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Original Research Article

A Study on Immediate Effect of Buteyko Breathing Technique during Submaximal Exercise on Cardio-Respiratory Parameters in Young Adults

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ABSTRACT

Background: The Buteyko breathing technique, or Buteyko method, is a physical therapy that is used mainly in the management of respiratory conditions. The therapy involves instructing patients in controlled shallow breathing through the nose only, with breath-holding at the end of the exhalation and resuming normal breathing calmly and gently.
Aim: To Study the immediate effect of Buteyko breathing technique during sub-maximal exercise, on cardio-respiratory parameters in young Adults
Methodology: 80 subjects recruited for the study were explained the entire procedure and subjects were taught how to perform Buteyko Breathing Technique (BBT). Baseline HR, BP, RPE and PFT were noted as pre-test evaluation and then they were subjected to brisk walking on treadmill with and without BBT randomly. Post-Sub maximal exercise evaluation was done for outcome measures like HR, RPE, BP and PFT (PEFR, FEV1 and FEF (25-75) after both the instances.
Results: On comparing the results of instances sub maximal exercise on treadmill with and without BBT, significant change in RPE was found in both Males and Females.
Conclusion: Buteyko Breathing technique used during sub-maximal exercise does not have any significant immediate effect on cardio-respiratory parameters in young adults

Keywords: Buteyko breathing technique, Sub-maximal exercise, Sedentary

INTRODUCTION

The Buteyko Breathing Technique is one of many health promoting breathing techniques which originated from Russia. The method is named after its originator, Dr. Konstantin Pavlovich Buteyko, who claimed that his program of breathing retraining could cure a large number of the chronic ailments affecting modern society. The postulated reasons were change in symptom perception and improved sense of control, improved biomechanics of breathing, beneficial effects of low-volume breathing, altered nitric oxide levels, and resetting of respiratory rhythm generation by breath-holding techniques. [1]

The calmer and quieter one breathes, the more the blood vessels and airways open. It has been postulated that if ones breathing volume increases faster than the metabolic production of CO_2, as observed during exercise, the airways will constrict and may lead to breathing dysfunction. [2] Thus, the aim of the study was to evaluate the immediate effect of Buteyko Breathing Technique during sub-maximal exercise on

cardio-respiratory parameters in young Adults

METHODOLOGY

This was an Interventional Study with a sample size of 80 subjects of the age group 18-30 years, both sexes, from a reputed institute, New Delhi.

The subjects who consented to participate, with Normal BMI, Sedentary lifestyle and who understand written and verbal English language were included whereas those with any history of medical, surgical, musculoskeletal or systematic condition which can affect the outcome of the study, with negative comment on PARQ, smokers and alcoholic and on regular medications were excluded. [3]
Instruments used were: Motorized treadmill, [4] Stop watch, Aneroid BP Apparatus, An RPE worksheet, Pulse oximeter and Spirometer.

The subjects were monitored for their Heart Rate (HR)- bpm, Blood Pressure(BP)- mmHg, Rate of Perceived Exertion(RPE)-Scores, Peak Expiratory Flow Rate(PEFR) -L/sec, Forced expiratory volume in one second(FEV_1)-L/sec and Forced Expiratory $Flow_{(25-75)}$-L/sec

Trial and Familiarization session was given and entire procedure was explained. Subject was demonstrated how to perform Buteyko Breathing Technique (BBT) and he was then asked to perform BBT. Baseline HR, BP, RPE and PFT were noted.

After recovery of the subject, consent was taken for further evaluation, to establish the effect of Buteyko Breathing Technique (BBT) as he was made to walk on treadmill with BBT and without BBT randomly. An observed trial session of BBT on treadmill was given and subjects were called with all precautions explained on consecutive day 2 & day 3.

For the instance with BBT, while walking the subject was instructed to exhale and then breathe in, breathe out gently for 2 to 3 times and then hold the breath for the Control Pause period for such 5-20 steps as per his convenience that he may be able to resume calm and gentle breathing and continue to walk and to repeat breath hold as above again after every 30 sec to 1 min of walk, for the 12 min protocol on the treadmill at a speed of 4mph[2.4]. It was taken care that none of the subjects exceeded their target heart rate. The subject was then made to walk without BBT on treadmill on the consecutive day. For subjects who completed the protocol Post-test evaluation was done for outcome measures like HR, HRR, RPE, BP and PFT (PEFR, FEV1 and FEF (25-75) after both the instances on day 2 and day 3.

