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EFFECT OF RESPIRATORY PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION ON PULMONARY FUNCTION TEST IN SMOKERS

Physiotherapy

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ABSTRACT

Once smoker quits smoking, they need to undergo a proper exercise program to restore their pulmonary function and the results of which have already been proven. Respiratory PNF has been seen to have positive effects on PFT in normal population as well as in patient population in terms of reducing respiratory rate and heart rate, improving oxygen saturation, diaphragmatic muscle function and facilitation of respiratory muscle. Smokers also have reduced PFT values but there is no research available which shows the relation between smokers and respiratory PNF. Therefore this particular research was undertaken to see if respiratory PNF has any positive effect on smokers in terms of pulmonary function values. The study design was pre-test post-test experimental study design. To see the effect of respiratory proprioceptive neuromuscular facilitation on PFT in smokers, 30 male smokers in the age group 25-35 were considered. Measurement of baseline parameters of PFT were compared with post test PFT values at the end of study. Intergroup comparison of pre and post PFT parameters shows significant changes ($p<0.05$) for the following parameters; TV(Tidal Volume), IRV(Inspiratory Reserve Volume), ERV(Expirator Reserve Volume), %FVC(Forced vital capacity) for the experimental group. The results of the study have shown that when the experimental group is compared with the control group, significant improvement is seen in TV, IRV and FVC% ,since majority of parameters shows improvement therefore, Experimental Hypothesis stands accepted for TV, IRV, and FVC % though ERV, FEV1 and FVC did not show any significant changes.

KEYWORDS

Smokers, PFT, PNF, TV, IRV, ERV, FVC.

India is a diverse country, with marked regional variation in lifestyles where smoking has become a part of the schedule of a vast population with about 120 million smokers in the country. In India, it has been estimated that nearly 50% of men are dependent on some form of tobacco use with beedi and cigarette smoking being the major types (Prabhat Jha et al., 2008). According to National Family Health Survey-3 conducted in 2005-06, prevalence of smoking in women and men aged 15-49 years who smoked cigarette or beedi in India was 1.4 and 32.7% respectively. Prevalence of cigarette smoking in different states was variable with a low of 14% of men in Goa to a high of 74% in Mizoram(S Ramesh Kumar et al., 2009).

Of the estimated 1.1 billion smokers worldwide, about 182 million(16.6%) are in India and by 2020 it is predicted that tobacco will account for 13% of all deaths. In the year 2000, an estimated 1.62 million cardiovascular deaths in the world, 11% of total global cardiovascular deaths, were due to smoking. Of these, 1.17 million deaths were among men and 450 000 among women. There were 670 000 smoking-attributable cardiovascular deaths in the developing world and 960 000 in industrialized regions. Ischemic heart disease accounted for 54% of smoking-attributable cardiovascular mortality, followed by cerebrovascular disease (25%) (John R et al., 2009).

Cigarette smoking is one of the major risk factor for a number of chronic diseases, including cancer, lung diseases and cardiovascular diseases and is the single most important cause of morbidity and mortality in industrialised countries (Reinskje Talhoiut et al.,2011). Smoking Index is defined as the product of average number of cigarettes/beedi smoked per day and the total duration of smoking in year. Classification of smokers based on smoking index-

Light smokers SI = (<100)
Moderate smokers SI = (101-300)
Heavy smokers SI = (>300)

Lifetime smoking exposure is quantified in 'pack years' which is 20 cigarette smoked /day for one year. The parameter similar to pack year is smoking index which is used to express cumulative smoking exposure quantitatively and it is more suitable to Indian subjects (John A,2004).

Pulmonary function tests are useful in assessing the functional status of the respiratory system, it is the primary method used to diagnose, stage and monitor various pulmonary diseases. Pulmonary function signifies assessment of functional capacity objectively (S. Ramesh Kumar et al., 2009).

Respiratory P.N.F is the use of selective external proprioceptive and tactile stimuli that produce reflexive movement response in the ventilatory apparatus to assist respiration (Ezzati M et al., 2003).

