Supriwandani, H., Mardiyono., Warijan. Belitung Nursing Journal. 2018 February;4(1):58-67
Received: 18 July 2017 | Accepted: 2 September 2017
http://belitungraya.org/BRP/index.php/bnj/

ORIGINAL RESEARCH **ISSN: 2477-4073**

SLOW DEEP PURSED-LIPS BREATHING EXERCISE ON VITAL LUNG CAPACITY IN POST-EXTUBATION PATIENTS IN THE INTENSIVE CARE UNIT

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Abstract
Background: The incidence of respiratory failure reaches 20-75 cases per 100,000 population each year with mortality rate reaching 30-50%. Provision of respiratory assistance with mechanical ventilation is provided with an indication of the inability of the respiratory function for optimal alveolar ventilation. Efforts to restore lung oxygenation ventilation function can be done through breathing exercises and are expected to improve pulmonary ventilation function.
Objective: This study was to examine the effectiveness of the modified Slow Deep Pursed-Lips Breathing Exercise (SDPLBE) on vital lung capacity in patients post-extubation of mechanical ventilators.
Methods: This was a true experimental study with pretest posttest control group design. Thirty respondents were selected using stratified random sampling, with 15 samples assigned in the experiment and control group. Peak flow meter was used to measure vital lung capacity (FEV1 value). Repeated measures ANOVA was used for data analysis.
Results: There was a significant difference on respondent's vital lung capacity after given slow deep pursed lips-breathing exercise at each session from session 1 to session 8 (p=0.000). However, both groups were not yet able to achieve ≥ 400 mL / min, but the experiment group was closer to the normal value (369) than the control group.
Conclusion: Slow Deep Pursed-Lips Breathing Exercise may increase vital lung capacity in patients post-extubation of mechanical ventilator.

Keywords: slow deep pursed-lips breathing exercise; vital lung capacity; post-extubation; mechanical ventilator

INTRODUCTION

The incidence of respiratory failure reaches 20-75 cases per 100,000 population each year with a mortality rate of 30-50% (Opdahl, 2010). Respiratory failure is the most common reason for treatment in intensive care unit (ICU). Respiratory failure is a pulmonary inability to maintain the O2 and CO2 homeostatic balance in the body and the inability of the lungs to provide adequate O2 or reduce CO2 in the body. Further respiratory failure may be defined as failure of ventilation and/or oxygenation failure caused by respiratory disturbance, chest muscle diseases, chronic inflammation of lung tissue and other causes such as trauma that damage lung tissue or other organs such as heart and brain (Winkelman, Workman, & Hausman, 2010).

Provision of respiratory assistance with mechanical ventilation is provided with an indication of the inability of the respiratory function to perform optimal alveolar ventilation (Sellares et al., 2009). The aid is to meet the body's oxygen requirements, reduce respiratory work, increase oxygenation to the tissues or correct respiratory acidosis (Smeltzer et al., 2008). Multinational surveys with 5000 clients indicated that mechanical ventilation is used in cases of acute respiratory failure (69%), coma (17%), chronic respiratory failure (13%) and neuromuscular disorders (2%) (Rodriguez, Dojat, & Brochard, 2005).

The main indications of mechanical ventilator installation are the presence of respiratory or clinical failure leading to respiratory failure. Conditions leading to respiratory failure include refractory hypoxemia, acute hypercapnia, or a combination of both. Another indication is severe pneumonia that remains hypoxemic although given high-pressure oxygen or COPD exacerbation which the PaCO2 increases suddenly and leads to acidosis (Setiati et al., 2014).

When a patient using a mechanical ventilator starts breathing on his own and the reason the MV's installation is resolved, the nursing team may decide to wean the patient. Weaning is not always done as in the case of patients recovered from surgery. If the patient breathes spontaneously, consciously, can follow instructions, and normal vital signs, the patient can be extubated without the weaning period. Weaning is an organized trial in which the patient is allowed to breathe spontaneously for an extended period of time until the patient can breathe on his own after the MV is released (Terry & Weaver, 2014).

