



COMPARISON BETWEEN EFFECT OF PURSED LIP BREATHING AND MOUTH TAPING ON DYSPNOEA: A CROSS SECTIONAL STUDY

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ABSTRACT

Background and purpose of the study was to compare Pursed-lip breathing and Mouth taping for relieving dyspnoea and analyse their effectiveness.

Method: Subjects of age group 18-34 years and normal BMI were randomly divided into two groups, group A (n= 40) for PLB technique and group B (n= 40) for MT technique. Each subject's Heart rate, Respiratory rate, Blood pressure, Treadmill walking time and level of dyspnoea according to Modified Borg CR10 scale was assessed before and after the intervention.

Results: Both the techniques showed significant improvement by virtue of an increased treadmill walking time, the subject's dyspnoea status during the treadmill walking and lesser time for recovery to baseline vital parameters. Significant reduction in post-test RR after PLB (p=0.030) and MT (p=0.012) respectively were seen. Although, when compared to each other, MT and PLB techniques showed no significant differences with respect to the dyspnoea relieving time(p=0.08)and treadmill walking time(p=0.2).

Conclusion: MT and PLB both have proved themselves to be equally effective in improving the response to exercise in terms of increased treadmill walking time and post-test dyspnoea status and recovery of vital parameters, without any significant differences between the two techniques.

Key Words: Treadmill walking time, Dyspnoea relief

INTRODUCTION

'Dyspnoea' or 'shortness of breath' or 'breathlessness' is perceived as difficulty in breathing or painful breathing that a patient is aware of. It is an unpleasant sensation of laboured breathing. Normal breathing is an unconscious act but when respiration becomes disturbed, an individual may become acutely aware of discomfort or distress associated with breathing¹.

Dyspnoea may be considered as a part of the warning system for humans to recognize when they are at a risk due to variations in intensity of exertion/exercises which may lead to inadequate ventilation.

Dyspnoea has always been a frequent cause of emergency room visits and has proven itself to be an independent predictor of mortality². The workshop by The National Institute of Health on pulmonary rehabilitation also suggested 'Dyspnoea' as the most frequent symptom reported by patients with chronic respiratory disease³.

A statement from American Thoracic Society offered the following definition of dyspnoea, "Experience of dyspnoea derives from interactions among multiple physiological, psychological, social, and environmental factors, and may induce secondary physiological and behavioural responses⁴". It is especially very important when it interferes with activi-

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ties of daily living, important consequence being profound reduction in activity. The subsequent sedentary lifestyle may contribute to muscular deconditioning leading to greater breathlessness.

Therapies for relieving dyspnoea include pharmacological and non-pharmacological treatments with the aim of modifying a specific cause or rather a general symptomatic management⁵. Non-pharmacological treatment includes ventilator support like BiPAP, relaxation techniques, counselling, facial cooling by icing, application of cold air by sitting near an open window, doing pursed lip breathing in a relaxed posture, music therapy, dyspnoea relieving positions, etc.

Pursed Lip Breathing (PLB) is a very popular and excellent “Rescue” technique for acute dyspnoea resulting from COPD, Emphysema and Asthma. It simply imposes a slight obstruction to expiratory air flow at the mouth which generates back pressure throughout the airway causing stenting effect which helps prop open the airways and assists exhalation and thereby, better lung emptying⁶

Mouth taping is a technique which simply mimics pursed lip breathing, modification here is the application of tape around & over the lips with a small opening at the centre, creating a central aperture. Mouth taping may appear to be an unconventional approach; but there is no evidence that the practice may be harmful. With no published research about the physiological effects of mouth taping there is a need to investigate this area.

The need of this study was to observe whether the effect of mouth taping technique would be similar to the beneficial effects of pursed lip breathing.

MATERIALS AND METHODOLOGY

Institutional Ethical committee approval was obtained for the cross sectional study design. By purposive sampling, 80 healthy subjects fulfilling our selection criteria were fully explained the nature of the study and a written informed consent was obtained from them.

Baseline parameters-HR, RR, BP and level of dyspnoea according to Modified Borg’s scale (CR-10) were documented. Before the test, subjects were instructed to stand on treadmill with hands loosely holding the handrails. All were subjected twice to the Bruce’s protocol with a rest period of 3 days as a wash out period in between the tests.