RESULT

A total of 80 subjects aged 18 to 25 years were recruited for the interventional study, amongst which- 15 (18.8%) were males and 65(81.3%) were females. Other demographic variables are shown in Table 1.The study done by Rai R et al showed that there was a significant decrease in SBP at rest in females and after BBT at rest and $FEF_{(25-75)}$ for females increased significantly post BBT.[3] We studied further the same subjects in the present study for the outcome variables for the instance 'Subject Performing Sub Maximal Exercise on Treadmill without BBT' & 'Subject Performing Sub Maximal Exercise on Treadmill with BBT', for males and females separately, as we saw there was a significant difference at rest between certain cardio respiratory parameters.

For both the instance: 'Subject Performing Sub Maximal Exercise on Treadmill with BBT' and "subject performing sub maximal exercise on treadmill without BBT 'for males and females the mean value of HR, SBP,DBP and RPE increased significantly after exercise on treadmill with $p<0.01$.It has also been found that FEV_1 decreased significantly in females post exercise, with mean difference of 0.03 with $p<0.01$ during the instance without BBT.
Comparing two instances 'Subject Performing Sub Maximal Exercise on

Treadmill without BBT' & 'Subject Performing Sub Maximal Exercise on Treadmill with BBT' for males subjects, on analyzing the cardiac parameters post exercise for both the instances there was no statistically significant change found between the instances (Table 3) similarly in the respiratory parameters no change was found between the two instances (Table 4.) However, in both the instances RPE post exercise has shown to have increased by a mean value of 1.27score in sub maximal exercise with BBT in males with a p value of <0.01(Table 4.)

Comparison of two instances 'Subject Performing Sub Maximal Exercise on Treadmill without BBT' & 'Subject Performing Sub Maximal Exercise on Treadmill with BBT' for female subjects, on studying the cardiac variables for both the instances the pre exercise HR for both the groups was found to be statistically different at baseline, thus the post exercise increase in HR was not comparable statistically between the two instances.(Table 5). On comparing the other cardiac variable between the two instances no statistically significant difference was observed (Table 5). Similarly in the respiratory parameters no change was found between the two instances. However, RPE which has significantly increased in both the instances post exercise, has shown to have increased more by a mean value of 0.88 score in sub maximal exercise with BBT in females with a p value of <0.01(Table 8).

Table 1: Subject Performing Sub Maximal Exercise on Treadmill without BBT: Cardiac Respiratory parameters for Male.

Mean ±SD of Variables	PRE±SD	POST±SD	Difference of mean(Post-Pre)	p VALUE
HR(bpm)	73.20± 5.43	117.06 ± 13.39	43.87	0.000**
SBP(mmHg)	120.67±7.99	131.00± 8.49	10.33	0.000**
DBP(mmHg)	79.33±2.58	85.67±5.62	6.33	0.001**
RPE	0±0	2.13±0.64	2.13	0.000**
PEFR (lit/sec)	5.04±1.86	5.36±1.77	0.33	0.330
$FEF_{(25-75)}$ (lit/sec)	3.78± 0.78	3.79± 0.77	(-0.01)	0.649
FEV_1 (lit/sec)	3.37± 0.65	3.35±0.65	(-0.02)	0.211

(**) = statistical significant

Table 2: Subject Performing Sub Maximal Exercise on Treadmill with BBT: Cardiac Respiratory Parameters for Male.

