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Effect of Breather on Multidimensional Outcomes in Post-Stroke Survivors

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ABSTRACT

Background: Strokes are the second-most frequent reason of dementia and the most frequent reason of physical impairment. In addition, most survivors develop motor impairments that affect their quality of life and capability to perform activities of daily living.

Objective: This study aims to show if respiratory muscle training by the breather could enhance the quality of life in post-stroke patients.

Material and methods: Fifty stroke patients were assigned into two groups. Both groups were engaged in conventional rehabilitation three times per week for six weeks. The experimental group performed respiratory muscle training (RMT) by the breather at a rate of five breaths per set, five sets/session, twice daily. The intensity was approximately 60% of the maximum effort. Data about quality of life assessed through the stroke impact scale were taken before and after six weeks.

Results: Both groups achieved significant improvement in physical, emotional, and social memory, communication, and stroke recovery of SIS, but there was no significant difference between the two groups.

Conclusions: Adding a breather to conventional rehabilitation of stroke patients produces a non-significant effect on the quality of post-stroke life.

Keywords: Stroke, Quality of life, Rehabilitation.

INTRODUCTION

Stroke was the second most common reason of mortality worldwide in 2019. Behind cancer, stroke claimed 6.55 million lives. Stroke is linked to a significant morbidity rate, accounting for 143 million with a disability [1].

Stroke is an abrupt onset of several daily life difficulties for survivors and their families. Stroke survivors experience problems that include speech damage, brain injury, and physical or cognitive impairment. A stroke survivor's dependence on others increases by 30%–50% if they have a significant disability [2].

Reduced quality of life (QoL) and concurrent reductions in daily physical activity are also frequently noted. Stroke-related burden is considerable in low- and middle-income countries where medical care and social support resources are scarce [3].

Stroke patients' diaphragm, intercostal muscles, and abdominal muscles are all weakened, limiting their ability to breathe and reducing their capacity for physical activity and independent walking. The studies found that breathing exercises can help stroke patients' physical function and increase their stamina and quality of life [4].

The breather is respiratory equipment that trains both inspiratory and expiratory muscles. Hence, we hypothesized that it could help post-stroke patients and improve their pulmonary functions and quality of life.

MATERIAL AND METHODS

Participants

Fifty stroke patients of both sexes were allocated to two groups. Both groups were engaged in conventional rehabilitation three times weekly for six weeks. The

experimental group performed respiratory muscle training (RMT) by the breather at a rate of five breaths per set, five sets/session, twice daily. The intensity was approximately 60% of the maximum effort. They were enrolled in the outpatient clinic of Faculty of Physical Therapy at Cairo University. Data about quality of life assessed through the stroke impact scale were taken before and after six weeks**.**

Procedure:

The device used in this study to strengthen inspiratory and expiratory muscles is Breather (PN Medical Cocoa Beach, FL32931, made in the United States of America). Each patient in both groups was engaged in a conventional rehabilitation program for 30 min three times per week for six weeks.

Each patient in the breather group (group A) was asked to breathe in for 3 s, slight pause, then breathe out for 3 s for ten repetitions/set and repeat this rhythm ten times /two sets, two sessions per day, three times per week. The resistance was about 60%–80% of the maximum effort. The resistance was gradually increased according to patient tolerance.

Outcome measures:

Stroke Impact Scale: (SIS 3.0) is frequently utilized to assess the quality of life of stroke survivors [5].

The Stroke Impact Scale (SIS 3.0), created by **Duncan *et al.*** [6], is one of the unique measures for evaluating health-related quality of life (HRQoL) that enables a thorough multidimensional assessment of the effects of a stroke on ADLs and Instrumental ADLs

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(IADLs), mobility, memory and thinking, emotions, communication, and social participation/role fulfillment; are all assessed. All items were scored on a scale from 1 to 5, with a lower score representing more difficult conditions [7].

Ethical consent:

The work was authorised by Cairo University's Academic and Ethical Council. To participate in the trial, each patient signed a written informed permission form. The International Medical Association's rule of ethics for human studies, the Helsinki Declaration, directed the conduct of this study.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 25 for Windows was used for all statistical analyses (IBM SPSS, Chicago, IL, USA).

To compare the topic characteristics in the two groups, an unpaired t-test was used. The sex and afflicted side distributions between groups were compared using the Chi-squared test. The Shapiro-Wilk test evaluated how normally distributed the data were. The homogeneity between groups was tested using Levene's test for homogeneity of differences. The influence of the therapy on SIS was examined using mixed MANOVA. For additional comparison, post-hoc tests using the Bonferroni correction were carried out. All statistical tests had a significance threshold of p 0.05.

RESULTS

This study aimed to estimate the impact of a breather on stroke-specific health-associated quality of life in post-stroke survivors.

Fifty stroke patients enrolled in this study. They were allocated into two groups in a random manner. Group A performed respiratory muscle training by breather besides conventional physiotherapy; group B received conventional physiotherapy only.

The groups were not significantly different in age, weight, height, BMI, sex, and affected side distribution ($p > 0.05$) **(Table 1)**.

Mixed MANOVA presented a significant interaction effect of treatment and time ($F = 7.08$, $p = 0.001$). Treatment had a significant main effect ($F = 2.95$, $p = 0.01$). There was a significant main effect time ($F = 27.87$, $p = 0.001$).

