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A Study to Assess Immediate Effects of Buteyko Breathing Technique on Cardiorespiratory Parameters in Geriatric Population

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Abstract: ***Breathing is the most essential of all the functions in the body, since all other functions depend upon it. In Modern era, we tend to have sedentary lifestyle, as a result, it entails a lot of over breathing i.e breathing a volume of air greater than which we require. Therefore, Buteyko breathing technique which uses breath control & breath holding exercises was chosen for the research work. A number of clinical research trials have been performed which indicates that Buteyko breathing technique is successful treatment of Asthma. Also, few researches were done on normal young adults & school going children, which also showed positive results. Hence, the research has been carried out to check it's immediate effects on Cardiorespiratory parameters in Geriatric population. Cardiorespiratory parameters included Pulse rate, Respiratory rate, Blood pressure, Sp02, PEFR, RPE SCORE. Quasi-experimental study design along with purposive sampling was done. Older adults (> 60 yrs) were included in the study. Buteyko breathing technique was taught to them & pre -post parameters were compared. Results showed that Buteyko breathing technique have positive effects on various Cardiorespiratory parameters in Geriatric population. The technique is worth of wider attention.***

Keywords: Geriatric population, Cardiorespiratory parameters, Buteyko breathing technique

1.Introduction

- Geriatrics is the medical speciality dedicated exclusively to providing high quality, patient centred care for older adults.
- An older person, defined by the United Nations, is a person who is over 60 years of age.
- Breathing is the most essential of all the functions of the body, since all other functions depend on it.
- In this modern era, we eat more processed food, overeat, do less physical exercise and experience more stresses, etc. In other terms this is called as SEDENTARY LIFESTYLE.
- As a result, all these activities entail a lot of over breathing i.e. breathing a volume of air greater than which we require.
- Buteyko breathing technique is a unique therapy that uses breath control and breath holding exercises to treat a wide range of health conditions believed to be connected to hyperventilation and low carbon dioxide**.**

Need of Study:

- A number of clinical research trials have been performed which indicate that buteyko breathing technique is successful treatment for Asthma.
- There are, however many other possible reasons due to which breathing technique by buteyko work, these reasons include • Change in symptom perception • Improved sense of control • Improved biomechanics of breathing • Beneficial effects of low volume breathing • Altered nitric oxide levels • Resetting of respiratory rhythm generation by breath holding techniques, etc.
- Few researches have been done specifically on Buteyko breath holding technique in normal individual (i.e individuals without any physiologic conditions), these researches include young adults as well as school going children.
- Since there is paucity of literature on BHT's immediate effects in geriatric Population.
- Thus, the study was taken up to evaluate the immediate effects of Buteyko breathing technique on cardio-respiratory parameters in older persons.

Aim:

• To study immediate effects of Buteyko breathing technique on cardio-respirator parameters in geriatric population

Objective:

- To study immediate effects of Buteyko technique on the following cardio-respiratory parameters in geriatric population

-Pulse rate-using stopwatch
-Respiratory rate-stopwatch
-Blood pressure- sphygmomanometer
-Oxygen Saturation- pulse oximeter-
-Peak expiratory flow rate-PEFR device
-RPE score-Borg scale (CR-10)

- To compare PRE and POST Values of cardio-respiratory parameters, while using Buteyko technique.

2.Materials and Methods

- Study design- Quasi – experimental design
- Sampling design- Purposive sampling
- Sample size- 150
- Study setup- LTCOP OPD, Old age homes, Parks.

Inclusion criteria:

- Older adults (>60 yrs,Males & Females)
- Higher functions intact.
- Blood pressure controlled within normal limits
- Subjects who can speak and understand one of the either language (English, Hindi, Marathi)

Exclusion criteria:

- Uncontrolled cardiovascular condition- recent (within 6 months) myocardial infarction, unstable arrhytmia or unstable angina
- Severe restrictive or obstructive Disease
- Neurological or Cognitive impairment
- Musculoskeletal conditions affect respiratory mechanics: a recent thoracic surgery, khyphoscoliosis or rib fracture
- Uncontrolled metabolic diseases
- Recent major surgery or hospitalization
- Sensory or communication barrier.

Procedure:

- Approval was taken from Institutional ethics committee of TMV's Lokmanya Tilak college of Physiotherapy.
- Purpose & procedure of study was clearly explained to the participants & informed consent was taken with consideration of inclusion & exclusion criteria.
- Demographic data along with pre & post parameters were noted for comparison.
- The data is descriptively analysed using Microsoft Excel.

3.Data Analysis and Results

Data entry, validation, and basic descriptive statistics were analyzed using Microsoft-Excel. Descriptive statistics was applied to describe participant characteristics where continuous variables were summarized using mean ± standard deviation or median and interquartile range while categorical variables were expressed in frequency and percentages. Inferential statistics was analyzed using SPSS software (Version 26) and a cut off statistical level of significance was set at $p < 0.05$. Normality of the data was confirmed using Shapiro Wilk test, skewness and kurtosis, visual inspection of histogram. Since the data was found to have free distribution intragroup analysis was done using Wilcoxon signed- rank test while Mann Whitney U test was the preferred test for gender wise comparison. Effect size for intragroup analysis and intergroup analysis was calculated using the formula $r = z/(\sqrt{N})$ where z value is reported in the outcome of the analysis done using SPSS, and N is the total number of participants.

