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QUANTIFY THERAPEUTIC EFFICACY OF BUTEYKO BREATHING TECHNIQUE ON PULMONARY FUNCTIONS IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE ATHLETES

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ABSTRACT

The Buteyko concept is a system of breathing exercises originally devised in the 1950s by Professor Konstantin Buteyko, a Russian physician and academician. COPD is characterized by symptoms of breathlessness, wheeze, cough, sputum production and exercise intolerance. Breathlessness is principally an outcome of poor oxygen exchange. The aim of the study is to identify the efficacy of BBT in management of chronic obstructive pulmonary disease (COPD) athletes. According to American Thoracic Society Guideline for COPD diagnosis, COPD athletes in the age group 25-40years were recruited for the study. COPD athletes referred by pulmonologist were initially assessed those who met inclusion and exclusion criteria where considered for this study.. Prior to data obtained, the participation of the athletes is oriented to the study and informed consent taken through written consent form. Instructions on how to perform the spirometer test was demonstrated to the athletes. FVC, FEV_1, respiratory rate and heart rate were evaluated.. After three weeks of regular daily exercise session final readings were taken.The Resultof the data obtained were analyzed by using paired t-test to find out the difference in pre and post spirometric evaluation for FVC and FEV_1 along with heart rate and respiratory rate. Pre and post comparison shows $p<0.05$ means there is significant improvement in respiratory rate and heart rate.The present study which concluded that the Buteyko breathing exercise which is highly significant efficacy for the management of COPD among the athletes.

KEYWORDS: *Chronic Obstructive Pulmonary Disease, Heart Rate, Respiratory Rate, Forced Vital Capacity, Low forced expiratory volume in 1 second, Buteyko Breathing Technique, Spirometer*

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is characterized by airflow obstruction with breathing-related symptoms such as chronic cough, exertion dyspnea, expectoration, and wheeze. These symptoms may occur in conjunction with airway hyper responsiveness and may be partially reversible. Although COPD is a nonspecific term referring to a set of conditions that develop progressively as a result of a number of different disease processes, it most commonly refers to chronic bronchitis and emphysema and a subset ofathletes with asthma. These conditions can be present with or without significant physical impairment. Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease which characterized by airflow limitation. The airflow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking. Although COPD affects the lungs, it also produces significant systemic consequences.

GOLD Criteria for COPD

Several different definitions have existed for COPD. The recently published and widely accepted definition from GOLD defines COPD as "a disease state characterized by airflowlimitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases. Airflow limitations is the slowing of expiratory airflow as measured by spirometry, with a persistently low forced expiratory volume in 1 second (FEV_1) and a low FEV_1/forced vital capacity (FVC) ratio despite treatment[1]. The GOLD definition for airflow limitation is an FEV_1/FVC ratio of less than 70%.

The Indian Scenario of COPD

The Journal of the Association of Physicians of India 2004, reports that 65 Million. Indians suffer from various chronic respiratory diseases excluding tuberculosis. While current prevalence figures for COPD are not available; in 2001, the Indian Journal of Chest Diseases and Allied Sciences reported that close to 13 million Indians suffered from COPD. About 62 percent of these were men and the remaining women.

Buteyko breathing technique

BBT exercises aim to increase carbon dioxide and reset chemoreceptor thresholds however they may also be useful in reducing hyperinflation.

Need and objectives

Need of the study

Buteyko Breathing has been identified as a potent mechanism for reducing broncho constriction. It is suggestive of that Buteyko may be a more effective pattern of breathing than natural breathing. However there are lack of studies and hence the need arises to measure the efficacy of Buteyko breathing on pulmonary functions in COPD athletes.

Objectives of the study

To quantify and evaluate the pre and post efficacy of Buteyko breathing technique in the management among the athletes with chronic obstructive bronchial disease.

METHODOLOGY

Source of Data

Athletes have COPD Diagnosed and referred by the pulmonologist were recruited for the study with reference to the Physiotherapy Department.

