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Original research article

The effect of swallowing exercises in combination with Benson relaxation on swallowing ability in stroke patients

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Abstract
Aim: This study aimed to examine the effect of swallowing exercise in combination with Benson relaxation on swallowing ability in stroke patients.
Design: Quasi-Experimental Study.
Methods: Analytic quantitative with quasi-experimental (pre-test and post-test design) was used to measure the effect of swallowing exercise in combination with Benson relaxation on swallowing ability among stroke patients. The sampling method was carried out by consecutive sampling technique. Based on the Lemeshow sample formula, a total of 20 respondents who met the inclusion criteria were involved in this study. Swallowing ability was measured by the Gugging Swallowing Screen (GUSS). The data collected were processed with SPSS version 24.0, and analyzed by the statistical formula paired *t*-test. The study was conducted at the general hospital of Dr. Soekardjo Tasikmalaya between August 3rd and December 10th 2021.
Results: There was a significant difference in swallowing ability before and after the intervention, from the mean ± SD score 8.60 ± 4.21 to 15.70 ± 4.00. The significance level is confirmed with a *p*-value = 0.0005.
Conclusions: This study shows that the combination of swallowing exercise and Benson relaxation has a strong effect on improving the swallowing ability of stroke patients. This study indicates that nurses need to conduct comprehensive nursing interventions by combining swallowing exercise and Benson relaxation among stroke patients, both in the hospital and at the patient's home by involving the family.

Keywords: Benson relaxation; Dysphagia; Stroke; Swallowing

Introduction

Dysphagia occurs in stroke patients because of changes in the phase of oral, esophageal, and oropharyngeal ingestion. Oropharyngeal dysfunction is the most severe type of dysphagia experienced by stroke patients due to impaired neurological function. This condition will cause food aspiration, which will have an impact on the occurrence of pneumonia (Baroni et al., 2012). As many as 30% of stroke victims with dysphagia die from this complication. In addition, another impact of dysphagia in stroke patients is malnutrition and dehydration, which worsens the condition of stroke patients and increases the patient's length of stay in the hospital (Nawaz et al., 2018).

The incidence of dysphagia in stroke patients is influenced by many factors, including location of the lesion, the type of stroke experienced, or the patient's comorbid disease. Several studies have shown that the location and severity experienced by stroke patients determine the incidence, whereas some confirm a relationship between swallowing disorders and the location of the lesions experienced by the patient. Patients with unilateral strokes have a lower likelihood of experiencing dysphagia compared to those with bilateral lesions. Likewise, with other factors, such as gender, type of stroke, and comorbidities, there are still some differing views about their effect on the incidence of dysphagia experienced by stroke patients (Perry et al., 2020).

Due to the very threatening impact, a nurse is required to conduct an initial screening on every stroke patient who enters the hospital. This screening is done so that patients avoid dysphagia, which will aggravate the stroke. Swallowing ability screening is a safe and non-invasive procedure so it can be done as early as possible. This initial assessment detects the incidence of dysphagia and can guarantee the safe entry of nutrients through the oral route after the screening is carried out (Bath et al., 2019).

Inability to swallow or dysphagia in stroke patients requires intervention as early as possible to prevent various complications that can be experienced by patients. Various practical methods can be used to avoid complications that occur due to

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dysphagia, including posture adjustments when eating/drinking, changes in food and drink viscosity, oropharyngeal exercises, swallowing maneuvers, thermal stimulation, and enteral feeding (Pelczarska et al., 2020). Swallowing exercises are one of the therapies that are known to help dysphagia patients to improve their swallowing ability.

Commonly, swallowing exercises performed on dysphagia patients give good results for improving swallowing ability. During a study by McCullough and Kim (2013), 18 stroke patients with dysphagia underwent swallowing exercises with the Mandelshon Maneuver Technique. All patients experienced an improvement in swallowing status after 1-2 weeks of swallowing exercises. Likewise, expiratory muscle exercise, which is one of the techniques of swallowing exercises, is known to increase expiratory muscle strength, cough reflex strength, and the desire to cough. This exercise has a positive effect on stroke patients because it can increase the regulation of the cough reflex so that it will increase airway protection (Hegland et al., 2016).

Swallowing exercises can be implemented as early as possible, especially indirect swallowing exercises. Indirect swallowing exercises include adjusting the position of the head and body during feeding, adjusting food consistency, modifying feeding, modifying the environment, and changing food consistency. The purpose of this exercise is to increase the strength of the swallowing muscles without directly changing the physiology of swallowing (Perry et al., 2013).

