



THE EFFECT OF FORWARD LEAN POSITION AND PURSED LIP BREATHING ON PEAK EXPIRATORY FLOW IN ACTIVE SMOKER

Lutfia Zein Amalia¹, Erna Setiawati², Rahmi Isma Asmara Putri², Meita Hendrianingtyas³

¹Undergraduate of Medical Student, Faculty of Medicine, Diponegoro University

²The Lecturer Science of Physical and Rehabilitation, Faculty of Medicine, Diponegoro University

³The Lecturer Science of Clinical Pathology, Faculty of Medicine, Diponegoro University

Jl. Prof. H. Soedarto, SH, Tembalang-Semarang 50275, Tel. (024) 76928010

ABSTRACT

Background: Chronic exposure to tobacco smoke cause activation of macrophages which contribute to the release of inflammatory mediators and the establishment of Chronic Obstructive Pulmonary Disease (COPD). In COPD, the airway become narrowed and result in reduced peak expiratory flow (PEF). One form of treatment that improve pulmonary functions and can be given to active smokers is by giving forward lean position and pursed lip breathing (PLB). **Aim :** To analyze the differences of PEF before and after performing forward lean position and PLB both acute and chronic types in active smokers. **Methods:** The study was quasi-experimental with pretest posttest, respondents of this study are 18 active smokers with purposive sampling. The instrument used in the research are scales, microtoise and peak flow meter. Method used for data analysis was paired and unpaired t-test. **Results:** PLB increases PEF with the mean of PEF 28.89 ± 47.08 in acute phase and 28.34 ± 40.84 in chronic phase. The combination of PLB and forward lean position increase PEF with the mean of PEF 30.00 ± 34.91 in acute phase and 46.12 ± 89.60 in chronic phase. **Conclusions:** There were not statistically significant difference of PEF in acute and chronic phase in group A between before and after intervention ($p > 0.05$). There was not statistically significant difference of PEF in chronic phase in group B between before and after intervention. There was statistically significant difference of PEF in acute phase in group B between before and after intervention. The combination of forward lean position and PLB showed to have a better effect on increasing the value of PEF than PLB without combination both acute and chronic types in active smokers.

Keywords: Pursed lip breathing, forward lean position, peak expiratory flow, active smokers

INTRODUCTION

Chronic exposure to tobacco smoke and nicotine cause inflammatory responses in the lung, which cause activation of macrophages. The macrophages contribute to the release of inflammatory mediators and secrete proteolytic enzymes that contribute to the establishment of Chronic Obstructive Pulmonary Disease (COPD).¹

In COPD, the airway become narrowed and result in reduced PEF.² PEF measurements may estimate and evaluate airway functions.³ One form of treatment that improve pulmonary functions and can be given to active smokers is by giving forward lean position and pursed lip breathing.



MATERIALS AND METHODS

This research was quasi-experiment pre and post test with control group design. Total of samples in this study were 18 subjects with the inclusion criteria 1) Adult men, aged 18-55 years, 2) with a Body Mass Index 18,50 and 24,99 kg/m² (inclusive), 3) Height ranged from 156- 183 cm, 4) Smoked at least 4 cigarettes per day for ≥ 1 year while an exclusion criterion in this study was: 1) Active smokers who had symptomatic or past history of cardiovascular or respiratory disease. This study was used non probability sampling technique type of purposive sampling. The independent variables in this study were forward lean position and pursed lip breathing exercise while the dependent variable in this study was peak expiratory flow (PEF).

RESULTS

This study took place at the Faculty of Medicine Diponegoro University Semarang on 22 nd April – 21 st August 2019. The instrument used is a peak flow meter to measure PEF. Data were analyzed using Paired t test and Independent t test. The first analysis was Paired t test if p value ≤ 0.05 then H1 accepted, which means that forward lean position and pursed lip breathing affecting PEF. While H2 rejected, which means forward lean position and pursed lip breathing does not affect PEF and the second test was independent t test to analyze the differences in the value of PEF post intervention in both groups. This study has passed the ethical test in Faculty of Medicine Diponegoro University.