Sample and sampling technique

Fifty COPD athletes were selected using purposive sampling technique

Instrumentation

The following instruments have been used for the study

1. Spirometer
2. Weighing machine
3. Wrist watch
4. Tissue paper

Inclusion criteria

Informed consent

1. Age group 25-40 years affected athletes.
2. Clinical diagnosis of COPD confirmed by smoking history, physical examination and PFT affected athletes.
3. Showing irreversible airflow limitation affected athletes.
4. Medically stable COPD (No history of acute exacerbation for past 6 months) affected athletes.
5. Both genders of athletes were included with symptoms of COPD affected athletes.

Exclusion criteria

1. Musculoskeletal problems limiting mobility affected athletes.
2. Rapid intensifying or unstable Angina affected athletes.
3. Any alteration in the intake of medication affected athletes.
4. Intermittent Claudication affected athletes.
5. Neurological problems limiting cognition/mobility affected athletes.
6. Resting O2 saturation <90 % with room air breathing affected athletes.
7. Athletes with viral infection.
8. Athletes with heart disease, migraine headaches, and panic attacks.

Collective data has been analyzed by paired "t. The research was conducted after taking permission from Ethical Clearance of competent authority of administration. All the athletes gave their informed consent prior to their inclusion in the study.

Method of collection of data

According to American Thoracic Society (ATS) Guideline for COPD diagnosis, COPD athletes in the age group 25-40years were recruited for the study. Diagnosed COPD athlete sreferred by the physician or pulmonologist were initially assessed in the Physiotherapy Department for inclusion and exclusion criteria. The COPDathletes were diagnosed as per the GOLD criteria. Prior to participation athletes are oriented to the study and informed consent was taken in a written consent form. Instructions on how to perform the spirometer test was demonstrated to the athletes.

Spirometry Instructions

The athletes were either seated or standing. Athletes were made comfortable and were asked toloosen all restricting clothing. The readings for each athlete were taken in a relatively no stressful environment. The nose clip was applied with a tissue and another tissue was handed to the athletes for use while removing the mouthpiece. Athletes were asked to gently press the nose clip to test for leaks. The athletes was then handed the measuring device and asked to place the mouthpiece in the mouth, chin slightly elevated, the neck stretched and athletes was allowed to get accustomedto breathing into the apparatus.When the athletes reached the end of a normal expiration, he was instructed to take a deep slow breath without any pause and then instructed to blow as hard as possible. During blowing, athletes were encouraged to blow as long as possible for 6 seconds or more. The FVC and FEV1 values were recorded. Athletes were then asked to remove the mouthpiece, using the tissue to collect any saliva. The nose clip was also removed. "Buteyko breathing exercise" procedure which subdivides in 3 main phases:-

Phase I - Pre exercise Phase (5-6mins)

Athletes were advised to have an empty stomach, and sit in a chair in comfortable position with spine erect.

Step 1

Athletes were asked to nod head backwards and forwards slowly and coordinate the nodding movement with breathing. Breathe in smoothly, gently and as quietly as possible as head goes back and out as head comes forwards.

Step 2

Pulse was measured with resting two fingers about one centimeter below the wrist - in line with the thumb-side of the hand.

Phase II - Exercise Phase (20-22mins)

Step 1

To measure Control Pause - Athletes was asked to take in a normal sized breath in and out through nose. Nose is held gently. Stopwatch was used to keep track of time until athletes felt the first onset of a feeling of lack of air. Nose was released, breathing in gently through nose and stopping the stopwatch. Time of Control Pause was noted.

Step 2

Control pause was followed by relaxed breathing and this was continued for 3mins followed by short rest duration of 30 sec.

Step 3

Same as above was repeated four times followed by a long rest duration of 2mins.

Phase III Post exercise Phase (5-6mins)

Step 1

Post exercise control pause (final control pause) was measured.

Step 2

Post exercise pulse was measured.

In weeks 3, a further stage of Reduced Breathing was used called "Very Reduced Breathing".It included practicing reduced Breathing with hands on upper and lower chest and allowingathletes to breath to reduce to less than normal volume settle into this pattern.Post exercise values were measured after completion of 3 weeks. The data obtained beforeand after the intervention were analyzed by paired t test.