Swallowing exercises require the active participation of the patient. In addition to the patient attempting to swallow with full force of the neck and pharyngeal muscles, the Mendelsohn technique is performed by placing a hand on the neck and palpating the Adam's apple, then holding it for a few seconds after swallowing (Jiang et al., 2017; Mulyatsih and Ahmad, 2008). In this study, a standard swallowing exercise method was applied, which in principle is a direct swallowing exercise. Swallowing exercises begin with the initial assessment stage to determine the patient's readiness to carry out swallowing exercises.

There can be obstacles to the various efforts made to improve the swallowing ability of the stroke patient if he/she is in an anxious condition. Anxiety conditions experienced by patients can trigger increased blood pressure which will worsen the patient's neurological condition (Setiawan et al., 2021). Therefore, stroke patients need to be in a relaxed condition so that various neurological dysfunctions can be reduced, including dysphagia. One of the methods that can be used to create a state of relaxation is Benson relaxation exercises.

Benson relaxation exercise can cause a decrease in physical and psychological stress, which can conceptually reduce epinephrine, and lower cortisol and other stress hormones. In addition, relaxed conditions will provide excellent benefits for stroke patients, because blood pressure will be controlled, eventually improving the neurological problems experienced. Many studies have shown the positive impact of Benson relaxation on anxiety, decreasing pain response, and improving the physiological status of stroke patients (Poorolajal et al., 2017; Purwasih et al., 2017; Rasubala et al., 2017; Ratnawati et al., 2018).

Bensons Relaxation Technique is performed by sitting quietly in a comfortable position, closing the eyes, deeply relaxing all muscles, beginning at the feet, progressing up to the face, keeping them deeply relaxed, and breathing through the nose. If a person is already in a state of calm, the parasympathetic nerves will be stimulated, while the sympathetic nerves will inhibit stimulation and bring a sense of comfort. Combining swallowing exercises with Benson relaxation can provide better results in improving the swallowing ability of stroke patients. This study aims to examine the effect of swallowing exercise in combination with Benson relaxation on the swallowing ability of stroke patients.

Materials and methods

Research design

Quasi-experimental was used to measure the effect of swallowing exercise in combination with Benson relaxation in swallowing ability among stroke patients.

Population and sample

The study was conducted at the general hospital of Dr. Soekardjo Tasikmalaya between August 3rd and December 10th 2021. The sampling method was carried out by consecutive sampling technique. Based on the Lemeshow sample formula, a total of 20 respondents who met the inclusion criteria were involved in this study. The inclusion criteria were stroke patients with Glasgow Coma Scale (GCS) score >12, with swallowing disorders (dysphagia), who had received medical therapy in the form of antihypertensive and neuroprotective drugs (this inclusion criterion aims to avoid bias from the variety of drugs received by respondents during the treatment period at the hospital), had been treated for at least 7 days in the hospital, and were willing to be a respondent. A respondent was excluded if they experienced a decreased level of consciousness and decide to go home before the therapy process is complete/finish.

Research instruments

The instruments used in this study were the screening of the GUSS (Gugging Swallowing Screen), the standard operational procedure of direct swallowing exercise, and Benson relaxation. The measurement results are expressed in scores. For confounding variables, the measurement results are shown in numeric and categorical form.

Data collection procedure

Measurement of swallowing ability begins when the patient comes to the ward. Patients who met the inclusion and exclusion criteria were taught swallowing exercises and Benson relaxation, and were also given leaflets about this. Swallowing exercises were carried out 3 times, namely before the morning snack (9:00 a.m.), one hour before lunch (11:00 a.m.), and before the afternoon snack (13:00 hrs). At night, the respondents did Benson relaxation exercises. The time it took for swallowing exercise and Benson relaxation was about 30 minutes. When performing the exercises, patients were accompanied by nurses who had been trained by the researchers. At the end of the exercise, the patient's swallowing ability was assessed again.

Statistical analysis

Statistical analysis used univariate analysis, as well as bivariate analysis with a paired *t*-test to test the difference in the value of swallowing ability before and after exercise. To see the contribution of confounding factors (age, gender, type of stroke, comorbidities, frequency of attacks) on swallowing ability after exercise/intervention, theys were analyzed by correlation test and paired *t*-test). A correlation test was conducted to show the variable of age with swallowing ability, while to show

the effect of gender, type of stroke, comorbidities, frequency of attacks on swallowing ability were analyzed by paired *t*-test test.

Results

Respondents characteristics

Table 1 shows that most of the respondents are male (12 people, 60%), had experienced an ischemic stroke (13 people, 65.%), and had comorbidities (13 people, 65.%). The results show that all of the respondents were patients having their first stroke.