At each stage of Bruce’s protocol, subjects graded their dyspnoea status. Test was terminated either when the subject reported “maximal” on the CR-10 or when the subject stopped due to any reason other than dyspnoea (e.g. leg cramps, giddiness). All the vital parameters were reassessed immediately

after and until recovery to baseline values. Time required for recovery to pre-test parameters was noted. This denoted time for dyspnoea relief,

Researcher one carried out Bruce’s protocol on all the 80 subjects.

These 80 were divided by simple random sampling into two groups.

Group A- Mouth taping (Before starting the Bruce’s protocol), subjects’ mouth were taped with the help of micropore tape, only central aperture, i.e., only 1/4th of the total lip length was kept open. Subjects were asked to demonstrate breathing pattern like pursed lip breathing after the tape was applied. After the confirmation of the breathing pattern, subjects were asked to walk on treadmill and advised to inhale from nose and exhale through the mouth right from beginning of the test.



Figure 1: Mouth taping

Group B- Pursed lip breathing (Subjects were instructed to purse their lips while walking on treadmill and advised to inhale from nose and exhale through pursed lips)

Researcher two carried out the Bruce’s protocol for both these groups.

RESULTS

Statistical analysis

The data was analysed using SPSS software. The level of significance was set at $p \leq 0.05$. Paired ‘t’ test was used for comparison within the groups, i.e., for pre and post-test values of Group A & B.

Unpaired ‘t’ test was used for comparison between the two groups of all the parametric values.

Tables 1: The following table shows comparison between the vital parameters pre and post intervention in Group A post intervention.

	MT		P value
	Pre-test(Mean±SD)	Post-test(Mean±SD)	
HR	138.27±15.63	143.3±14.30	0.124
RR	35.44±5.	32.51±5.50	0.012
SBP	149.58±10.24	154.41±8.97	0.022
DBP	76.37±5.42	75.72±4.83	0.00

(2) The following table shows comparison between the vital parameters pre & post intervention in Group B PLB post intervention.

	PLB		P value
	Pre-Test (Mean±SD)	Post Test (Mean±SD)	
HR	132.97± 18.87	140.43	0.088
RR	35.78±4.46	33.45±4.75	0.033
SBP	144.32±10.80	149.89±8.08	0.015
DBP	77.35±5.45	77.62±5.47	0.832

(3) Following table shows comparison between PLB and MT on dyspnoea relieving time

	MT	PLB	P value
Dyspnoea relieving time	308.44	330.29	0.088

(4) Following table shows comparison between PLB and MT on treadmill walking time.

	PLB	MT	P value
Treadmill walking time	810.37	833.65	0.249

(5) Following table shows the comparison between pre and post-test values on dyspnoea relieving time and treadmill walking time by using MT technique.

	Dyspnoea relieving time	P value	Treadmill walking time	P value
Pre -test (Mean±SD)	400.45±72.52	0.00	726.72±90.21	0.00
Post-test (Mean±SD)	304.65±51.09		831.4±87.75	

post-test values on dyspnoea relieving time and treadmill walking time by using MT technique.

	Dyspnoea relieving time	P value	Treadmill walking time	P value
Pre-test (Mean±SD)	404.77±75.86	0.03	722.32±97.22	0.00
Post-test ((Mean±SD)	339.15±84.53		818.25±88.00	

DISCUSSION

Dyspnoea is described as an abnormal awareness of breathing, including a number of qualitatively distinct sensations that vary in intensity⁷. It is also one of the most common symptoms associated with cardiovascular and pulmonary diseases.

There are numerous treatment methods to decrease dyspnoea which DO NOT necessarily involve the use of bronchodilators. For a physiotherapist all these techniques are of great importance in helping relieve a patient's dyspnoea, and thus improving the functional status of the patient.

Dyspnoea presents itself as a complex mechanism because it can have varying origins. Understanding the patho-physiology of dyspnoea is very essential so that the correct choice of treatment can be made.⁴

In the present study, subjects were made to walk on treadmill to induce maximal level of breathlessness as their rate of respiration increased.