Chart No. 1: Results (Table -1)

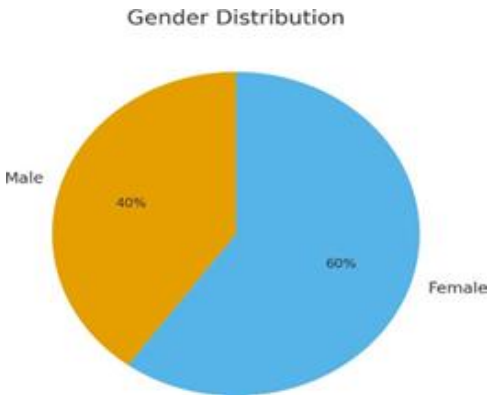
Table 1: Characteristics of participants

Characteristics	Categories	n (%)	Mean ± SD	Median (IQR)
	Overall	150 (100%)	67.34 ± 6.71	65 (62 – 71)
	Male	60 (40%)	67.10 ± 6.55	65.5 (62 – 71)
Age (in years)	Female	90 (60%)	67.50 ± 6.84	65 (62 – 71)
BMI (in kg/m2)			27.64 ± 4.73	27.10 (24.60 – 30.33)

SD = Standard Deviation, IQR = Interquartile Range.

The study comprised of 150 participants having mean age of 67.34 ± 6.71 years.

Majority of the participants were female n = 90 (60%). The mean BMI of the participants was 27.64 ± 4.73 kg/m2 which has been summarized in Table 1 along with other characteristics of the participants.

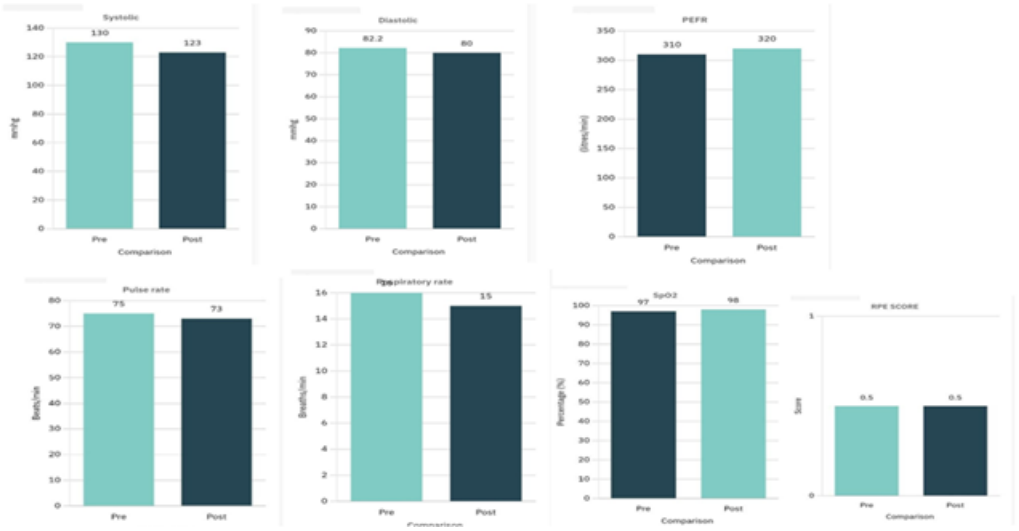


Variables / Outcomes	Pre	Post	Z value	p-value	Effect Size
	Median (IQR)	Median (IQR)			
Systolic BP (in mmHg)	130 (121 – 136.25)	123 (120 – 133)	-7.944	0.000	0.64
Diastolic BP (in mmHg)	82.25 (80 – 89)	80 (78 – 85)	-7.666	0.000	0.63
Pulse Rate (in beats/min)	75 (72 – 80.25)	73 (70.75 – 80)	-7.243	0.000	0.59
Respiratory Rate (in breaths/min)	16 (15 – 18)	15 (13 – 17)	-6.937	0.000	0.57
RPE Score	0.5 (0 – 0.5)	0.5 (0 – 0.5)	-2.385	0.017	0.19
SPO2 (in %)	97 (95 – 98)	98 (97 – 99)	-7.980	0.000	0.65
PEFR (in litres/min)	310 (290 – 370)	320 (300 – 380)	-8.513	0.000	0.70

BP = Blood Pressure, RPE = Rate of Perceived Exertion, SPO_2 = Peripheral Oxygen Saturation, PEFR = Peak Expiratory Flow Rate, IQR = Interquartile Range.