RESULTS

Based on age, subject were divided into three groups: Group (1) 25-30 year, Group (2)31-35year, Group (3)36-40 years

Table 1

Age- wise distribution of subjects in three age group

Age	No.of Athletes
25-30	14
31-35	14
36-40	22

Table 1

Shows age wise distribution of subjects in three age groups. A total of 50 athletes among the 25 males and 25 females were included in the present study. The number of subjects in the group of 25- 30years of age were 14(28%), age group 31-35 years of age were 14(28%), the number ofsubject in the group of 36 to 40 years of age 22 (44%).

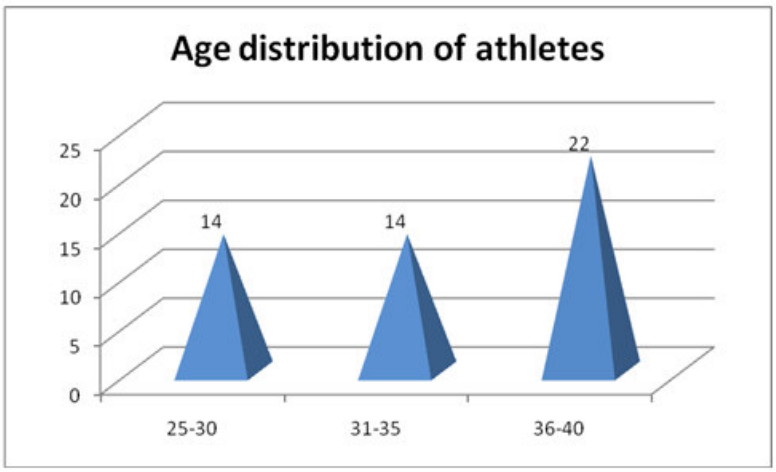

Figure 1
Age wise distribution among the three age group

Table 2
Pre and post comparison between mean and SD value of Heart Rate, Respiratory Rate, Forced Vital Capacity, Low forced expiratory volume in 1 second

	Pre		Post	
	Mean	**SD**	**Mean**	**SD**
HR	87.19	9.5426	81.02	9.3579
RR	21.6	3.1558	15.28	2.4993
FVC	64.12	10.9575	65.08	10.5633
FEV_1	42.34	6.9093	43.22	6.8431

This table 2 shows the pre and post comparison between mean and standard deviation values ofHeart rate, Respiratory rate, Force vital capacity, Force expiratory volume in one seconds. The sample size was taken as 50 (N=50). In heart rate average pre reading was (mean) 87.19± (standard deviation) 9.5426 and post reading was (mean) 81.02± standard deviation 9.3579. In respiratory rate pre reading was (mean) 21.6± (standard deviation) 3.1558 and post reading was(mean) 15.28± (standard deviation) 2.4993. In FVC average pre reading was (mean) 64.12± (standard deviation) 10.9575 and post reading was (mean) 65.08± standard deviation10.5633. In FEV_1 average pre reading was (mean) 42.34± standard deviation6.9093 and post reading was (mean) 43.22± standard deviation 6.8431.

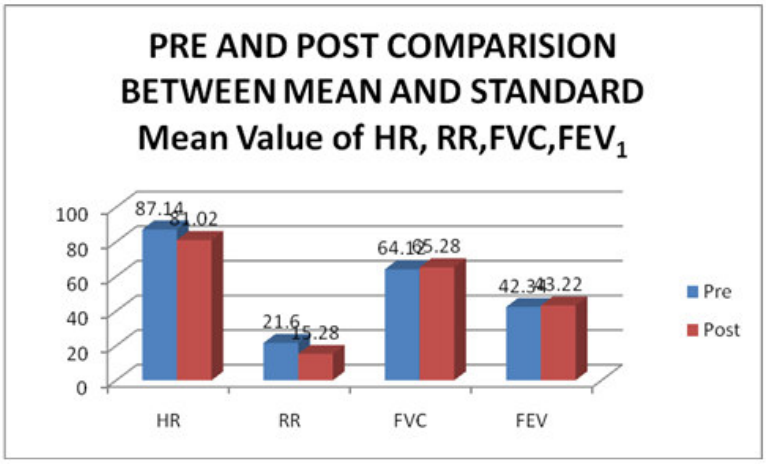

Figure 2
Pre and post comparison between mean and SD value of Heart Rate, Respiratory Rate, Forced Vital Capacity, Low forced expiratory volume in 1 second