Nursing actions that have been implemented in the Intensive Care Unit of General Hospital of Dr. Moewardi Surakarta, General Hospital of Tugurejo Semarang City, and General Hospital of Ambarawa on post mechanical ventilation patients include: giving nasal oxygen for maintenance of oxygen requirement, hemodynamic monitoring, suctioning and postural drainage to overcome airway obstruction as well as daily needs fulfillment such as nutrition, elimination, fluid and electrolyte. According to literature, the role of nurses in monitoring lung oxygenation ventilation function is well done, even the manifestations of respiratory distress receive more attention from ICU nurses (Priyanto, Irawaty, & Sabri, 2011).

Efforts to restore lung oxygenation ventilation function can be done through breathing exercises and are expected to improve pulmonary ventilation function (Winkelman et al., 2010). El-Batanouny research said that breathing exercises after six weeks can increase respiratory muscle strength so that pulmonary ventilation function improves. Ventilation improvements can be achieved after diaphragmatic exercise, deep breathing, incentive spirometry, gait and limb exercises. Increased airway resistance and decreased residual air lead to the required inspiratory muscle strength to be minimal (El-Batanouny, Salem, & El-Nahas, 2009). Respiratory and chest muscle exercises can increase lung capacity. The results of previous study indicate a strong relationship between the capacity of diffusion and vital capacity of the lung. Exercise in the form of breathing exercises such as deep breathing exercise can be performed by healthy people or lung sufferers to increase lung volume and capacity (Nury, 2008).

According to literature, after extubation weaning, patients are encouraged to immediately practice deep breathing exercises every half hour, using incentive spirometers every 2 hours and train sitting semi fowler (Winkelman et al., 2010). Deep breathing exercise can be started 1 hour post-extubation by doing deep breath as much as 30 times per hour when wakeful (during the day) for first post operation for 4 days (Westerdahl, Lindmark, Eriksson, Hedenstierna, & Tenling, 2005). Deep breathing exercise consists of 10 deep breaths, divided into 3 stages for half an hour with effective cough pauses to mobilize secretions, if possible, patients do exercise with a sitting position. Nurses teach and supervise the practice of the patients who are instructed to perform maximum inspiration slowly to end Functional Residual Capacity (FRC) and minimize airway obstruction and alveolar collapse (Westerdahl et al., 2005).
Some types of breathing exercises that can be recommended for pulmonary recovery are

Diaphragmatic Breathing Exercise (DBE), and Incentive Spirometer, Deep Breathing Exercise (DBE), and Pursed-Lips Breathing Exercise (PLB) (Smeltzer et al., 2008). Diaphragmatic Breathing Exercise (DBE) allows doing deep and full breath with little effort. Deep Breathing Exercise (DBE) is an important factor in performing effective and normal cough. A strong cough is often less effective compared with controlled cough, or coughing with Pursed-Lips Breathing Exercise (PLB) helps the patient to control the breath. The shriveling lips provide resistance to the air flowing out of the lungs, thereby prolonging the exhalation and preventing airway collapse by maintaining positive pressure on the airway (Kozier, 2008).

Deep Breathing Exercise and Pursed-Lips Breathing Exercise have been used in numerous studies to improve pulmonary oxygenation ventilation that researchers have summarized from a range of 10 years back. Deep Breathing Exercise (DBE), used by some researchers said that patients who did DBE after CABG surgery can minimize pulmonary atelectasis and better lung function on day 4 postoperatively than control group (Westerdahl et al., 2005), and DBE may increase pulmonary oxygenation (Winkelman et al., 2010), and can increase oxygenation after major head and neck surgery without causing additional harmful hemodynamic effects (Gen, Ikiz, & Günerli, 2008).