Table 1. Subject characteristics

Characteristics	Mean \pm SD	Median (min-max)
Age (years)	21.72 \pm 5.88	21.00 (18.00-44.00)
Weight (kg)	58.89\pm7.34	59.00 (45.00-77.00)
Height (cm)	168.22\pm5.65	168.00 (156.00-180.00)
BMI (kg/m ²)	20.74\pm1.67	20.30 (18.49-24.30)
PEF pre-acute A*	531.11\pm57.32	540.00 (440.00-600.00)
PEF pre-chronic A*	531.67\pm60.21	525.00 (450.00-630.00)
PEF pre-acute B [#]	495.56 \pm 107.95	450.00 (430.00-770.00)
PEF pre-chronic B [#]	512.78 \pm 110.43	460.00 (430.00-770.00)

*A = Group A (*pursed lip breathing*)

[#] B = Group B (*pursed lip breathing with forward lean position*)



Total 18 adult males were used in this study. Results were expressed as mean \pm standard deviation. The means and the

standard deviations for each group for age, weight, height, BMI, and PEF are given in Table 1.

Table 2. PEF in acute phase before and after forward lean position and Pursed Lip Breathing exercise

Group	Pre-test		Post-test		p value
	Median (min-max)	Mean \pm SD	Median (min-max)	Mean \pm SD	
Pursed lip breathing	540.0 (440.0-600.0)	531.11 \pm 57.32	570.0 (480.0-630.0)	560.00 \pm 53.33	0.103
Forward lean position and Pursed lip breathing	510.0 (430.0-770.0)	495.56 \pm 107.95	510.0 (435.0-800.0)	525.56 \pm 111.79	0.021

The mean of PEF pre and post in group A was 531.11 \pm 57.32 and 560.00 \pm 53.33 respectively. The mean of PEF pre and post in group B was

495.56 \pm 107.95 and 525.56 \pm 111.79. The data showed that there were differences mean of PEF before and after exercise in both groups. But, not statistically significant in group A.

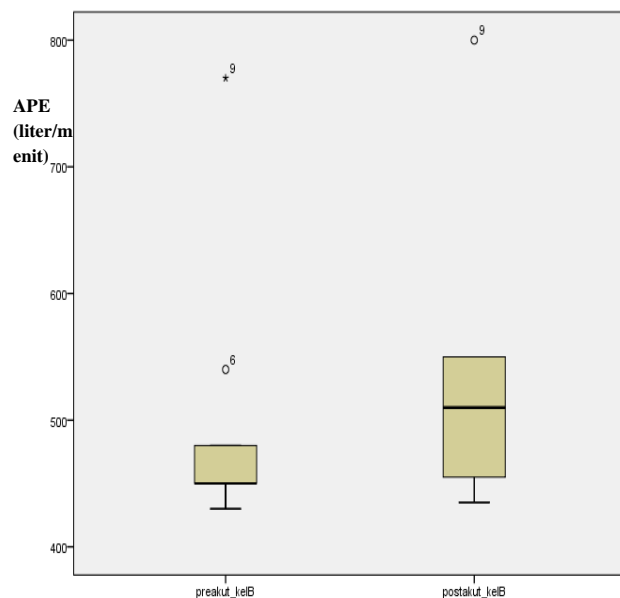
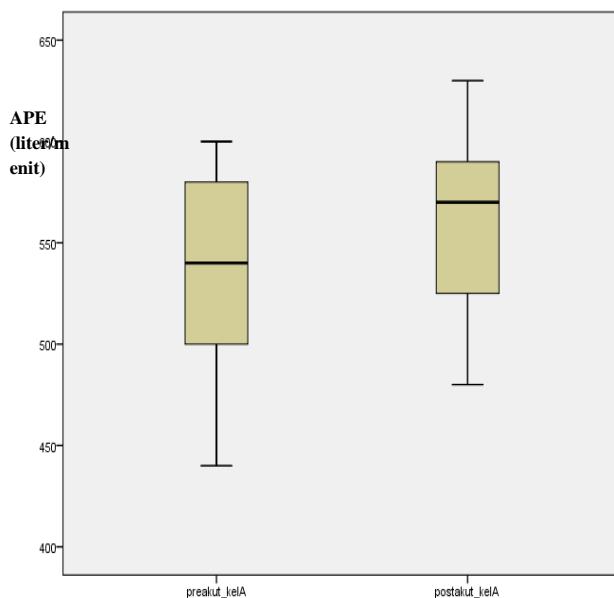