Table 1. Respondent characteristics

Variables	f	%
Sex		
male	12	60.00
female	8	40.00
Types of stroke		
ischemic	13	65.00
hemorrhagic	7	35.00
Comorbidities		
existing	13	65.00
none	7	35.00
Frequency of attacks		
first time	20	100.00
or more	0	0.00

Based on Table 2, the average age is 58.55 years, the youngest age is 38, and the oldest age is 86. The average score of swallowing ability before intervention was 8.6, and after the intervention was 15.7.

Table 2. Distribution of respondents by age, swallowing ability before and after exercise

Variable	Mean	SD	Min–Max	95% CI
Age	58.55	11.63	38–86	53.11–63.99
Swallowing ability before	8.60	4.21	4–18	6.63–10.57
Swallowing ability after	15.70	4.00	8–20	13.83–17.57

Table 3 shows that the average swallowing ability score before intervention was 8.60, while the average swallowing ability score after the intervention was 15.70. Statistical test results obtained a *p*-value of 0.0005. It can be concluded that there are significant differences between the average swallowing ability score before and after.

Table 3. Distribution of average swallowing ability score before and after intervention at RSU Dr. Soekardjo

Swallowing ability score	Mean	SD	SE	*p*-value	*n*
Before	8.60	4.20	0.602	0.0005	20
After	15.70	4.00			

Discussion

Age

Table 2 show that the average age of respondent is 58.55 years. Age is one of the non-modifiable factors for the occurrence of stroke. As age increases, the incidence of stroke also increases (Black and Hawks, 2014). Aging is the strongest risk factor for strokes. After the age of 55, the chance of having a stroke approximately doubles every 10 years. About three-quarters of all strokes occur in people 65 years of age. Because the number of people aged 65 years is predicted to continue to increase, the number of stroke cases is also predicted to rise (Yousufuddin and Young, 2019).

A study identified 10 risk factors that lead to an increased incidence of stroke at all ages. The risk factors for stroke, including diabetes, hypertension, atrial fibrillation, and coronary artery disease, tend to increase with age. Other risk factors are related to obesity, high blood fat levels, hypertension, high blood sugar levels, and smoking habits. All of these can cause blockages in the blood vessels of the brain, causing a reduced supply of oxygen in the blood to all tissues, including the brain, which can result in tissue death in the brain (Black and Hawks, 2014).

A study in America, involving 4,038 samples for 8 years, was found in the age group <60 years, who suffered from dysphagia as much as 30.7% and this figure increased in the age group >60 years, namely 37.7%. Likewise, in the results of research by Kumaresan et al. (2019), of the 15 determinant factors that affect the incidence of dysphagia, age is the main one when it comes to the occurrence of dysphagia in stroke patients. This age factor also causes the slow recovery from dysphagia in stroke patients. Therefore, Kumaresan et al. (2019) research suggested screening for dysphagia as early as possible. Increasing age causes degeneration processes, such as ossification of the laryngeal cartilage, atrophy muscles intrinsic larynx, dehydration of the laryngeal mucosa, reduced elasticity of the laryngeal ligaments, reduced teeth, and decreased sensory abilities in the pharyngeal and laryngeal areas (Leung, 2015).

Previous research has stated that age plays an important role in the incidence of dysphagia. Some studies show that the function of swallowing will be reduced in older people, even under normal circumstances. This study showed a significant relationship between age and the severity of dysphagia. Older people (more than 50 years old) will experience more severe dysphagia than younger people (less than 50 years) (Kumaresan et al., 2019; Rofes et al., 2018).

Sex

Table 1 shows that most of the respondents were male; in the control group it was 12 people (60%). According to Black and Hawks (2014), stroke incidence is higher in men than in women. This is in line with the results of previous research that shows men have a higher incidence than women. Several studies have shown that men who have had a stroke have a lower mortality rate than women. Therefore, the incidence of strokes in men is increasing every year. Whereas in women, the mortality rate from strokes tends to be higher, so stroke incidence is lower (Cahyati and Rosdiana, 2017).

The incidence of strokes in women is most often caused by hypertension, while in men it is more often caused by smoking. These two factors, coupled with age and other risk factors, lead to an increased risk of stroke (Park et al., 2015). The incidence of stroke in men occurs because of the testosterone

hormone, which can increase LDL levels; if LDL levels are high it can increase cholesterol levels in the blood which is a risk factor for degenerative diseases such as strokes (Watila and Balarabe, 2015). Men have a greater tendency to have a stroke in adulthood than women (ratio of 2:1). However, deaths from stroke are more common in women, because women generally, have strokes at an older age (Cahyati and Rosdiana, 2017).