Priyanto's study found a positive effect of DBE on ventilation oxygenation function in post-mechanical ventilation patients on days 4 and 5, but there was no significant difference in oxygenation function between 1 hour post-extubation and on the second day (24 hours post-extubation), the value of the vital capacity of the lung cannot reach ≥ 400 mL / min (normal value) (Priyanto et al., 2011). There was an increase in lung oxygenation ventilation function until day 5 but the value of the vital capacity of the lung cannot reach the normal value. Bilo indicated that Slow Deep Breathing improve lung oxygenation ventilation function indicated by increased oxygenation of blood, reduce blood pressure systemic and pulmonary high areas, but does not alter the diffusion of lung gas (Bilo et al., 2012).

Another breathing exercise that can be used is Pursed-Lips Breathing (PLB), shown in previous study indicated that Pursed-Lips Breathing study proved to increase gas exchange with increased arterial oxygenation and saturation (SaO2) as well as decreased levels of carbon dioxide in the arteries primarily by encouraging the use of slow and deep breathing patterns (Burtscher, 2009). This effect was observed in healthy subjects in low and high places as well as in patients with pulmonary edema and people with obstructive pulmonary disease. Frank conducted a 2 minute-PLB method study and then performed a forced inspiration test 5 times and followed by 2 minutes of PLB again, and 3 times forced expiration test, which the result could increase the inspiratory capacity of the lungs (Visser, Ramlal, Dekhuijzen, & Heijdra, 2011). Surya conducted a 10 minute PLB study after the subjects were 6 minutes walking (Bhatt et al., 2013), then Hartono indicated that PLB was effective on the increase in vital capacity of the lung (Hartono, 2015).

Based on effect size calculation from previous research, Westerdahl and Priyanto research showed a weak effect size on the influence of Deep Breathing Exercise intervention implementation to Lung Ventilation Function in post mechanical ventilator post-extubation (Priyanto et al., 2011; Westerdahl et al., 2005). Priyanto's research found that the effect size of DBE intervention on lung oxygenation ventilation function was -0.067 (very weak category), on respiratory pattern 0.17 (very weak category), and on oxygen saturation -0.58 (very weak category) (Priyanto et al., 2011). So, it can be concluded that the deep breathing exercise has not been effective or the effect is still weak in improving lung oxygenation ventilation function at 24 hours post-extubation in previous studies so that risk for reintubation is high. Grzegorz Billo's research revealed that slow deep breathing exercise can improve the oxygenation ventilation seen from oxygen saturation by 3.37% and respiration rate decrease 1.7% at high altitudes (Bilo et al., 2012). Frank J. Visser said Pursed-lips Breathing Exercise can improve lung oxygenation ventilation function in patients with COPD disease as indicated by oxygen saturation increased 61.3%, inspiration capacity increased by 31.5%, respiratory pattern decreased by 57%, vital pulmonary capacity increased by 77% (Visser et al., 2011). Hartono said Pursed-lips Breathing Exercise can increase the vital capacity of lung in COPD patients seen from the results of research that the vital capacity of the lung increased as much as 23.88% (Hartono, 2015) .

Based on the literature review and the above data, the potential for modification of the intervention of the existing type is still open for modification to improve the quality of Breathing Exercise in post-extubation weaning patients. Pursed-lips Breathing Exercise is one of the effective breathing exercises on improving ventilation function of pulmonary oxygenation. It is interesting for researchers to modify these two interventions to improve pulmonary oxygen ventilation function and time of successful weaning in post-operative extubation of mechanical ventilation. This study aimed to examine the effectiveness of the modified Slow Deep Pursed-Lips Breathing Exercise (SDPLBE) on vital pulmonary capacity in patients post-extubation of mechanical ventilators.

METHODS

Study design

This was a true experimental study with pretest posttest control group design.

Setting

The study was conducted for 3 months in 2017 in the Intensive Care Unit of the General Hospital of Pantiwilasa Citarum Semarang, the General Hospital of Roemani Semarang, and the General Hospital of Semarang City.