Table 3
Average difference in Heart Rate, Respiratory Rate, Forced Vital Capacity, Low forced expiratory volume in 1 second

	Average	T value	P Value	Result
HR	6.17	3.1960	0.000943	P<0.05sig
RR	6.32	11.0846	0.0000	P<0.05sig
FVC	0.96	-0.4396	0.332403	p>0.05 non sig
FEV_1	0.88	-0.61113	0.271278	p>0.05 non sig

This table 3 shows that the HR and RR score obtained 6.17,6.32(P<0.05) significant results. But forced vital capacity and Low forced expiratory volume score 0.96,0.88 (p>0.05) which was shows not significantly.

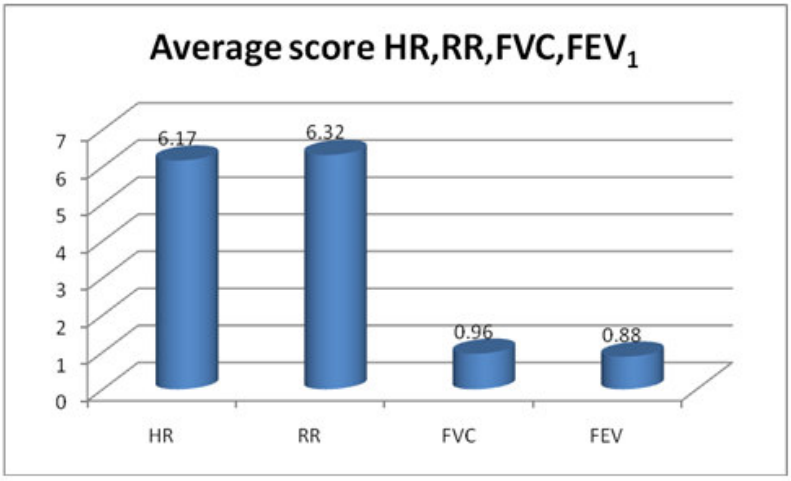

Figure 3
Average improvement in Heart Rate, Respiratory Rate, Forced Vital Capacity, Low forced expiratory volume in 1 second

This diagram shows the average difference in heart rate, respiratory rate, FVC, FEV_1. Pre and post comparison was done with the help of paired t-test. Pre and post comparison of heart rate and respiratory rate shows p<0.05 means there is significant improvement after treatment. The average improvement in heart rate was 6.17 and in respiratory rate 6.32. Pre and post comparison of FVC and FEV_1 shows p>0.05 means there is no significant improvement after treatment. The average value of FVC was0.96 and FEV_1 was 0.88.

DISCUSSION

The present study was conducted on COPD athleteswith Subjects have been taken from purposive sampling. Among eighty (80) athletes who participated in the study were males and females suffering from COPD. GOLD staging system classifications was then used to describe the severity of the obstruction or airflow limitation of all athletes. Athletes of age range 40 to 60 years with mild COPD (FEV_1≥ 80% normal) to moderate COPD (FEV_1 50-79% normal)(FEV1 \ FVC <0.70) were included for the study.Most of the subjects had COPD symptom for more than a year. Diagnosed COPD athletes referred by the physician or pulmonologist were initially assessed in the Physiotherapy Department for inclusion and exclusion criteria. We used a sample size of fifty COPD athletes. Subjects were taken from purposive sampling. The type of study done was quasi experimental and collective data was analyzed with paired 't' test. There was three incident where athletes had flu and throat infection hence were considered as dropout. All the subjects were regularly checked for any droplet infection. All the subjects underwent spirometric evaluation for FVC, FEV_1 along with Resting heart rate and blood pressure reading in supine position. Subjects were demonstrated the steps and technique of Buteyko breathing exercise. Buteyko method is a series of reduced-breathing exercises that focus on nasal-breathing, breath-holding and relaxation. The Buteyko method is based on the concept that hyperventilation is the underlying cause of numerous medical conditions, including asthma. It is known that hyperventilation can lead to low carbon dioxide levels in the blood (hypocapnea), which can subsequently lead to disturbances of the acid-base balance in the blood and lower tissue oxygen levels. Advocates of this method believe that the efficacy of chronic hyperventilation has efficacy which include bronchospasm, disturbance of cell energy production via the Krebs cycle, as well as disturbance of numerous vital homeostatic chemical reactions in the body.[2] The Buteyko method is a purported method of "retraining" the body's breathing pattern to correct for the presumed chronic hyperventilation and hypocapnea, and thereby treat or cure the body of these medical problems. Buteyko has been found to be effective in management of Asthma[3]. The quality of evidence of the Buteyko Method according to an Australian Department of Health report is stronger than any other complementary medicine treatment of asthma.[4]There are now new definitions for both asthma and COPD that acknowledge the overlap