Table 3. PEF in chronic phase before and after forward lean position and Pursed Lip Breathing exercise

Group	Pre-test		Post-test		p value
	Median (min-max)	Mean±SD	Median (min-max)	Mean±SD	
Pursed lip breathing	525.0 (450.0-630.0)	531.67±60.21	570.0 (480.0-630.0)	560.01±53.33	0.071
Forward lean position and Pursed lip breathing	505.0 (430.0-770.0)	505.0±108.91	500.0 (435.0-800.0)	550.57±117.13	0.066

The mean of PEF pre and post in group A was 531.67±60.21 and 560.01±53.33 respectively. The mean of PEF pre and post in group B was 505.0±108.91 and 550.57±117.13. The data

showed that there were differences mean of PEF before and after exercise in both groups. But, not statistically significant in both groups.

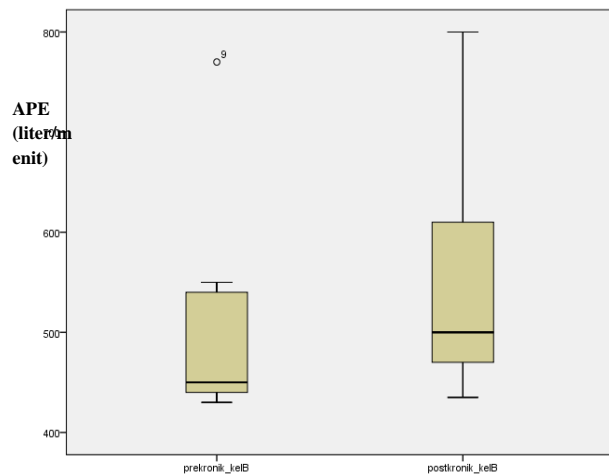
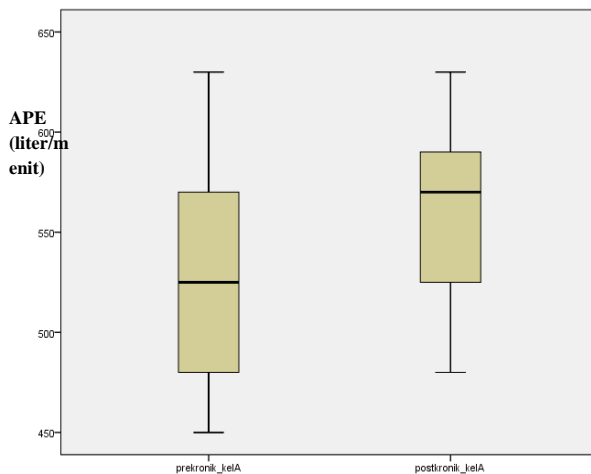


Table 4. Comparison of peak expiratory flow in acute phase between PLB and PLB with forward lean position

Group	Mean±SD	p value
Pursed lip breathing	28.89±47.08	0.955
Forward lean position and Pursed lip breathing	30.00±34.91	

Independent t test showed p value 0.955 (>0.05), which indicated that there was not statistically significant difference of peak expiratory flow in acute phase between the two groups before and after

intervention. The data showed that active smokers who received a combination of forward lean position and PLB increased peak expiratory flow value higher than the PLB without combination, but statistically



not significant with p value = 0.955 ($p > 0.05$).

Boxplot showing the relationship of (Δ) PEFR in acute phase between the two groups.