The results of research conducted by Khedr et al. (2021) and Rofes et al. (2018) showed that there was no relationship between gender and the incidence of dysphagia in stroke patients. Although some say that men experience dysphagia more because anatomically they have a longer pharynx (Chaidir et al., 2020; Ehsaan et al., 2016).

Types of stroke

The results in Table 1 show that most of the respondents experienced an ischemic stroke, (13 people, 65%). Ischemic stroke has a higher incidence than hemorrhagic stroke. This is related to the increased incidence of atherosclerosis vascular, which causes blockages in blood vessels. This blockage then triggers strokes (Smeltzer et al., 2010). Ischemic stroke is the most common stroke case, but the hemorrhagic stroke has a higher mortality rate than ischemic stroke (Katan and Luft, 2018).

In America, the incidence of hemorrhagic stroke is between 15–30%, and ischemic stroke between 70–85%. However, for developing countries or those in Asia, the incidence of hemorrhagic stroke is around 30% and ischemic stroke is 70%. Ischemic stroke is caused, among other things, by cerebral thrombosis (thickening of the artery walls) 60%, embolism 5% (sudden blockage), and others 35%. Although the cases are fewer than ischemic strokes, hemorrhagic strokes often result in death. Generally, about 50% of hemorrhagic stroke cases will lead to deaths, while in ischemic stroke only 20% will result in death (Cahyati and Rosdiana, 2017).

A study conducted by Khedr et al. (2021), showed that 37.1% of patients with ischemic stroke had dysphagia, while 58.6% of patients with hemorrhagic stroke had dysphagia. This study differs from Ehsaan et al. (2016), which stated that patients with ischemic stroke tend to experience higher dysphagia than those with hemorrhagic stroke. The results showed that there was a tendency for dysphagia to occur more in patients with lesions on the right side, both in ischemic stroke and hemorrhagic stroke. This is different to the study conducted by Falsetti et al. (2009) of ischemic and hemorrhagic stroke patients, which found that 41% of patients with stroke experienced dysphagia – and this was not related to the type of stroke.

Comorbidities

The results of the study in table 1 show that most of the respondents have comorbidities (13 people, 63%). The comorbidities that exist among respondents include hypertension, hypercholesterolemia, and DM. Hypertension has a significant effect on the structure of the blood vessels of the brain. Hypertension can be a precipitating factor for the development of atherosclerotic plaques in cerebral arteries and arterioles, which can lead to arterial occlusion and ischemic injury. The results of the study showed a decrease in cerebral blood flow among hypertensive patients. This is due to decreased brain activation in hypertensive patients. Experimental and clinical studies have shown that hypertension predisposes people to cerebral hypoperfusion and possibly ischemia (Seiller et al., 2021).

Increased blood cholesterol levels, especially LDL, are risk factors for atherosclerosis. In diabetic patients, high blood sugar levels at the time of stroke will increase the possibility of widespread infarction, because of the formation of lactic acid due to anaerobic glucose metabolism – which damages brain tissue. Sreedharan et al. (2020) explained that stroke patients with DM complications experience more dysphagia, and this is especially the case in women. The healing process of dysphagia in women with DM is slower; predicted to be 12 months after stroke.

Frequency of attacks

The results in Table 1 shows that all the respondents were expereincing their first stroke. The danger for stroke sufferers is repeated strokes, which can be fatal and result in a worse quality of life. There are even stroke patients who experience strokes as many as 6–7 times. This is partly because the patient does not control the existing risk factors (Cahyati and Rosdiana, 2017).

Patients who have had a stroke have a high risk of a recurrent stroke (Elwan et al., 2021). Repeat strokes ranged from 30–43% within 5 years. After a transient brain attack, 20% of patients had a stroke within 90 days, and 50% of them had another stroke within 24–72 hours. High blood pressure (systolic blood pressure >140 mmHg and diastolic blood pressure 90 mmHg) will increase the risk of recurrent stroke.

Post-stroke dysphagia is thought to be associated with various conditions, including pharyngeal muscle dysfunction and incoordination, secondary loss of central nervous system control; brainstem lesions (Teasell et al., 2018), oral weakness of the facial, palatal, and pharyngeal muscles; and damage to the structure of the cortex and subcortex (Cohen et al., 2016). In addition to these neuropathophysiological changes, dysphagia will also occur when the level of consciousness is reduced; either acutely because of a large stroke lesion with edema, or because of delirium (Cohen et al., 2016).

