



## EFFECT OF BUTEYKO BREATHING TECHNIQUE ON DEPRESSION AND FATIGUE IN GERIATRIC POPULATION – A CLINICAL TRIAL

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### ABSTRACT

**Introduction:** Depression is a biomedical disorder affecting mental and physical wellbeing in 20% of geriatric population, making it an upcoming risk. The purpose of this study is to see the effect of Buteyko Breathing Technique on depression and fatigue in geriatric population.

**Methodology:** A total of 34 participants were included in the study using Geriatric Depression Scale (GDS) and Senior Fitness Test (SFT). Buteyko Breathing Technique was given to each participant for the period of 4 weeks daily. Daily session was conducted for about 40 minutes. After intervention again, assessment was undertaken using Geriatric Depression Scale and Senior Fitness test.

**Result:** Statistically significant improvements were reported in depression and fatigue after giving Buteyko Breathing Technique ( $p=0.00$ ). Statistical difference between pre and post intervention values with  $p$ -value is less than 5% significance level.

**Conclusion:** There are positive effects of Buteyko Breathing Technique on depression and fatigue in geriatric population suggesting that this specific intervention should be further explored as a rehabilitation method.

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### INTRODUCTION

According to WHO 65 or older are defined as elderly, among them India carries 15% of the world population.<sup>1</sup> With decline in fertility and mortality rates, compared by improvement in child survival and increased life expectancy, there is progressive rise in elderly persons. By the year 2025, the world will host 1.2 billion people aged 65 and over and rising to 1.9 billion in 2050.<sup>2</sup> Over 20% suffer from depression (prevalence of 21.9% in INDIA among which 3.9- 47% with higher rates in females) which causes changes in a person's mood, and feelings and symptoms of sadness, fatigue, anxiety, sleep and appetite disturbances, difficulty in concentrating, feelings of hopelessness, restlessness, or decreased activity, loss of interest in usual activities, aches and pains with no medical cause and finally thoughts of death and suicide.<sup>3</sup>

Due to natural series of depression, there is reduced functional capacity.<sup>4</sup> Thus apathy, will decrease the individual's participation in activities of daily living as these patients perceive even simple task as the difficult ones and requiring excessive energy, and do not comply to do them.<sup>5</sup> Another important symptom and problem associated with depression is hyperventilation. Hyperventilation of lungs makes the diaphragm shorten so that it loses its ability to lift and widen

rib cage, understandably, this contributes to feelings of not being able to take breath leading to early fatigue follow a cycle of dependency based on hyperventilation.<sup>6</sup>

Breathing retraining has positive effect on anxiety and panic disorders as these patients' manifest hyperventilation as a symptom.<sup>7</sup> Buteyko is breathing technique discovered by Konstantin Pavlovich Buteyko.<sup>8</sup> It involves reduced breathing which is done with breath holding technique and the two most important being a short breath hold- control pause and longer breath hold- maximum pause.<sup>9</sup> The beneficial effects of Buteyko Breathing have been in anxiety and panic disorders hence this study was intended to find out the effect of Buteyko breathing on depression and fatigue in geriatric population.

### MATERIALS AND METHODS

This clinical trial was conducted as a pre and post interventional study targeting population above 65 years of age and having symptoms of depression. The sampling design used for this study was non probability sampling and the technique used was convenient sampling.

For this trial ethical clearance was obtained from the institutional ethical committee and informed consent was obtained from all the participants. Data was collected from Geriatric day care centres and old age homes in Belgavi, Karnataka. All the participants were recruited on the basis of their inclusion and exclusion criteria. Males and females of age

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65-90 years who were prone for depression screened for depression using Geriatric Depression Scale (GDS) and Senior Fitness Test (SFT). Inclusion criteria used was 1) Person above 65 years of age, 2) Person having symptoms of depression or prone for depression such as anxiety disorder, physical disability, stress or major life change, 3) Person managing to perform his activities of daily living requiring positions such as lying, sitting, standing without assistance. Participants having severe mental disability, severe emphysema with heart failure, kidney failure, brain haemorrhage or tumour known arterial aneurysm, uncontrolled high blood pressure, cardiac pacemaker device and patients with organ transplant were excluded. Materials used in the study were geriatric depression scale sheet and scoring. Scoring for GDS was done for the participants with inclusion criteria and were then assessed using SFT to confirm their inclusion. A minimum score of 10 was required on GDS to include them in the study. Also, their breath holding time was noted.