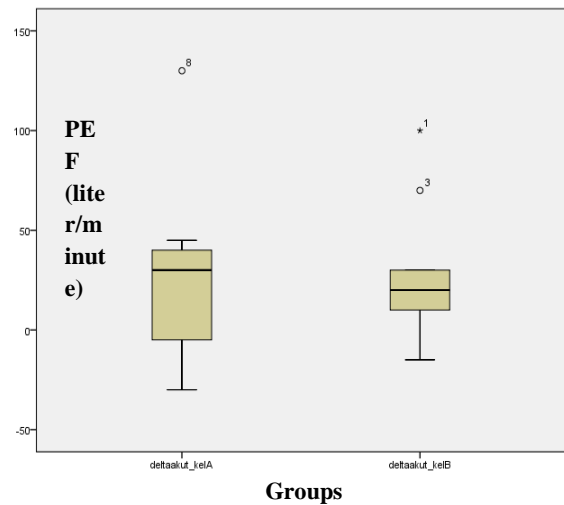
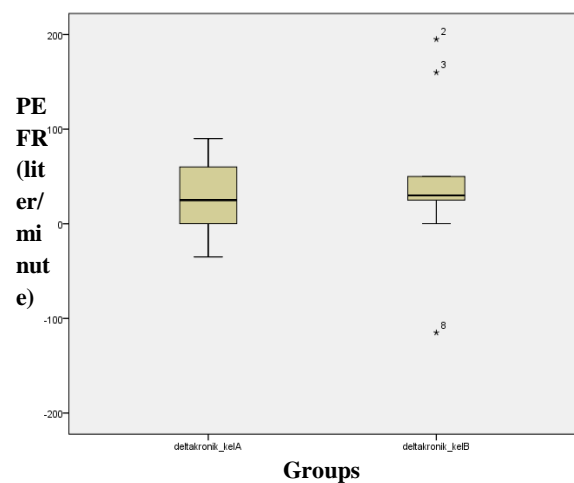


Table 5. Comparison of peak expiratory flow in chronic phase between PLB and PLB with forward lean position

Group	Mean±SD	p value
Pursed lip breathing	28.34±40.84	0.599
Forward lean position and Pursed lip breathing	46.12±89.60	

Independent t test as shown in the table 5 showed p value 0.599 (> 0.05), which indicated that there was not statistically significant difference of peak expiratory flow in chronic phase between the two groups before and after intervention. The data showed that active smokers who received a combination of forward lean position and PLB increased peak expiratory flow value higher than the PLB without combination, but statistically not significant with p value = 0.599 ($p > 0.05$).

Boxplot showing the relationship of (Δ) PEFR in chronic phase between the two groups.





DISCUSSION

The aim of this research was to examine the results of forward lean position and PLB exercise as a treatment approach for increasing PEF in active smokers. The study was conducted in 18 subjects, for duration of four weeks. The subjects were divided into two groups consisting of 9 subjects in each group. Group A was given PLB and Group B was given forward lean position and PLB exercise. Both groups were given intervention for 3 times in a week for 4 weeks.

Pursed lip breathing helps to keep airways open longer during exhalation and decreases airway resistance. This process improves gas exchange, permits more complete exhalation, and emptying of CO₂ from the lungs. Pursed lip breathing causes less air trapping which result in reduction of hyperinflation.^{4,5} In this situation, PaO₂ will increased and decreased PaCO₂ so the peak expiratory flow will increase.⁶

The results of this study showed that the PEF value of acute and chronic effects between before and after intervention in the PLB group did not obtain statistically significant difference, indicated by p value > 0.05. The results of this study are in line with Leanne M.

Wade's research, which stated that not all of the research subjects experienced increased lung function whose measurements were made right after doing PLB exercises. This might be caused by the subject still feeling tired at the time of measurement, resulting in less than maximum measurement results.⁷

The forward lean position helps in decreased the volume of thoracic cage and increased intraalveolar pressure. The decreasing volume of the thoracic cage, causing the intraalveolar pressure to rise above atmospheric pressure, make it easier increased air flows out of the lungs, which when combined with PLB exercises, both of them will work synergistically in increasing the value of PEF.⁸

The PEF value of the acute effect in the CKD and PLB group showed that there was a statistically significant difference between before and after exercise with a p value of 0.021. The study done by Rikk Gosselink investigated the effects of forward lean position and pursed lip breathing exercise on breathing control. This study found that forward lean position and pursed lip breathing exercise resulted in a reduced the shortness of breath. Thus this study shows similarity to the findings of the present study that



Lutfia Zein Amalia, Erna Setiawati,
Rahmi Isma Asmara Putri, Meita Hendrianingtyas

forward lean position and pursed lip breathing have an effect on peak expiratory flow. Forward lean position and pursed lip breathing help to reduce shortness of breath in several mechanism; improvement of gas exchange, reduction of hyperinflation, and improvement of diaphragm function which resulted in increasing peak expiratory flow.⁹

