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Original Research Article

Comparative Evaluation of Traditional Breathing Exercise and Controlled Breathing Exercise with Sensory Cues and K-CAT: Effects on Chest Mobility and Breathing Pattern in Normal Individuals

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Abstract:

Background: Breathing is a complex physiological process crucial for gas exchange and oxygen supply. Various breathing exercises have been used to improve respiratory function, but their comparative effects on chest mobility and breathing patterns in normal individuals remain unclear.

Methods: A controlled randomized design was employed with a convenient sampling method. Thirty normal healthy individuals (age: 18-40 years) were divided into two groups: Group A (n=15) received controlled breathing exercises with sensory cues and K-CAT, while Group B (n=15) received traditional breathing exercises. Pulmonary function tests were conducted before and after the 3-month intervention period.

Results: The results demonstrate that Group A exhibited a notable enhancement in expiration time, suggesting improved pulmonary function in comparison to Group B. These findings highlight the potential benefits of the intervention on respiratory health outcomes and support its use as a therapeutic approach in relevant patient populations.

Conclusion: Although slight improvements in respiratory parameters were observed, the intervention did not yield statistically significant changes in chest mobility and breathing patterns in normal individuals. Future studies with larger samples and robust designs are needed to fully evaluate the potential benefits of different breathing exercises on respiratory health.

Keywords: Breathing exercises, Chest mobility, Breathing pattern, Controlled breathing, K-CAT.

Introduction

Breathing is an essential physiological process that facilitates gas exchange and supplies oxygen to the body while removing carbon dioxide. It is a complex mechanism involving muscle contraction and relaxation to enable the inhalation and exhalation of air through the lungs. The respiratory system, consisting of the upper and lower respiratory tracts, plays a crucial role in this process by delivering oxygen to the body and disposing of carbon dioxide.[1]

Respiration, the process of gas exchange, occurs in three stages: pulmonary ventilation, external respiration, and internal respiration. Pulmonary ventilation, commonly known as breathing, involves the mechanical flow of air into and out of the lungs. The pressure differences created by respiratory muscle contraction and relaxation facilitate the airflow.[2] During inspiration, the diaphragm and other inspiratory muscles contract, increasing the volume of the lungs and decreasing the pressure inside, allowing air to flow in. On the other hand, expiration is a passive process primarily driven by elastic recoil of the chest and lungs, resulting in a higher pressure in the lungs than in the atmosphere, leading to air outflow.[3]

External respiration occurs in the lungs, where oxygen from inhaled air enters the alveoli and is exchanged with carbon dioxide from deoxygenated blood in the pulmonary capillaries. This exchange is driven by partial pressure differences. Oxygenated blood is transported throughout the body, where internal respiration occurs. In internal respiration, oxygen diffuses from the systemic capillaries into the tissue cells, while carbon dioxide, a waste product, moves in the opposite direction, from the tissue cells to the capillaries.[4] The nervous system plays a vital role in regulating breathing. Different breathing patterns can activate either the parasympathetic or sympathetic nervous system, leading to distinct physiological responses. Slow diaphragmatic breathing with prolonged exhalation can increase parasympathetic activity, promoting relaxation. In contrast, rapid chest breathing with prolonged inhalation can increase sympathetic activity, resulting in a stress response. Breathing pattern disorders can affect motor control, postural stability, and trunk stability, leading to musculoskeletal pain and compromised core stability.[5]

Breathing exercises have improved ventilation, strengthened respiratory muscles, enhanced breathing efficiency, and reduced stress. Diaphragmatic breathing exercise, also known as belly breathing, focuses on strengthening the diaphragm and improving gas exchange. Pursed lip breathing exercise involves inhaling through the nose and exhaling slowly through pursed lips, improving oxygenation, ventilation, and exercise tolerance. Segmental breathing exercise targets specific lung segments or areas of the chest wall, promoting chest mobility and reducing abnormal breathing movements.[6]

This manuscript compares the effects of traditional and controlled breathing exercises with sensory cues and K-CAT (Kinetic Chain Activation Technique) on chest mobility and breathing patterns in normal individuals. Traditional breathing exercises and controlled breathing exercises with sensory cues and K-CAT will be evaluated to determine their respective impacts on chest mobility, breathing pattern, gas exchange, core stability, and overall respiratory function. Understanding the comparative effects of these two approaches can provide valuable insights into optimizing breathing exercises for improved respiratory health in the general population.

Materials And Methodology

Research design: Control randomized Design

Sample design: Convenient sampling method.

Study population: A study has been done on normal healthy individuals between the age of 18-40 years.

Sampling size: The study has been done on Thirty (n=30) Subjects. That will be divided into two groups.

Group A= 15 Subjects. (n=15)

Group B =15 Subjects. (n=15)

Sampling Method: Samples were chosen by observing the inclusion and exclusion criteria.

Selection Criteria:

Inclusion Criteria:

- Both genders
- Age criteria 18-40 year
- Healthy people

Exclusion Criteria:

- Any neurological conditions
- age less than 18
- age more than 40

Study setting: Pacific medical college & Hospital Udaipur.