This initial breath holding time of the subjects before experiencing mild discomfort is known as control pause time. After completing the inclusion criteria, intervention was started which included 5-6 cycles of breath hold per day. A total of 40 subjects were assessed for the study out of which 6 were excluded and none of them dropped out. Thus 34 participants underwent the intervention. The subjects performed tidal inhalation and exhalation following which they were asked to perform 3-4 repetitions of deep breathing exercises which included inhalation through nose and exhalation via lips and were finally instructed to hold their breaths. Normative value for control pause test as given by Buteyko is 30 seconds. Hence the subjects having less control pause test time were trained to increase their time up to 30 seconds. Once the control pause time was achieved, the participants were then trained for maximum pause test which is the longest period for which a person can hold his breath while battling the discomfort and urge to breathe. It is said to be double the control pause test. Thus, making its normative value of 60 seconds. The intervention was administered in the form of group exercises for a duration of 4 weeks i.e. 32 sessions; each session taking 30-40 minutes. If a subject missed a session, he/ she was made to perform the technique individually after the group exercise. Any subject missing more than 13 sessions was excluded from the study. No warm up period was given before Buteyko intervention. After 4 weeks of intervention, all subjects were retested using the same procedure and the scoring was documented.

**RESULTS**

In this study 34 subjects were included for studying the effect of Buteyko breathing technique on depression and fatigue in geriatric population. Results were analysed by the statistician using SPSS software version 23. Test for normality was done separately for pre and post intervention values using Kolmogorov-Smirnov for small sample size which included components like statistical value, degree of freedom and significance level as most of the variables indicated insignificant outcome at 5% hence independent T test was performed for comparing pre and post data to know the effect of Buteyko on fatigue and depression and Paired t test was used for correlation between components.

**Table 1** Tests for Normality Pre-intervention

Particular	Kolmogorov-Smirnov <sup>a</sup>		
	Statistic	Df	Sig.
Precontrol	.142	34	.079*
Pregds	.142	34	.081*
	Sft		
Prechairstand	.152	34	.045
Prearmcurl	.125	34	.193*
Preminsteps	.147	34	.062*
Presitreach	.359	34	.000
Prebackscratch	.177	34	.009
Pre 8ft Up & Go	.264	34	.000

Post intervention

Particular	Kolmogorov-Smirnov <sup>a</sup>		
	Statistic	Df	Sig.
Postcontrol	.149	34	.055*
Postgds	.211	34	.001
	Sft		
Postchairstand	.155	34	.038
Postarmcurl	.151	34	.047
Postminsteps	.148	34	.055*
Postsitreach	.391	34	.000
Postbackscratch	.156	34	.035
Post 8ft Up & Go	.265	34	.000

\*This is a lower bound of the true significance

Data set is normally distributed as most of the variables have indicated insignificant outcome at 5% level of significance using the small sample Kolmogorov-Smirnov test procedure.

**Table 2** Summary Independent Samples t-test for comparison

Particular	Pre-Value		Post Value		t-value	p-value
	Mean	SD	Mean	SD		
Control pause test	14.73	4.30	39.14	5.60	20.15	0.000*
Gds	14.23	3.89	10.76	3.81	3.176	0.000*
	SFT					
Chair& stand	10.88	3.89	13.41	4.27	2.554	0.013*
Arm curl	16.58	5.63	20.44	5.25	2.924	0.005*
2 min steps	133.02	42.78	146.26	42.10	1.128	0.203
Sit & reach	3.41	4.57	3.75	4.42	0.312	0.765
Backscratch	6.04	3.18	5.58	2.91	0.622	0.536
8 Ft Up And Go	14.41	5.67	11.67	4.40	2.226	0.029*

**Table 3** Paired Samples Statistics

Particular	Mean	Std. Deviation	Std. Error Mean
Pair 1 Precontrol	14.7353	4.30862	.73892
Postcontrol	39.1471	5.60375	.96103
Pair 2 Pregds	14.2353	3.89295	.66764
Postgds	10.7647	3.81432	.65415
Pair 3 Prechairstand	10.8824	3.89844	.66858
Postchairstand	13.4118	4.27195	.73263
Pair 4 Prearmcurl	16.5882	5.63602	.96657
Postarmcurl	20.4412	5.25813	.90176
Pair 5 Preminsteps	133.0294	42.78593	7.33773
Postminsteps	146.2647	42.10831	7.22152
Pair 6 Presitreach	3.4118	4.57011	.78377
Postsitreach	3.7500	4.42830	.75945
Pair 7 Prebackscratch	6.0441	3.18464	.54616
Postbackscratch	5.5882	2.91929	.50065
Pair 8 Pre8ft up & go	14.4118	5.67353	.97300
Post8ft up & go	11.6765	4.40881	.75610

**Table 4** Paired Samples Correlations

Particular	Correlation	Sig.
Pair 1 Precontrol & postcontrol	.490	.003
Pair 2 Pregds & postgds	.828	.000

The correlation value for all pairs indicated significant association since the test has revealed a strong relationship in the same direction with at 5% significance level (i.e. 0.000 < 0.05).