Once smoker quits smoking, they need to undergo a proper exercise program to restore their pulmonary function and the results of which have already been proven. Respiratory PNF has been seen to have positive effects on PFT in normal population as well as in patient population in terms of reducing respiratory rate and heart rate, improving oxygen saturation and diaphragmatic muscle function, facilitation of respiratory muscles. Smokers also have reduced PFT values but there is no research available which shows the relation between smokers and respiratory PNF. Therefore this particular research was undertaken to see if respiratory PNF has any positive effect on smokers in terms of pulmonary function values.

METHODS

The method of sampling was randomized sample of convenience. There were 30 subjects taken for the study. On the basis of inclusion and exclusion criteria they have been divided into two groups (Experimental group n=15, control group n=15). The inclusive and exclusive criteria are listed below

INCLUSION CRITERIA:

1) Males: Age 25-35 years
2) Light to moderate smokers who have quit smoking within a span of past 1 year
3) BMI range:18.5 kg/mt.sq. - 24.9 kg/mt.sq.

EXCLUSION CRITERIA:

1) Subjects with particular history of heart and lung diseases.
2) Congenital deformation of chest.
3) Subjects undergoing physical training to improve pulmonary function.
4) Athletic population or individual involved in any sports activity.
5) Any recent surgery of mouth, throat, abdomen and thorax less than 6 months
6) Any recent history of major bone fracture of the limbs and thorax less than 6 months
7) Upper and lower respiratory tract infections.

Before the commencement of the study, each subject included was given information about the study and after attaining their interest, a written consent was signed from every participant. The protocols and

research methodology and sample collection were approved by the department of physiotherapy, department of physiology and ethical committee Jamia hamdard university, New Delhi.

The source of the study was in and around the population of jamia hamdard campus and was performed in rehabilitation center and physiology department, jamia hamdard university, New Delhi.

Subjects were scheduled for 20-30 minutes of physical therapy sessions over 4 weeks (5 days a week). The Subjects of experimental group were given Respiratory PNF along with breathing exercises and for the control group, only breathing exercises were performed. Pulmonary function test has been used as an Outcome measure and the intervention scores were documented as pre test at the time of initial evaluation and post test values after 4 weeks of interventions.

DATA ANALYSIS

The data was analysed using SPSS(Statistical package for social sciences for windows) software,version 17.To see the effect of Respiratory Proprioceptive Neuromuscular Facilitation on Pulmonary Function Test in Smokers, paired t test and independent t test was done.

RESULTS

Comparison was done of PFT parameters within the Experimental Group in which mean of pre-test and post-test parameters of PFT values were compared for experimental group. Within the group, analysis of PFT parameteres was conducted using paired t test, with level of significance ($p < 0.05$). The comparision of baseline measures for PFT parameters of pre and post units was found to be statistically significant for TV ($p=0.009$),IRV ($p=0.001$),ERV ($p=0.017$) and %FVC ($p=0.016$) in experimental group.The results of the study have shown that when the Mean of pre-test and post-test parameters of PFT values were compared, significant improvement is seen in TV, IRV and FVC% ,since majority of parameters shows improvement therefore, Experimental Hypothesis stands accepted for TV, IRV, and FVC % .

DISCUSSION

Pulmonary function tests are useful in assessing the functional status of the respiratory system, it is the primary method used to diagnose, stage and monitor various pulmonary diseases. Pulmonary function signifies assessment of functional capacity objectively.

Due to the structural changes in the tracheo bronchial tree due to smoking , there is decrease in the normal values of pulmonary function in the smokers which can be measured by pulmonary function test.

Once smoker quits smoking, they need to undergo a proper exercise program to restore their pulmonary function and the results of which have already been proven. Respiratory PNF has been seen to have positive effects on PFT in normal population as well as in patient population in terms of reducing respiratory rate and heart rate, improving oxygen saturation, diaphragmatic muscle function and facilitation of respiratory muscles. Smokers have reduced PFT values but there is no research available which shows the relation between smokers and respiratory PNF.

Therefore this particular research was undertaken to see if respiratory PNF has any positive effect on smokers in terms of pulmonary function values.