Mean ±SD of Variables	PRE±SD	POST±SD	Difference of mean(Post-Pre)	p VALUE
HR(bpm)	74.67 ± 2.58	118.27 ± 17.0	43.60	0.000**
SBP(mmHg)	118.0±10.14	131.0±10.38	13	0.000**
DBP(mmHg)	80±6.55	87.3± 5.94	7.33	0.001**
RPE	0± 0	3.40± 1.06	3.40	0.000**
PEFR(lit/sec)	5.31±1.78	5.42 ± 1.90	0.10	0.104
$FEF_{(25-75)}$ (lit/sec)	3.61± 0.91	3.62±0.91	(-0.01)	0.334
FEV_1(lit/sec)	3.23±0.71	3.18±0.66	(-0.05)	0.188

(**) = statistical significant

Mean values ± SD	RPE(Scores)		PEFR(lit/sec)		FEF(lit/sec)		FEV_1(lit/sec)	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
WITH BUTEYKO	0.0	3.40± 1.06	5.31± 1.78	5.42± 1.90	3.61± 0.91	3.62± 0.91	3.23± 0.91	3.18± 0.66
WITHOUT BUTEYKO	0	2.13± 0.64	5.04± 1.86	5.36± 1.77	3.78±0.78	3.79± 0.77	3.37± 0.65	3.35± 0.65
DIFFERENCE	0	1.27	0.27	0.06	(0.17)	(-0.17)	(0.14)	(-0.17)
p-VALUE	-	0.000**	0.691	0.943	0.576	0.586	0.583	0.489

Tables 3: Comparison of Cardiac parameters between the two instances 'Sub Maximal Exercise on Treadmill with BBT' and 'Sub Maximal Exercise on Treadmill without BBT' for Males

(**) = statistical significant

Tables 4: Comparison of Respiratory parameters between the two instances 'Sub Maximal Exercise on Treadmill with BBT' and' Sub Maximal Exercise on Treadmill without BBT' for Males.

Mean Values± SD	HR(bpm)		SBP(mmHg)		DBP(mmHg)	
	PRE	POST	PRE	POST	PRE	POST
WITH BUTEYKO	74.67± 2.58	118.27± 17.06	118.0±10.14	131.0± 10.38	80± 6.55	87.3± 5.94
WITHOUT BUTEYKO	73.20± 5.43	117.06± 13.39	120.67±7.99	131.00± 8.49	79.33± 2.58	85.67± 5.63
DIFFERENCE	1.47	1.21	(-2.67)	0	0.67	1.63
p-VALUE	0.353	0.832	0.430	1.000	0.716	0.437

Table 5: Subject Performing Sub Maximal Exercise on Treadmill without BBT: Cardio-Respiratory parameters for Female.

Mean ± SD of Variables	PRE±SD	POST±SD	Difference of mean(post-pre)	p VALUE
HR(bpm)	72.55 ± 4.26	121.28 ± 11.99	48.72	0.000**
SBP(mmHg)	117.23± 8.57	129.92± 6.99	12.69	0.000**
DBP(mmHg)	79.54± 2.11	87.61± 4.42	8.08	0.000**
RPE	0.0±0	2.09±0.72	2.09	0.000**
PEFR(lit/sec)	3.93± 1.47	3.93± 1.42	0.0	0.944
$FEF_{(25-75)}$ (lit/sec)	3.47±0.84	3.51± 0.78	0.04	0.193
FEV_1(lit/sec)	3.13±0.71	3.10± 0.73	(-0.03)	0.003**

(**) = statistical significant

Table 6: Subject Performing Sub Maximal Exercise on Treadmill with BBT: Cardio-Respiratory parameters for Female.

Mean±SD of Variables	PRE±SD	POST±SD	Difference of mean(post-pre)	p VALUE
HR(bpm)	74.58± 3.84	127.96± 8.19	53.38	0.000**
SBP(mmHg)	114.37± 9.35	128.31± 9.20	14.0	0.000**
DBP(mmHg)	78.46± 5.37	88± 4.57	9.54	0.000**
RPE	0±0	2.97± 0.64	2.97	0.000**
PEFR(lit/sec)	4.01±1.62	3.98±1.58	(-0.03)	0.187
$FEF_{(25-75)}$ (lit/sec)	3.30± 0.81	3.34± 0.77	0.04	0.066
FEV_1(lit/sec)	3.04±0.64	3.03± 0.63	(-0.01)	0.259

(**) = statistical significant

Table 7: Comparison of Cardiac parameters between the two instances 'Sub Maximal Exercise on Treadmill with BBT' and 'Sub Maximal Exercise on Treadmill without BBT' for females