According to Pearson correlation technique

Pre-intervention

GDS

Variable 1	Variable 2	Pearson Correlation	Sig. (2-tailed)
PREGDS	Pre-control	-0.124	0.483

SFT

Variable 1	Variable 2	Pearson Correlation	Sig. (2-tailed)
<b>Pre sft</b>			
Pre-control	Prechairstand	0.485	0.004**
	Prearmcurl	0.222	0.206
	Preminsteps	0.161	0.362
	Presitreach	0.022	0.902
	Prebackscratch	-0.163	0.358
	Pre8ftup & Go	-0.126	0.479

\*\*Correlation is significant at the 0.01 level (2-tailed).

Post intervention

Variable 1	Variable 2	Pearson Correlation	Sig. (2-tailed)
Post-GDS	Post-control	0.185	0.296

Variable 1	Variable 2	Pearson correlation	Sig. (2-tailed)
Post control	Post chairstand	0.256	0.145
	Post armcurl	0.106	0.552
	Post min steps	-0.121	0.495
	Post sit reach	-0.323	0.062*
	Post backscratch	-0.111	0.532
	Post 8ft up & go	0.133	0.453

\*correlation is significant at the 0.10 level. (2- tailed)

giving a high statistical significance of 0.013. The mean of arm curl changed from 16.58 that changed to 20.44, giving a highly significant value of 0.005. The mean value of 2-minute step test changed from 133.02 to 146.26 thus giving a s value of 0.203. The mean for sit and reach test was 3.41 pre-intervention that changed to 3.75 thus showing a statistical significance of 0.76. The mean for back scratch was 6.04 pre-intervention that changed to 5.58 post intervention, thus giving a statistical significance of 0.536. The mean of 8 feet and go test was 14.41 pre-intervention which changed to 11.67 post-intervention thus giving a highly significant value of 0.029. Paired correlation of each components pre and post values indicated significant association as the test revealed a strong relation in same direction at 5% significance level. Also Pearson’s correlation technique was used to study the correlations between the outcome measures pre and post intervention separately.

DISCUSSION

The present study was conducted to check the effect of Buteyko breathing technique on depression and fatigue in geriatric population. The study included a total number of 34 older individuals of age 65 and above from various old age homes to carry out a community-based study and excluded the population suffering from pathological difficulties to maintain a homogenous group of subjects who were given intervention in the form of Buteyko breathing exercises on a daily basis for 4 weeks. While there are many instruments available to measure depression, the Geriatric Depression Scale (GDS), first created by Yesavage, *et al.*, has been tested and used extensively with the older population is used in the present study. In a validation study comparing the long and short forms of the GDS, both were successful in differentiating depressed from non-depressed adults with high correlation ( $r = 0.84, p < 0.01$ ).<sup>10</sup> To check the fatigue in elderly, Senior Fitness Test (SFT) was taken as a measuring tool. The pre-and post-values of each component are compared.

In the present study, incidence of depression was seen more in females. According to the community-based studies in elderly; the prevalence of depression has been ranged from 3.9 to 47%. Higher rates of prevalence have been found among females and urban residents.<sup>11</sup> Depression also causes hyperventilation which leads to hyperinflation of lungs. The hyperinflation of lungs shortens the diaphragm such that it loses its ability to lift and widen the rib cage. The production of hyperinflation by any means makes the muscles of breathing function more efficiently and causes a significant decrease in the symptoms of breathlessness. Depression also includes symptoms of dysfunctional breathing which is associated with an abnormal breathing pattern, unexplained breathlessness and significant morbidity and loss of activity due to aches and pains with no medical cause. Loss of activity affects the fatigue levels of each individual and demonstrates the effect of depression on endurance and fitness in the current study.<sup>12</sup>

The study done by Judy Garber and V. Robin Weersing on comorbidity of anxiety and depression in youths, mentioned the frequent co-occurrence of anxiety and depression. It also concluded that anxiety leads to depression in most of the patients.<sup>13</sup> According to a study 85% of those people with major depression were also diagnosed with anxiety disorders and 35% had symptoms of panic disorder.<sup>14</sup> Hyperventilation is manifested to be symptoms in patients with anxiety and panic