Sample

The target population is all patients post-extubation of mechanical ventilation in the three hospitals. The inclusion criteria of the sample were adult patients post 1-hour extubation of mechanical ventilation due to respiratory failure, patients were capable of spontaneous breathing, willing to be respondent, and understood instruction both orally and in writing. The exclusion criteria included patients in very weak condition, total bedrest program, patients with severe pain, received central nervous system drug, patients with tracheostomy, and had a history of surgery with the installation of mechanical ventilation maintenance program. Thirty respondents were selected using stratified random sampling, with 15 samples assigned in the experiment and control group.

Intervention

Experiment and control groups received treatment and medical action according to hospital procedure, namely suctioning, nasal oxygenation, over lying, basic needs fulfillment: electrolyte fluid, nutrition, elimination and personal hygiene. For the experiment group, Slow deep Pursed-Lips Breathing Exercise training was given with the procedure as the following: Exercise started from the preparation of tools and materials, hand washing according to the procedure, identifying post-extubation has reached the duration of at least 1 hour, checking the respiratory status, identifying the patient was not in severe pain, severe shortness of breath and emergency, ensuring the patient was conscious and able to follow orders well, arranging the patient's position, teaching effective cough if there was a secret, and the patient was instructed to do Slow Deep Pursed-Lips Breathing Exercise (SDPLBE) with the following instructions: the patient was instructed to breathe slowly and deeply through the mouth and nose, until the stomach was pushed to a maximum / expand and then let stand 3 seconds then exhaled slowly by pursing the lips (this breath exercise continued for 30 minutes followed by tidal volume inspection with forced inspiration and expiration forced irradiation).

The exercise was divided into 8 sessions in 24 hours and each session was 2 hours long. This breathing exercise was conducted in 8 sessions for 24 hours when patient was awake at 08.00-22.00 (7 sessions) and 06.00 (1 session). The control group was given nasal oxygenation of the canal and semi fowler position according to hospital procedure. In both groups, observation of lung oxygenation ventilation function was performed before and after exercise which started 2 hours after extubation and then observed the success of weaning after 24 hours post-extubation.

Instruments

To measure the vital capacity of the lung (FEV1 value), Peak flow meter was used. Vital capacity (VC) is the volume of air that can be exhaled after maximum inspiration. VC can be assessed from the results of measurement of forced vital capacity (FVC) and forced expiratory volume (FEV1). This examination may use a spirometry or peak flowmeter. The purpose of this examination was to measure objectively the airflow in the large airways. The observation sheet was also used to record the results of respiratory exercise procedure (Slow Deep Pursed-Lips Breathing Exercise) and lung vital capacity observation sheet (FEV1 value), developed by the researchers with good content validity results from the experts.

Ethical consideration

The ethical approval of the study was obtained from the Research Ethics Commission of Poltekkes Kemenkes Semarang (Approval No: 241 / KEPK / Poltekkes-SMG / EC / 2016). Prior to data analysis, each respondent has signed an appropriate informed consent.

Data analysis

Data were analyzed using repeated measures ANOVA.

RESULTS

Table 1 Characteristics of respondents based on age, gender, BMI, disease, and hospitals (N=30)

Variable	Group		Group				Total		*p*
	Experiment	Control	Experiment		Control				
	Mean±SD	Mean±SD	f	%	f	%	N	%	
Age (Years)	(43.13±14.14)	(50.33±16.67)							0.110
12-25			2	13	2	13	4	13	
26-35			1	7	2	13	3	10	
36-65			12	80	11	74	23	77	
Gender									
Male			6	40	7	47	13	43	
Female			9	60	8	53	17	57	
BMI	(22.75±2.81)	(21.04±2.52)							0.262
Disease									
Pulmonal			8	53	8	53	16	53	
Non-Pulmonal			7	47	7	47	14	47	
Hospital									
Citarum Hospital			11	74	10	67	21	70	
Semarang Hospital			2	13	3	20	5	17	
Roemani Hospital			2	13	2	13	4	13	

Table 1 shows that the mean age between the experiment and control groups was not different (p = 0.110), which ranging from 36-65 years. The distribution of respondents by gender of both groups was also not different (p = 1.000), which most of respondents were females (56%). The mean BMI of the experiment group was 22.75 kg/m^2 and the control group was 21.04 kg/m^2. Respondents in this study had been stratified based on the history of the illness suffered by the respondent as the cause of the use of mechanical ventilator. Both groups were divided by type of pulmonary disease (53%)

and non-pulmonary disease (47%). This study collected the data of respondents from 3 different hospitals where the number of patients in Pantiwilasa Citarum Hospital was 21 people (70%), General Hospital of Semarang was 5 people (16.7%), and Roemani Hospital was 4 people (13.3%).