Table (1): Comparison of subject features between groups A and B

	Group A	**Group B**		
	Mean ±SD	**Mean ±SD**	**MD**	**p-value**
Age (years)	57.11 ± 5.64	59 ± 5.87	-1.89	0.34
Weight (kg)	83.05 ± 10.33	78.12 ± 8.78	4.93	0.14
Height (cm)	170.88 ± 7.54	169.29 ± 8.29	1.59	0.56
BMI (kg/m²)	28.39 ± 2.59	27.28 ± 2.76	1.11	0.23
Sex, N (%)				
Females	4 (24%)	5 (29%)		0.69
Males	13 (76%)	12 (71%)		
Affected side, N (%)				
Dominant side	8 (47%)	10 (59%)		0.49
Nondominant side	9 (53%)	7 (41%)		

SD, Standard deviation; MD, Mean difference; BMI, Body mass index.

Within group comparison

There was a significant elevation in SIS post-treatment in comparison with that pre-treatment in groups A and B ($p < 0.05$).

The percentage of alteration of physical problem, memory/thinking. Emotion, communication, and social participation in group A was 10.87%, 6.42%, 6.74%, 4.79%, and 16.93%, respectively, and that in group B was 5.73%, 9.18%, 8.94%, 3.95% and 16.23%, respectively **(Table 2)**.

Between-group comparison

There was no significant difference in SIS domains (physical problem, memory/thinking. Emotion, communication, and social participation between groups post-treatment ($p > 0.05$) **(Table 2).**

Table (2): Mean SIS pre and post-treatment of groups A and B

	Pre-treatment Mean ±SD	Post-treatment Mean ±SD	MD	% of change	p-value
Physical problem					
Group A	59.61 ± 11.55	66.09 ± 12.47	-6.48	10.87	0.001
Group B	57.22 ± 9.84	60.50 ± 12.09	-3.28	5.73	0.01
MD	2.39	5.59			
	p = 0.52	**p = 0.19**			
Memory/thinking					
Group A	71.08 ± 11.9	75.64 ± 7.77	-4.56	6.42	0.02
Group B	69.73 ± 16.15	76.13 ± 6.54	-6.4	9.18	0.002
MD	1.35	-0.49			
	p = 0.65	**p = 0.45**			
Emotion					
Group A	50.32 ± 9.23	53.71 ± 8.34	-3.39	6.74	0.003
Group B	47.97 ± 6.47	52.26 ± 7.33	-4.29	8.94	0.001
MD	2.35	1.45			
	p = 0.39	**p = 0.59**			
Communication					
Group A	75.86 ± 4.47	79.49 ± 1.12	-3.63	4.79	0.001
Group B	76 ± 4.96	79 ± 2.01	-3	3.95	0.005
MD	-0.14	0.49			
	p = 0.93	**p = 0.37**			
Social participation					
Group A	48.67 ± 14.33	56.91 ± 13.36	-8.24	16.93	0.004
Group B	51.62 ± 11.07	60 ± 16.51	-8.38	16.23	0.004
MD	-2.95	-3.09			
	p = 0.52	**p = 0.55**			
Stroke recovery					
Group A	58.23 ± 15.51	70 ± 16.2	-11.77	20.21	0.001
Group B	60.58 ± 17.84	68.23 ± 19.12	-7.65	12.63	0.02
MD	-2.35	1.77			
	p = 0.68	**p = 0.77**			

SD, Standard deviation; MD, Mean difference.

DISCUSSION

This study aims to detect the impact of breather device on the life quality in post-stroke survivors.

The findings of our study showed that after six weeks, both groups in our study showed an increase in domains of SIS (physical, emotional, social memory, communication, and stroke recovery). However, there was no significant difference between the two groups.

The findings of this study conclude that the breather has an unappreciated impact on the life quality in post-stroke individuals after six weeks.

Similar findings were found in a study to detect the effect of inspiratory muscle training on the walking capability of post-stroke patients for three months. EuroQol-5 evaluated quality of life. Both groups achieved significant improvement in EuroQol5D scores when compared before and after the intervention period. However, there was no difference between the experimental and control groups [8, 9].

In addition, a double-blinded randomized controlled experiment to evaluate the impact of inspiratory muscle training (IMT) on functional performance, strength, resistance, and quality of life (QoL) for chronic stroke survivors found that the measures of functional performance and QoL did not show statistically different results [10].

On the opposite side, a study used to estimate the impact of Breathe-Link breathing trainers on lung activity and the capability to achieve daily living activities in individuals with stroke for 12 weeks found that both groups' ADL scores increased after treatment in comparison to before treatment. Additionally, the enhancement in the treatment group was more noticeable compared to the control group showing a suitable impact of the breathing training equipment [11].

A systematic review in 2023 to estimate RMT efficacy on pulmonary activity, exercise capability, and life quality in internal and central nervous system disorders revealed that in comparison with the control conditions (i.e., no intervention, sham training, placebo, or conventional therapies), individuals with internal and central nervous system diseases who received RMT had a higher quality of life and significantly enhanced performance in exercise capability [12].

For the duration of program, no adverse events were documented.

Limitation of the study: The study duration was a little short of showing the long-term impacts of training**.**

CONCLUSIONS

Adding a breather to conventional rehabilitation of stroke patients produces a non-significant effect on the quality of life post-stroke.

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Competing interests: Nil.

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