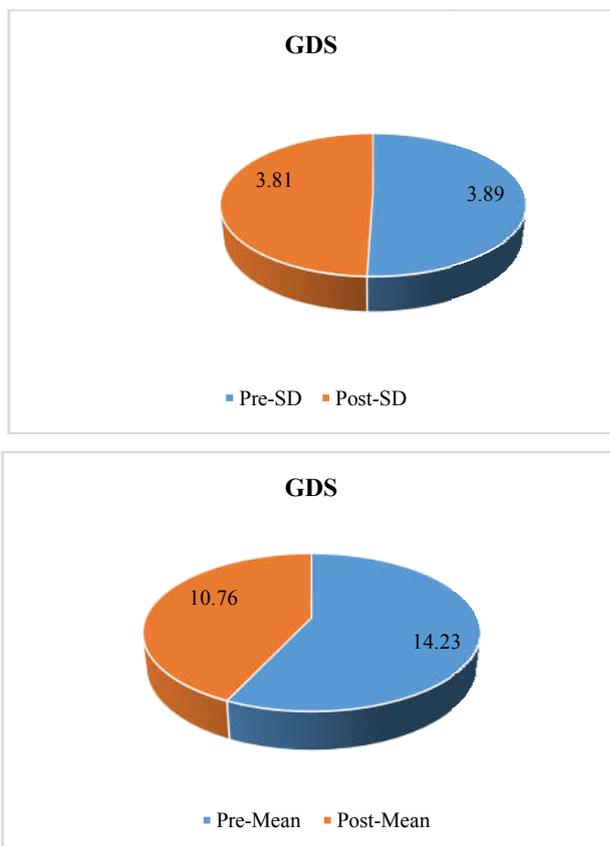


Figure 1 Mean and Standard deviation pre and post intervention for GDS

This study shows pre-intervention mean of GDS to be 14.23 which changed to 3.81 post intervention, thus showing a statistical significance of 0.000 which was highly significant with a standard deviation that changed from 3.89 pre-intervention to 3.81 post intervention. There was also a significant change regarding the components of SFT. The mean of chair stand test changed from 10.88 to 4.21 thus

disorders. Breathing retraining is known to have a positive effect on same.<sup>13</sup>

It is known that loss of indulgence in physical activity leads to higher chances of exhibiting symptoms of depression and anxiety when compared to participation in regular physical activity and social participation that was evident in our study subjects. Hence this also focused on the fatigue level which was assessed using SFT which correlated fitness and fatigue levels to depression both pre and post intervention.<sup>14</sup> Jamie S *et al.* conducted a study on physical activity in older age which suggests that healthy aging leads to a lifestyle free from illness and disability and is more likely in those engaging in fitness to improve the health and well-being of the individual.<sup>15</sup> A study suggested that it is important to improve the pulmonary function and exercise capacity by respiratory muscle training. Respiratory muscle training includes a technique which aims to improve the function of respiratory muscles by performing breathing retraining. This training allows more amount of oxygen to enter the bloodstream while strengthening the respiratory muscles which also allows to gain control over the breathing pattern of individual. This leads to functional adaptations to improve the strength and endurance performance.<sup>16</sup>

According to Buteyko teachings, hypocapnia leading to hyperventilation is wide spread and generally unrecognised destabiliser of physiological systems and psychological states.<sup>9</sup> It is also a type of breathing retraining which helps to alleviate symptoms caused by dysfunctional breathing and hyperventilation because breathing retraining is useful to normalise each pattern of breathing.<sup>17</sup> This technique includes repeated breath holds which increases level of body's endogenous antioxidants leading to increase in aerobic threshold, thus increasing capacity to exercise at higher levels of exertion similar to effect on altitude or hypoxic training.<sup>18</sup> This breathing retraining technique was performed by the participants fulfilling the criteria of study population. The utilisation of Buteyko exercise in our study is based on a study that suggests breathing retraining has a positive effect on anxiety.<sup>14</sup> Also, anxiety and depression often co-occur, which was used relatively in this study.

Though this study concluded that Buteyko Breathing technique has been successful in reducing symptoms of depression and fatigue in geriatric population, long term effects of the intervention was not evaluated which might pose as a limitation to the study. This study may be of significance for health care providers who treat depression and can be explored as rehabilitation method. We suggest that the future scope of the study is to highlight the importance of Buteyko in various physiological and psychological fields for healthy changes in lifestyle among different age groups and for evaluation of long-term effects.

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#### Declaration of Interest Statement

None of the author has conflict of interest to declare.

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