Table 2 Difference vital lung capacity on FEV1 value between experiment and control group using *Repeated Measure ANOVA (Tests of Within-Subjects Effects)* (N=30)

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Session	80222.500	196	409.298	225.945	.000

Table 2 shows that the F value for the "session" factor was statistically significantly different (F 80222.5, 196, p = 0.00). Thus, it can be concluded that there was a significant difference on respondent's vital lung capacity after given slow deep pursed lips-breathing exercise at each session from session 1 to session 8.

Table 3 Difference vital lung capacity on FEV1 value between experiment and control group using *Pairwise comparisons* (N=30)

Group	(Pre) Session	(Post) Session	*P-value*
Experiment group	1	8	.000
	1	2	1.000
	2	3	.000
	3	4	.000
	4	5	.003
	5	6	.000
	6	7	.000
	7	8	.000
Control group	1	8	.000
	1	2	.061
	2	3	.000
	3	4	.570
	4	5	.000
	5	6	.001
	6	7	.127
	7	8	.002

Table 3 shows the differences in the vital lung capacity before and after treatment at each session. The slow deep pursed-lips breathing exercise has a significant effect on increasing the vital lung capacity in session 2 with session 3, session 3 with session 4, session 4 with session 5, session 5 with session 6, session 6 with session 7, session 7 with session 8, and session 1 with session 8. In the control there was a significant effect between session 2 with session 3, session 4 with session 5, session 5 with session 6, session 7 with session 8 and session 1 with session 8.

Table 4 shows that there was a significant difference between vital lung capacity at sessions 6, 7, 8 in the experiment group compared with the control group (p = 0.000). Both groups experienced an increase in vital lung capacity at the 4th session. However, both groups were not yet able to achieve ≥ 400 mL / min, but the experiment group was closer to the normal value than the control group (mean 369).

Table 4 Analysis of FEV1 differences between experiment and control groups (N=30)

Variable		Mean	SD	*P-value*
FEV1	**Group**			
Session 1	Experiment	168.000	4.235	.956
	Control	167.667	4.235	
Session 2	Experiment	168.000	4.272	.913
	Control	168.667	4.272	
Session 3	Experiment	168.000	4.272	.913
	Control	168.667	4.272	
Session 4	Experiment	179.667	5.328	.210
	Control	170.000	5.328	
Session 5	Experiment	193.333	5.636	.772
	Control	191.000	5.636	
Session 6	Experiment	260.667	7.908	.000
	Control	214.667	7.908	
Session 7	Experiment	311.333	9.720	.000
	Control	229.000	9.720	
Session 8	Experiment	369.000	11.340	.000
	Control	255.000	11.340	

DISCUSSION

Characteristics of respondents

Characteristics of respondents in this study included age, gender, and BMI conceptually as confounding factors estimated to have a relationship with dependent variable. Findings of this study showed that age, gender and BMI between the experiment and control groups were homogeneous. There was no difference of the characteristics between both groups. The mean age in both groups ranged from 36-65 years old, considered as elderly group.

According to literature, age may affect pulmonary function decline. Respiratory function and blood circulation will increase in childhood and reach maximum by age 20-30 years, then decrease again in the age of elderly. Pulmonary diffusion capacity, pulmonary ventilation, vital oxygen uptake and all other lung physiological parameters will be decreased in aging period (Hartono, 2015).