The results of this study showed that PEF value of chronic effect between before and after exercise did not obtain a statistically significant difference. No significant results in this study can be caused by the different levels of visceral fat of the subjects. Higher visceral fat of subjects made PEF value lower. Increased visceral fat influenced the movement of the chest and diaphragm, and caused a decreased in respiratory function.^{10,11}

CONCLUSIONS

Based on the results of this study, there were not statistically significant differences of PEF in acute and chronic phase in group A between before and after intervention ($p > 0.05$). There was statistically significant difference in mean improvement PEF in acute phase after intervention in group B. There was no statistically significant difference of PEF

in chronic phase in group B after intervention. But, it can be concluded that the combination of forward lean position and PLB showed better improvement on increasing the value of PEF than PLB without combination both acute and chronic types in active smokers.

REFERENCES

1. Suradi. Pengaruh Rokok Pada Penyakit Paru Obstruksi Kronik (PPOK). Surakarta: Universitas Sebelas Maret; 2007.
2. Adeniyi BO. The peak flow meter and its use in clinical practice. *African J Respir Med.* 2011;33(3):22–4.
3. Mu L, Deng F, Tian L, Li Y, Swanson M, Ying J, et al. Peak expiratory flow, breath rate and blood pressure in adults with changes in particulate matter air pollution during the Beijing Olympics: A panel study. *Environ Res* [Internet]. 133:4–11. Available from: <http://dx.doi.org/10.1016/j.envres.2014.05.006>
4. Widiyani CTC. Pengaruh Pursed Lips Breathing Exercise Terhadap Arus Puncak Ekspirasi (APE) Pada Pasien Bronkitis Kronis Di Poli Spesialis Paru B Rumah Sakit Paru Kabupaten Jember. Universitas Jember; 2015.



Lutfia Zein Amalia, Erna Setiawati,
Rahmi Isma Asmara Putri, Meita Hendriangtyas

5. Aini F, Sitorus R, Budiharto. Pengaruh Breathing Retraining terhadap Peningkatan Fungsi Ventilasi Paru pada Asuhan Keperawatan Pasien PPOK. *J Keperawatan Indones* [Internet]. 2008;12(1):29–33. Available from: <http://jki.ui.ac.id/index.php/jki/article/view/196/307>
6. Shine G, Saad S, Nusaibath S, Shaik AR, Padmakumar S. Comparison of Effectiveness of Diaphragmatic Breathing and Pursed-Lip Expiration Exercise in Improving the Forced Expiratory Flow Rate and Chest Expansion in Patients with Bronchial Asthma. *Int J Physiother*. 2016;3(2):154–8.
7. Wade LM. A Pilot Study of Pursed Lip Breathing, Singing, and Kazoo Playing on Lung Function and Perceived Exertion of Participants Who Smoke [Internet]. University of Kansas; 2017. Available from: https://kuscholarworks.ku.edu/bitstream/handle/1808/25230/Wade_ku_0099
8. Khasanah S, Maryoto M. Efektifitas Posisi Condong Ke Depan (CKD) Dan Pursed Lips Breathing (PLB) terhadap Peningkatan Saturasi Oksigen Pasien Penyakit Paru Obstruktif Kronik (PPOK). *J Kesehat Al-Irsyad*. 2015;7(1):25–35.
9. Gosselink R. Controlled breathing and dyspnea in patients with chronic obstructive pulmonary disease (COPD). *J Rehabil Res Dev*. 2003;40(5):25–34.
10. Ilham Wahyu CM. Hubungan Nilai Arus Puncak Eskpirasi dengan Indeks Massa Tubuh pada Mahasiswi Fakultas Kedokteran Universitas Muhammadiyah Sumatera Utara. *Ibnu Sina Biomedika*. 2017;1(1):57–68.
11. Ihwanu Sholeh, Darmawati Ayu Indraswari BL. Hubungan Lingkar Pinggang dengan Arus Puncak Ekspirasi pada Populasi Sindrom Metabolik. *Media Med Muda*. 2015;4(4):965–74.