_{25-75\%}$	PEFR%	MVV%
Group I	(Final)	78.84 ± 13.41	90.68 ± 16.38	90.44 ± 29.77	88.96 ± 24.37	84.40 ± 17.6
Group II	(Final)	74.04 ± 17.4	82.2 ± 20.9	82.32 ± 23.9	76.08 ± 19.5	70.6 ± 20.49
P values		> 0.1	< 0.04*	< 0.05*	< 0.05*	< 0.05*

Comparison of values in Group I and Group II after 6 weeks of exercise training were done The FVC% was not found to be significant. The values of FEV1, FEF 25-75%, PEFR%, and MVV were all found to be significant as seen in the table 4.

DISCUSSION

Moderate physical activity is known to improve physical fitness and to reduce morbidity and mortality from numerous chronic conditions [3]. Spirometric tests are important measures for evaluating respiratory functions. In the present study, we tried to evaluate the effect of isotonic exercises on pulmonary function tests of the young healthy adult male. In the present study, we found that the Forced Vital capacity [FVC] value change was not significant between group I and group II (table 4) after 6 weeks of training exercises. There was the significant change in FEV1%, FEF 25-75%, PEFR% and MVV%. In a study, my Malkia and Impivaara [4] found that physical activity had a good correlation to spirometric values. This is in agreement with the observations of the present study; here we found that there was an improvement in all parameters in the test group. In a cross-sectional study by Y J Cheng *et al*. [5] found that higher physical activity levels had higher levels of FEV1% but there was no difference between FEV1/FVC. In the present study also though FEV1 was found to be significant but FEV1/FVC in both groups did not change significantly the result is in agreement the above study. There are several studies which have been to show the effect of yoga on the pulmonary function tests. A study by Makwana *et al.* [6] have shown normal male volunteers undergoing ten-week course in the practice of yoga have found to improved ventilatory functions in the form of lowered respiratory rate, increased forced vital capacity, FEV1, maximum breathing capacity and breath holding time. While tidal volume and FEV1 did not reveal any significant change. In a study by LKS Cristopher *et al*. [7] studying the effect of exercise on pulmonary function tests in obese patients found that a period of supervised regular exercise improves the pulmonary function of obese patients and this improvement is independent of the amount of weight loss. In the present study, all the participants were within normal range of BMI and there was a significant improvement in the pulmonary functions in the test group. In a study by V Moradinas *et al*. [8] studying the effect of eight week aerobic, resistive and interval exercise routine on respiratory parameters of Non-Athlete women found that interval and aerobic exercise routines could improve pulmonary functions and aerobic and interval training can be used to increase VC, IC, PIF, in non-athlete women. Therefore it appears in the present study and other studies in this area that there are by and large improvements in lung functions after regular exercise training and it is independent of sex as well as body weight. However, the amount of improvement also depended on the type of exercise and interval of training.

CONCLUSION

Benefits of isotonic exercises depended on the type of exercise and duration of exercise; in the present study, it appeared that there is a moderate benefit of isotonic exercise on pulmonary function tests after 6 weeks duration of training in the normal healthy adult male.

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