Larger tidal volumes require an increased work, necessary to overcome the elastic recoil of the lungs and chest wall during inspiration, as the lungs are less compliant at higher lung volumes and also because the elastic recoil of the chest wall is inward at high thoracic volumes; although this greater elastic force makes exhalation easier. The high flow rates generated during exercise result in a much greater airway resistance, a component of the work of breathing. Greater turbulence and dynamic compression of airways secondary to active exhalation combine to greatly increase the work of breathing; which leads to dyspnea³. So by giving PLB or mouth taping, we aimed to reduce work of breathing and thus relieve dyspnoea.

PLB is known to reduce dyspnoea at rest by altering the respiratory pattern and improve alveolar ventilation. It has also been reported that PLB increases exercise tolerance and reduces activity limitation, reducing both peak and mean expiratory flow rates and thereby reducing dyspnoea. Greater reduction in non-elastic resistance across lungs is seen with PLB⁸. It is used by some patients, typically COPDs auto-

matically and has been considered an important breathing strategy.

In the present study, PLB effectively increased the treadmill walking time in the subjects ($p=0.00^*$). It also proved successful in reducing the respiratory rate of these subjects significantly ($p=0.030$).

The subjects scored themselves lower on Borg's CR 10 scale for perceived exertion when undergoing the interventional test doing PLB.

PLB has shown greater activity in muscles of rib cage as compared to diaphragm activity, thus having a protective action on the diaphragm and ameliorating dyspnoea³³. Reduction in the respiratory rate increases tidal volume in patients with COPD during PLB, contributing to the improvement of their dyspnoea status.

In addition, PLB lead to a decrease in inspiratory time to total time ratio of the respiratory cycle (T_i/T_{tot}) by lengthening expiratory time, decreasing end expiratory chest wall volume which helps in modulation of breathlessness⁹.

In the present study, a method called mouth taping, working on a similar mechanism as PLB, was proved helpful in maintaining the sustained effect of PLB; it is known to add more uniform resistance to the expiratory flow, prolonging the breathing cycle, avoiding the perioral muscle fatigue, giving a continuous feedback, and therefore easier to administer and helpful during high intensity tasks¹⁰.

Mouth taping showed a significant reduction in dyspnoea status achieved by the subject during the intervention ($p=0.03$) along with increase in the distance covered during treadmill walking ($p=0.00^*$). The time taken for recovery to baseline parameters was also found to be significantly less as compared to when performed without MT.

Dyspnoea, which is often experienced during a simple task such as walking, an activity of daily living can become a major functional capacity limiting factor. If PLB can effectively reduce dyspnoea during walking then it may also prove effective if performed during other ADLs and may improve functional capacity, thereby improving quality of life¹¹.

The present study does show an increase in the treadmill walking time and a reduced dyspnoea relieving time (recovery to baseline parameters) after doing PLB as well as with MT while walking on the treadmill than without.

The greatest benefit of pursing the lips to exhale should occur when it is incorporated during exercise where the limitation by hyperinflation becomes most pronounced. Patients with COPD become dyspnoeic during exertion, not at rest. Any intervention that can slow the exhaled airflow during exertion will enable alveolar emptying and thereby create a

mechanical advantage for the subsequent inhalation. Such known interventions include bronchodilators, oxygen therapy, and exercise training itself¹².

There are many literatures supporting the effectiveness of pursing lips while exhalation in relieving dyspnoea, increasing exercise capacity, reducing respiratory rate.

When MT and PLB were compared they did not show a significant difference in the dyspnoea status reached during treadmill walking ($p=0.08$), the distance covered during treadmill walking ($p=0.2$) & the time for recovery of vital parameters to baseline.

As a result, the study suggests that PLB and MT have similar effect on the performance of subjects during the treadmill walking intervention.

CONCLUSION

We conclude that the exercise responses, reflected by the treadmill walking time, the dyspnoea status reached during exercising and the time for recovery to baseline parameters were similar in both the group; Suggesting that MT can be used as an alternative for PLB, especially when patients find it difficulty in pursing their lips voluntarily to exhale effectively or even when PLB is required for a prolonged duration.

Clinical implication: Mouth taping can be used as adjunct to PLB in order to relieve dyspnoea. It can be used in patients who have difficulty in maintaining and therefore performing pursed lip breathing.

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