Mean Values ± SD	HR(bpm)		SBP(mmHg)		DBP(mmHg)	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**
WITH BUTEYKO	74.58± 3.84	127.96± 8.19	114.37± 9.35	128.31± 9.20	78.40± 5.37	88± 4.57
WITHOUT BUTEYKO	72.55± 4.26	121.28± 11.99	117.23± 8.57	129.92± 6.99	79.54± 2.11	87.61± 4.42
DIFFERENCE	2.03	6.68	(-2.86)	(-1.61)	(-1.14)	0.39
p-VALUE	0.005**	0.000**	0.065	0.262	0.135	0.627

(**) = statistical significant

Table 8: Comparison of Respiratory parameters between the two instances' Sub Maximal Exercise on Treadmill with BBT' and'Sub Maximal Exercise on Treadmill without BBT' for females

Mean values± SD	RPE(Scores)		PEFR(Lit/sec)		FEF(lit/sec)		FEV_1(lit/sec)	
	PRE	**POST**	**PRE**	**POST**	**PRE**	**POST**	**PRE**	**POST**
WITH BUTEYKO	0	2.97± 0.64	4.01± 1.62	3.98± 1.58	3.30± 0.81	3.34± 0.77	3.04± 0.64	3.03± 0.63
WITHOUT BUTEYKO	0.0	2.09± 0.72	3.93± 1.47	3.93± 1.42	3.47± 0.84	3.51± 0.78	3.13± 0.71	3.10± 0.73
DIFFERENCE	-	0.88	0.08	0.05	(-0.17)	(-0.17)	(-0.09)	(-0.07)
p-VALUE	0	0.000**	0.750	0.849	0.237	0.221	0.426	0.525

DISCUSSION

A. Dhawarkar did a comparative study of Breath holding time (BHT) as index of Central Ventilatory Response in young healthy adults of both sexes & suggested that Progesterone, Estrogens and Testosterone can influence respiratory function in humans. [5] Thus in our studies we analyzed our data for males and females separately

When subject performed five minute Buteyko at rest in our prior study it was seen that HR increased and SBP decreased significantly, which is a normal physiological response [3] It was also seen that RPE increased significantly for both males and females and an increase in FEF_{25-75} was also observed after five minute of BBT at rest, but it was significant only in females. [3] Brutona, G.T. Lewith's study provides the background for BBT, reviews the available evidence for its use and examines the physiological hypothesis claimed to underpin it. Their study results indicated that the mean drop in FEV_1 was similar in those breathing air and those breathing added CO_2. Interestingly, when those breathing CO_2 re- turned to breathing air, they experienced a further drop in FEV_1, suggesting that the higher CO_2 may have been exerting some broncho-protective effect. Buteyko practitioners believe that FEV1 requires a forced expiratory manoeuvre that may itself provoke bronchoconstriction. [6] In our study also, it was observed that after sub maximal exercise on treadmill, FEV1 showed a significant drop in females, who performed exercise without BBT. [6,3]

Post exercise HR, SBP were found to increase statistically significantly in both

males and females as a normal response to exercise. [6,7]

Overall we have not observed any immediate changes in cardio respiratory parameters in the instances 'sub maximal exercise with BBT' and 'sub maximal exercise without BBT' (Table 3&4.) as also seen Review of the 'Australian government rebate on natural therapies' for private health insurance which stated that none of the available evidence suggests that the Buteyko Breathing Technique improves pulmonary function in adults. [8,9] This may be because; the deep inspiration that is required to perform a lung function test might induce bronchoconstriction and override any beneficial effect from the Buteyko breathing technique. Alternatively, studies which included RCTs may have been insufficiently powered to detect changes in lung function, or the Buteyko breathing technique may not influence pulmonary function. [10]

We have also not observed any immediate adverse effects on cardio-respiratory parameters while performing BBT at rest or on exercise, even though it involves breathe holding. [3] Pranayama and breathing exercise which include Breath Holding have proved to have shown improvements in respiratory pressure and Respiratory endurance as observed in studies. [11] So, we may recommend further researches on this aspect with a larger sample size.

CONCLUSION

Thus, Buteyko Breathing Technique used during sub-maximal exercise does not have any significant immediate effect on cardio-respiratory parameters in young adults.

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