The results of this study fit Martin's opinion, et al that the average age of patients who successfully performed weaning and average extubation was more 59 ± 15 years. Martin also said that younger clients require shorter treatment and have higher survival, while older age has a higher dependence on ventilators (Burtscher, 2009). Most of the respondents were female, 60% in the experiment group and 54% in the control group. According to literature the incidence of respiratory failure in females was higher than the incidence in men. It is because the physiological capabilities of male lung compliance were higher, but Martin et al. also found that the success rate of weaning ventilators at women were higher (Burtscher, 2009).

The mean BMI of the experiment group was 22.75 kg/m2 and control group was 21.04 kg/m2, categorized as a normal category. Westerdahl et al found that the average respondent post mechanical ventilation has a BMI of about 27 ± 4 kg/m2. A person who has a higher BMI describes the condition of obesity associated with decreased pulmonary compliance (Westerdahl et al., 2005).

Differences in Vital Lung Capacity Between Group Intervention and Control Group

Findings of this study showed that there was a significant difference on respondent's vital lung capacity after given slow deep pursed lips-breathing exercise at each session from session 1 to session 8.It proves that slow deep pursed-lips breathing exercise can help the lungs to perform post-extubation adaptation. Exercise to inhale and exhale air helps developing chest circumference and train the respiratory muscles so as to increase vital volume and capacity. On day 4, the vital capacity of the lung increases very high. Pathophysiologically, in respiratory failure, there is an injury to the alveolar pulmonary membrane that may result in leakage of fluid into capillary webs leading to uneven imbalances of ventilation and oxygenation, which result in alveolar collapse. Pulmonary compliance becomes very decreased (stiff) resulting in decreased lung capacity characteristics, hypoxia and hypocapnia. Low flow state of hypoxia leads to metabolic disorders resulting in the formation and release of quinine, amines, serotonin and other toxic factors. Furthermore, vasoconstriction occurs, decreasing perfusion and alveolar stability, which is at risk of atelectasis, edema and hemorrhagic, and decreasing pulmonary compliance.

Slow deep breathing exercise is a lung activity to train breathing inspiratory muscles. Pursed-lips breathing exercises are exercises to train expiratory muscles to prolong exhalation and increase airway pressure during expiration, thereby reducing the number of airway traps (Smeltzer et al., 2008).

Slow deep pursed-lips breathing exercise is expected to train the inspiratory muscles to prevent the occurrence of such threats. According to literature, exercising the inspirator muscle will help improving vital pulmonary capacity (Padula & Yeaw, 2006). The results of this study strengthen Nury's study that breathing exercises can increase vital pulmonary capacity by measuring the values of FEV1 and FVC (Nury, 2008).

Deep breathing exercise is performed to produce a lower/negative pressure on the intrathoracic, so that air will flow from higher / positive atmospheric pressure into the lungs having a lower / negative pressure as a gas exchange process or lung ventilation (Padula & Yeaw, 2006). Guyton and Hall stated that the volume of air entering and exiting the lungs were recorder through spirometer / peak flowmeter examination (Guyton & Hall, 2012). The volume of air will reach its normal value when the functional ability of the lung is good. Breathing exercises will train the inspiratory muscles to increase the volume and ability of the lung capacity. The training of the inspiratory muscles will improve the lung's ability to accommodate the air volume, so that FEV1 values will increase. According to

According to Padula and Yeaw (2006), breathing exercises aim to increase the ability of the inspiratory muscles in a variety of minimal conditions including the post mechanical ventilation. Muscle condition does not work during mechanical ventilation to be a lung-dependent factor. Some things that require breathing strength are conditions weakness and fatigue. Twenty percent of body energy and oxygen are used to support respiratory activity including supporting respiratory muscle activity during problems/disorders (Padula & Yeaw, 2006). Several experimental studies from Weiner in Padula and Yeaw (2006) suggest that inspirator muscle training has a significant impact on decreased complaints of breathlessness, increased FVC and reduce the range of symptoms of pulmonary impairment. In addition, Sperlich's study, et al suggests that breathing exercises can improve the physical appearance of a person free from weakness and fatigue conditions (Schiffer, Kleinert, Sperlich, Schulte, & Strüder, 2009).