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The possible mechanism behind this probable result can be the proprioceptive information arising from respiratory muscles may regulate the motor activity through long loop reflexes that include the medullary respiratory centres. Proprioceptive information through segmental and intersegmental loops at the spinal level may also influence the motor activity. Afferent information from the lower intercostals and the abdominal muscles(T9-T10) may facilitate phrenic motoneurons by spinal reflex, and the thoracic respiratory neurons seem to receive respiratory drive mainly via a network of thoracic interneurons The stretch reflex comes into play whenever we try to stretch a muscle ,it contracts reflexly because the stretching of muscle causes stretching muscle spindle which gets stimulated and start discharging sensory impulses.the impulses are then transmitted via primary and secondary nerve fibers to spinal cord and end directly on alpha motor neurons, which by receiving impulse from sensory nerve fiber,send motor impulses to muscles through their fibers and cause contraction of extrafusal fibers.

The Intercoastal stretch and the Anterior strech basal lift represent the reflexive activation of the diaphragm by the intercostals affarents that innervate its margin.

Study conducted by Payal gupta ,Gopal Nambi et al. titled- Effect of Intercostal Stretch Technique and Anterior Basal Lift Technique on Respiratory Rate, Saturation of Peripheral Oxygen and Heart Rate among ICU Patients in 2014 concluded that IC stretch is more effective in reduction of respiratory rate and heart rate and improving oxygen saturation over anterior basal lift technique, because IC stretch enhances the chest wall elevation and increase chest expansion and diaphragm excursion to improve intrathoracic lung volume which contributes to improvement in flow rate percentage. Anterior basal lift is another respiratory PNF technique which helps in improving respiratory muscle activity and thereby improves intra-thoracic lung volume which contributes to improvement in flow rate percentage. The results of our study was in accordance with the results of the study -The Effects on the Pulmonary Function of Normal Adults Proprioceptive Neuromuscular Facilitation Respiration Pattern Exercise conducted by Kyo Chul Seo,Misuk Cho in 2014 in which they took twenty eight normal adults in their 20s.Over the course of four weeks, the experimental group participated in PNF respiration pattern exercises for 30 minutes three times per week. Subjects were assessed pre-test and post-test by measurement of pulmonary function (tidal volume, inspiratory reserve volume, expiratory reserve volume, inspiratory capacity, and vital capacity). Result showed that the experimental group had significant improvements in expiratory reserve volume and vital capacity. In the comparison of the two groups, the experimental group had higher pulmonary function than the control. The mechanism described was repetitive PNF breathing exercises, the mobility of the subjects' chest walls increased, which led to improvements in pulmonary function. The large increases in vital capacity are attributable to the fact that when the subject was breathing in, the therapist promoted the activities of the diaphragm and other assisant inspiratory muscles. This was done first with an increase of intra-abdominal pressure through the resistive inspiration movement caused by pushing both sides of the subject's chest walls toward the head to cause spiral movements. When the subject was breathing out, the mobility of the chest walls was increased as much as possible to induce maximum lung ventilation by giving assistive movements with medial gathering of the lower chest walls (Yu Shi et al., 2010).

Although there is no research in which, study has been done for %FVC but the possible mechanism for increment in %FVC may be increase in FEV1 value in relation to FVC of individual person .

There is no significant difference found between the baseline and the post experimental values of any of the PFT parameters for control group

Limitations -Heterogeneous group of smokers were chosen, the cohort was a combination of beedi and cigarette smokers. Both types of smokers were included mild and moderate, no specific type was chosen. Moreover the sample size was small. For the present study female smokers were not approached. It can't be generalized to the whole population of smokers.

CONCLUSION AND FUTURE RESEARCH

The results of the study have shown that when the experimental group is compared with the control group, significant improvement is seen in TV, IRV and FVC% ,since majority of parameters shows improvement therefore, Experimental Hypothesis stands accepted for TV, IRV, and FVC % though ERV, FEV1 and FVC did not show any significant changes. Prospective study with larger and homogeneous sample population can be conducted. Moreover similar study could be conducted in females to evaluate the gender difference. Regional differences among smokers can be studied. For example, North Indian population could be studied by taking equal percentage of smokers from all the states of north India. Different types of smoking groups can be taken for future research.