Chart No. 2

Wilcoxon Signed Rank Test was conducted to evaluate the immediate effect of intervention on the variables mentioned in Table 2 based on normality of the data set. The results of the test indicated that there was a statistically significant difference in all the variables at the baseline and post intervention. Magnitude of the difference between the medians (effect size) was large ($r > 0.5$) in all the variables except for RPE score which was small ($r < 0.2$) based on the guidelines proposed by Cohen.



Variables	Categories	Pre	Post	Z value	p-value	Effect Size
		Median (IQR)	Median (IQR)			
Systolic BP	Male	126 (121 – 133)	121 (120 – 130)	-1.336	0.182	
(in mmHg)	Female	130.5 (120.75 – 140)	125.5 (120 – 134.25)			
Diastolic BP	Male	84.5 (80 – 87)	80 (80 – 85)	-0.482	0.630	
(in mmHg)	Female	82 (79 – 89)	80 (75 – 85)			
Pulse Rate	Male	74 (71 – 79)	72 (70 – 76)	-2.811	0.005	0.23
(in beats/min)	Female	76 (72 – 82.5)	75 (71 – 80.25)			
Respiratory Rate	Male	16 (15 – 18)	15 (14 – 16.75)	-0.614	0.539	
(in breaths/min)	Female	16 (15 – 18)	15 (13 – 17)			
RPE Score	Male	0.5 (0 – 0.5)	0.5 (0 – 0.5)	-1.428	0.153	
	Female	0.5 (0 – 1)	0.5 (0 – 1)			
SpO2 (in %)	Male	97 (95 – 98)	98 (96 – 99)	-0.656	0.512	
	Female	97 (95 – 98)	98 (97 – 99)			
PEFR	Male	320 (300 – 390)	335 (300 – 400)	-8.513	0.0042	0.20
(in litres/min)	Female	305 (287.5 – 350)	320 (297.5 – 262.5)			

Chart No. 3

Mann Whitney U test was conducted to compare the outcome variables mentioned in table 3 across gender based on the normality of the data set. It revealed that there was a statistically significant difference in pulse rate and PEFR ($p<0.05$) between male and female. The magnitude of the difference between the median values (effect size) was found to be large for PEFR ($r = 0.70$) while it was moderate for pulse rate ($r = 0.23$) based on the guidelines proposed by Cohen.

4.Discussion

- The present study analyzed the effects of the intervention on physiological parameters among 150 participants with a mean age of 67.34 ± 6.71 years, majority of whom were females (60%). The average BMI was 27.64 ± 4.73 kg/m², placing participants in the overweight category, which is relevant as it may influence cardiovascular and respiratory responses.

- **Intragroup Analysis** -The Wilcoxon Signed Rank Test demonstrated statistically significant improvements in most outcome variables after the intervention. Systolic and diastolic blood pressure, pulse rate, respiratory rate, and RPE score all showed reductions post-intervention, while SPO_2 and PEFR showed significant increases.

- **Blood Pressure (BP):** Both systolic and diastolic BP significantly decreased, with large effect sizes ($r > 0.6$), indicating strong clinical relevance in terms of cardiovascular benefits.
- **Pulse and Respiratory Rate**: Both decreased significantly with moderate-to- large effect sizes ($r \approx 0.57–0.59$), suggesting improved autonomic regulation and reduced exertional demand.
- **Oxygen Saturation (SPO_2):** Increased significantly ($r = 0.65$), highlighting enhanced oxygenation efficiency.
- **Peak Expiratory Flow Rate (PEFR):** Showed the highest effect size ($r = 0.70$), reflecting marked improvement in pulmonary function and airway clearance.
- **Rate of Perceived Exertion (RPE)**: Although statistically significant, the effect size was small ($r = 0.19$), suggesting that subjective exertion levels remained relatively unchanged despite physiological improvements.
- Overall, these findings indicate that the intervention had substantial physiological benefits across cardiovascular and respiratory parameters

- **Intergroup (Gender-wise) Analysis**
- The Mann-Whitney U test revealed significant gender-related differences in pulse rate and PEFR.
- Pulse Rate: Males showed a significantly greater reduction compared to females, with a moderate effect size ($r = 0.23$). This may reflect gender-related differences in autonomic adaptation or baseline fitness levels.
- PEFR: Males demonstrated significantly higher improvements than females, with a large effect size ($r = 0.70$). This could be attributed to anatomical differences (larger lung volumes and airway caliber in males) or baseline pulmonary function variations.

- For other variables (BP, respiratory rate, SPO_2, RPE), no significant gender differences were observed, suggesting that the intervention was equally effective across sexes in these domains.

5.Conclusion

This study shows that there is a presence of Immediate positive effects of Buteyko breathing technique on Cardiorespiratory parameters in Geriatric population. The technique has Strong positive effects on parameters like Systolic BP, Diastolic BP, Pulse rate, Respiratory rate, SpO2 & PEFR. Along with this, weak positive effects were seen in RPE score.

Conflict of Interest

None

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