and highlight the similarities and differences between them. Asthma and COPD have important similarities and differences[5] Both are chronic inflammatory diseases that involve the small airways and cause airflow limitation[69] both result from gene environment interactions and both are usually characterised by mucus and bronchoconstriction. In our study daily Buteyko breathing exercise session of 35 to 40 mins was given to athletes. Progression of the exercise was made as per the exercise manual of Buteyko Institute of Breathing & Health. A considerable improvement in controlling respiratory rate and heart rate as seen by the end of each session was mainly because of relaxation given by the exercise itself and added on intervals of relaxed breathing. Similar technique as done on few volunteer non COPD males and females also showed a reasonable decrease in respiratory rate after the session. Not much effect was seen in FVC and FEV_1 pre and post intervention readings. An alternative study design would be to see the effect of same breathing technique for a longer duration of course. Duration of three week has been sufficient to get considerable effect on heart rate and respiratory rate but not FVC and FEV_1values.

CONCLUSION

The present study which notion that

1) There was significant efficacy t in Heart rate reading after post Buteyko breathing exercise for the duration of three weeks in athletes with COPD.
2) There was significant efficacy in reading after the Respiratory rate post Buteyko breathing exercise for three weeks in athletes with COPD.
3) There was no significant improvement in FVC after the post Buteyko breathing exercise for three weeks duration among the athletes with COPD.
4) There was no significant improvement in FEV1 after the post Buteyko breathing exercise for three weeks in athletes with COPD.
5) The overall significant effects Buteyko breathing exercise which augments to produces good health and wellbeing and sports performance enhancement among the athletes.

Limitation of the study

We could not ascertain as to, in which stage of COPD, pursed lip breathing would be more efficacy during exercise. The efforts made during exercise were subjective and hence the amount of efforts made could not be quantized and related to resultant improvement. Similarly the accuracy to which spiromertic instruction were followed were also subjective. Buteyko breathing exercise was performed as a group activity which made it prone to spread of droplet infections but mask to prevent spread of infections could not be given as it would have deviated us from following the procedure.

Summary

COPD is characterized by symptoms of breathlessness, wheeze, cough, sputum production and exercise intolerance. A variety of techniques have been used to address limitation in breathing and severe dyspnoea. One such technique is Buteyko breathing technique. In this study we have tried to find out the effect of buteyko breathing technique in management of COPD. The current study was carried out on fifty COPD athletes who underwent a three week course of Buteyko breathing technique for 35-40 minutes daily. Respiratory rate, heart rate, forced vital capacity and Forced expiratory volume in one second were measured before and after the course. There was a significant difference in heart rate and respiratory rate values while there was not much improvement seen in forced vital capacity and Forced expiratory volume in one second. It was concluded that Buteyko breathing technique improves can be taken into consideration in the management of athletes with COPD.

CONFLICT OF INTEREST

Conflict of interest declared none.

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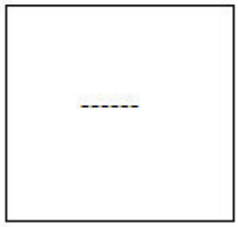

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