Appendix A

Comparison of PFT parameters within the Experimental Group

TABLE 1.1 Paired sample t-test to compare the pulmonary function test values(Experimental Group)

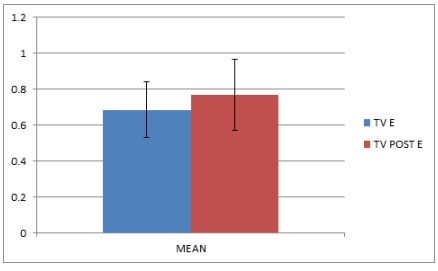
	MEANS.D	t-value	Sig.(2-tailed)
TV Pre Post	 0.69±0.157 0.77±0.198	-3.021	.009
IRV Pre post	 1.46±0.455 1.72±0.393	-4.401	.001
ERV Pre post	0.27±0.254 0.42±0.249	-2.716	.017
FVC Pre post	2.11±0.463 2.27±0.442	-1.369	.193
FEV1 Pre post	 1.77±0.416 1.97±0.420	-1.791	.095
%FVC Pre post	 83.93±3.173 86.33±3.754	-2.753	.016

Appendix B

GRAPH 1.1 Comparision between TV before and after applying respiratory PNF

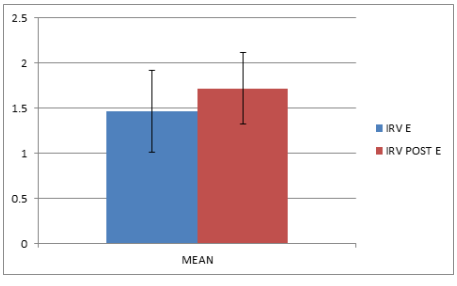
FOR EXPERIMENTAL GROUP

Xaxis- subject group
Yaxis-mean TV in ml



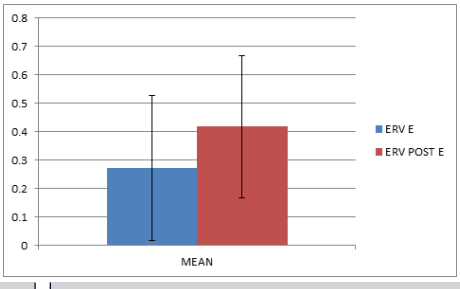
GRAPH 1.2 Comparision between IRV before and after applying respiratory PNF

Xaxis- subject group
Yaxis-mean IRV in ml



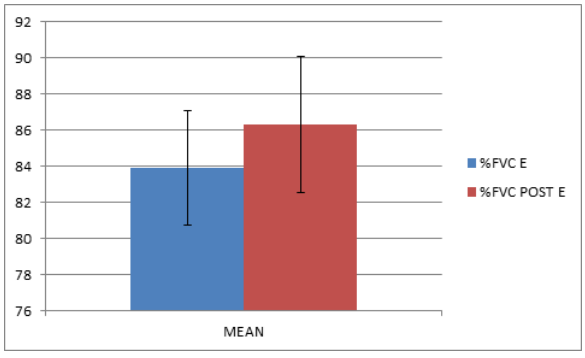
GRAPH 1.3 Comparision between ERV before and after applying respiratory PNF

Xaxis- subject group
Yaxis- mean ERV in ml.



GRAPH 1.4 Comparison between %FVC before and after applying respiratory PNF

Xaxis- subject group
Yaxis-mean FVC in %



REFERENCES

1. Majid Ezzati, Lopez A D Lopez.(2003). Estimates of global morbidity attributable to smoking The Lancet, 362 (9387), 847- 852.
2. Jindal S. K., Malik S.K.(1988). Smoking Index- A measure to quantify cumulative smoking exposure. Lung India, (4),195-196.
3. John R, Sung H, Max W.(2009).Economic cost of tobacco use in India. Tab control, (18),138-143.
4. Prabhat Jha, Binu Jacob.(2008).A nationally representative case control study of smoking and death in India. N Eng J Med, 358 (11),1137-1147.
5. Reinskje Talhoiut, Thomas Schulz. .(2011). Hazardious compounds in tobacco smoke. Int. J. Environ. Res. Public Health, 8(2), 613-628.
6. Ramesh Kumar, Soumya Swaminathan,Timothy Flanigan, KH Mayer, Raymond Niaura.(2009). HIV and smoking in india. Indian J Med Res India, (130),15-22.
7. Yu Shi, Toby N. Weingarten, Carlos B Mantilla, W Michael Hooten, David O Warner. Smoking and Pain Pathophysiology and Clinical Implications.(2010) The Journal of American Society of Anesthesiologists, 113(4),977–992.