Slow deep breathing exercise and pursed lips breathing exercise are ones of a combination of breathing exercises proven to increase the ability of inspiratory and expiratory muscle strength, as have been developed in several studies (Bilo et al., 2012; El-Batanouny et al., 2009; Hartono, 2015; Visser et al., 2011; Westerdahl et al., 2005). Slow deep pursed-lips breathing exercise will be able to complete treatment procedure actions, especially nursing modal modalities that already exist in the context of intensive care. Monitoring should be done continuously to anticipate changes in oxygenation ventilation function so that emergency action needs to be done to overcome them. The most frequent causes of inadequate oxygenation ventilation function are airway obstruction as well as some underlying disease factors such as (i) central nervous system depressions, which will depress the respiratory center located at the bottom of the brainstem, excess plow of anesthetic drug, opium, head injury, stroke as well as brain infections; (ii) primary neurologic abnormalities that also affect respiratory function; (iii) postoperative period; and (iv) pleural disorders and trauma. Priyanto (2010) states that, in the short term, deep breathing exercise is beneficial to improve pulmonary function, similar with Hartono (2015) stated that pursed-lips breathing exercise can increase vital pulmonary capacity. Thus, a combination of the two may be useful in improving the function of pulmonary oxygenation ventilation.

Findings of this study showed that there was a significant difference between vital lung capacity at session 6, 7, 8 in the experiment group compared with the control group ($p = 0.000$). Both groups experienced an increase in vital lung capacity at the 4th session. However, both groups were not yet able to achieve ≥400 mL / min, but the experiment group was closer to the normal value than the control group (mean 369). The average of FEV1 in 1 hour post-extubation was only able to achieve no more than 160 mL/min, which indicated a very weak post-extubation lung condition, but after treatment increased to a value of 369 mL / min.

The slow deep pursed-lips breathing exercise intervention statistically resulted in a significant increase in forced expiratory volume of the first second with an average value of 369.00 ± 52.04 (54.5%) compared with the pre-treatment value ($p < 0.05$). In this study also seen that slow deep pursed-lips breathing exercise effect was 18 (very strong) to the vital lung capacity of patients post-extubation mechanical ventilator. Some conditions, such as COPD and respiratory diseases, show that the vital capacity of the lungs under normal conditions is only about 200-300 mL / min, so the average FEV1 value of the results of the study illustrates that the respondents in the control group had a causative / risk factor of respiratory diseases.

CONCLUSION

In conclusion, slow deep pursed-lips breathing exercise intervention was effective to increase vital capacity of the lung, which can be seen from significant increase of FEV1 value from session 2 to 8 or 24-hour post-extubation. The effect size of the slow deep pursed-lips breathing exercise interventions obtained in this study was better than the previous studies. Slow deep pursed-lips breathing exercise interventions can increase FEV1 by 54.5%, so it is better used to improve vital lung capacity post-extubation of mechanical ventilator than the previous studies.

This breathing exercise can be a choice of therapy of nursing modalities in respiratory management. It is suggested for nurse clinic practitioners to apply slow deep pursed-lips breathing exercise to patients after 1 hour of extubation. Further studies is needed to examine the effectiveness of respiratory management on time of success of weaning seen from lung ventilation function per hour before 24 hours post-extubation of mechanical ventilator, and the effectiveness of respiratory management prior to extubation to the success of mechanical ventilator weaning using the PaO2 value of the blood gas analysis as an indicator in monitoring the oxygenation ventilation function.

Declaration of Conflicting Interest
None declared.

Funding
This study was supported by Politeknik Kesehatan Kementrian Kesehatan Semarang, Central Java, Indonesia.

Author Contribution
All authors contributed equally in this study.

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Cite this article as: Supriwandani, H., Mardiyono., Warijan. (2018). Slow deep pursed-lips breathing exercise on vital lung capacity in post-extubation patients in the intensive care unit. *Belitung Nursing Journal, 4*(1), 58-67. https://doi.org/10.33546/bnj.127