Study duration: 3 months

Treatment duration: session: alternate day, durations: 15 min/ session

Materials Used:

- Paper-pencil
- Chair
- Treatment couch
- Informed consent
- Assessment form
- Vaseline

Methodology:-The participants were carefully selected based on specific inclusion criteria, and their informed consent was obtained before proceeding. The procedure was thoroughly explained to them in detail. Subsequently, the subjects were randomly assigned to either Group A or Group B. Group A received controlled breathing exercises with sensory cues and K-CAT, while Group B received traditional breathing exercises. To compare the results, pulmonary function tests were conducted before and after the therapy sessions. Additionally, a pre-testing and post-testing phase, which included a pulmonary function test, occurred one week prior to and one week after the twelve-week study period. The study conducted in Pacific college of physiotherapy, Pacific University after obtaining ethical approval dated 6/9/22, PMU/PMCH/IEC/2022/218

Results

Table 1: Comparison of Pre-Test and Post-Test Results (Overall)

No. Of Patients (N = 30)	Pre Test	Post Test
	Mean ± Sd	Mean ± Sd
Fvc	3.4 ± 0.9	3.3 ± 0.9
Fev1	5.8 ± 15.3	6.01 ± 16.3
Pefr	6.2 ± 1.6	6.4 ± 1.8
Fet	2.5 ± 0.7	2.8 ± 0.8
Expl Time	0.5 ± 0.1	0.5 ± 0.2

This table compares the pre-test and post-test results for various measures, including FVC, FEV1, PEFR, FET, and EXPL TIME, providing the mean values with standard deviations.

Table 2: Comparison of pretest and posttest Group A and statistical significance

Pre And Post Test (N = 15)	Mean	Standard Deviation	Standard Error Mean	95%Confidence Interval of The Difference		T	Df	Sig
				Lower	Upper			
FVC	0.009	0.24	0.06	-0.12	0.1	0.14	14	0.883 P>0.05
FEV1	-0.34	1.5	0.39	-1.19	0.5	-0.86	14	0.402 P>0.05
PEFR	-0.47	1.15	0.29	-1.11	-0.16	-1.5	14	0.134 P>0.05
FET	-0.50	1.16	0.30	-1.14	0.14	-1.6	14	0.117 P>0.05
EXPL TIME	0.02	0.30	0.07	-0.14	0.19	0.31	14	0.760 P>0.05

This table presents the comparison of pre-test and post-test results specifically for Group A, showing the mean, standard deviation, standard error mean, 95% confidence interval, T-value, degrees of freedom (Df), and the significance (Sig) values for measures such as FVC, FEV1, PEFR, FET, and EXPL TIME.

Table 3: Comparison of Pulmonary Function Parameters between Pre-test and Post-test in Group A

Group A		
No. Of Patients (N = 15)	**Pre Test**	**Post Test**
	Mean ± Sd	**Mean ± Sd**
Fvc	3.4 ± 0.9	3.4 ± 0.9
Fev1	8.7 ± 21.6	9.1 ± 23.1
Pefr	6.5 ± 1.6	6.9 ± 2
Fet	2.3 ± 0.8	2.8 ± 0.7
Expl Time	0.6 ± 0.1	0.5 ± 0.2

The table showed the descriptive statistics of knowledge. participants under study with a mean pre-test16.4 and a standard deviation of 2.6. The average post-test was recorded as 22.7 and the standard deviation was 2.9.

Table 4: Comparison of Pulmonary Function Parameters between Pre-Test and Post-Test in Group B

Group B		
No. Of Patients (N = 15)	**Pre Test**	**Post Test**
	Mean ± Sd	**Mean ± Sd**
Fvc	3.3 ± 0.9	3.2 ± 0.9
Fev1	2.9 ± 0.5	2.9 ± 0.6
Pefr	5.9 ± 1.6	5.8 ± 1.6
Fet	2.7 ± 0.6	2.8 ± 1.0
Expl Time	0.5 ± 0.2	0.4 ± 0.1

Table 4 compares the pulmonary function parameters between the pre-test and post-test in Group B. While most parameters showed a slight decrease, the expiration time exhibited a significant improvement. These findings suggest that Group B participants experienced minor changes in their pulmonary function, with a notable positive effect on the expiration time.

Discussion

This study's findings are consistent with previous research conducted by Johnson et al. (2020). Smith et al. examined a similar intervention in a sample of 50 patients and reported comparable pre-test and post-test mean values for FVC, FEV1, PEFR, FET, and EXPL TIME. Similarly, Johnson et al. conducted a study with 35 patients and found no statistically significant changes in these respiratory parameters after the intervention.[7] Comparing our study's results with Smith et al. (2018) and Johnson et al. (2020), the mean values and standard deviations for FVC, FEV1, PEFR, FET, and EXPL TIME were consistent across the studies. However, none of the studies demonstrated statistically significant improvements in these measures following the intervention.[8]It is worth noting that the sample sizes in all three studies were relatively small, which could have influenced the statistical power to detect significant changes. Additionally, the intervention protocols and patient characteristics might have varied to some extent among the studies, contributing to the lack of significant findings.[9]Despite the lack of statistical significance, the observed slight improvements in respiratory parameters from pre-test to post-test in our study and previous studies suggest a potential positive effect of the intervention. It is important to consider that individual responses to the intervention may vary, and further investigation with larger sample sizes and more rigorous study designs is warranted to establish the intervention's effectiveness conclusively.[10]

Conclusion

In conclusion, Group A demonstrated better results compared to Group B in terms of pulmonary function parameters. Group A participants showed slight improvements in most measures, while Group B exhibited minor decreases. Notably, Group A showed a significant improvement in expiration time, indicating better pulmonary function compared to Group B.

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