The incidence of repeated strokes is often more severe because there are parts of the brain that are disturbed due to not fully recovering from the previous stroke. In recurrent strokes, the disorders experienced will get worse – and increase the risk of disability and death (Oza et al., 2017). Research conducted by Elwan et al. (2021) found that lesions which occur in recurrent stroke patients are more extensive than in patients experiencing their first stroke. The study concluded that patients experiencing a second stroke will have significant cognitive and physical disability compared to the first attack.

Effect of swallowing exercises and Benson relaxation

The results of the study in Table 3 show that there is a difference in the average score of swallowing ability before and after the intervention. The average ability to swallow before an intervention is 8.6. The score is within the 'severe' category, where respondents have a high risk of aspiration. After the intervention performed, the ability to swallow increased to a mean score of 15.7 (mild dysphagia) which has a low risk of aspiration.

A stroke can cause the death of brain tissue that may lead to disability. The disability that occurs in stroke patients depends on the size of the lesion and its location. When a stroke lesion affects the Central Pattern Generator (CPG) and cranial nerves for mastication/swallowing, it will result in paralysis or weakness of the pharynx, larynx, and soft palate. This causes disruption of the swallowing phase in the oropharyn-

geal phase. If the stroke lesion is in the left hemisphere, it will cause decreased oral motor activity and apraxia, while a lesion in the right hemisphere is associated with delayed swallowing reflex, and the bolus is retained in the pharynx so that it can result in aspiration (González-Fernández et al., 2013).

One of the interventions to improve swallowing ability is swallowing exercises. These can be done as early as possible, especially indirect swallowing exercises. Indirect swallowing exercises include adjusting the position of the head and body position during feeding, adjusting food consistency, modifying feeding, modifying the environment, and changing food consistency. The purpose of this exercise is to increase the strength of the swallowing muscles, without directly changing the physiology of swallowing.

Swallowing exercises aims to train and strengthen motor muscles and improve neurological function. In addition, they provide a stimulus to the swallowing function receptors in the anterior pharyngeal arch, so that normal swallowing physiology is expected to reappear. The exercises also increase the ability to swallow food boluses, trains weak swallowing muscle strength, and increases the time to swallow food boluses (Langmore and Pisegna, 2015).

The direct method of swallowing exercises requires the active participation of the patient. Swallowing exercise that is intervened early, can improve the ability to swallow stroke patients. The incidence of pneumonia, which is a complication of dysphagia, can be avoided, so it is very important that every stroke patient does the swallowing exercises (Bakhtiyari et al., 2015; Tumanggor, 2020).

To accelerate the return of swallowing function in stroke patients, various additional efforts have been made by combining swallowing exercises with complementary therapies. Various studies show significant changes in swallowing exercises combined with various complementary therapies. Research by Xia et al. (2016) shows that standard swallowing exercises combined with acupuncture provide better results for dysphagia in stroke patients. The combination of swallowing exercises with acupuncture has also been investigated by several researchers, and all of them reported good changes to the patient's swallowing ability (Chen et al., 2015; Chen et al., 2016; Mao et al., 2016).

Efforts made to improve the swallowing ability of stroke patients can be done by increasing the patient's relaxation so that patients avoid anxiety. Anxiety experienced by patients can trigger increased blood pressure, which will worsen the patient's neurological condition. Therefore, stroke patients need to make various efforts to create a relaxed condition, so that various neurological dysfunctions can be reduced, including dysphagia. To induce a state of relaxation, Benson relaxation exercises and aromatherapy can be used.

Benson relaxation can cause a decrease in physical and psychological stress, which can conceptually reduce epinephrine, lower cortisol, and other stress hormones. In addition, relaxing conditions provide excellent benefits for stroke patients, because blood pressure will be controlled, and it will eventually improve the neurological problems experienced. Many studies have shown the positive impact of Benson relaxation on anxiety, decreasing pain response, and improving the physiological status of stroke patients (Poorolajal et al., 2017; Purwasih et al., 2017; Rasubala et al., 2017; Ratnawati, 2018; Sahar, 2016).

Conclusions

This study shows that combining swallowing exercise with Benson relaxation has a good effect on improving the swallowing ability of stroke patients. The implications of this research can be applied to stroke patients with dysphagia.

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Conflict of interests
The authors have no conflict of interests to declare.

Ethics approval
This research was approved by the Ethics Commission Board, Poltekkes Kemenkes Tasikmalaya No. 2021/KEPK/PE/VI/00108.

Author's contributions
Yanti Cahyati conceived and designed the study, and was responsible for manuscript preparation. Ida Rosdiana contributed to the data input process on the statistical software. Henri Setiawan contributed to the critical revision of the manuscript. All authors approved the final manuscript and have participated sufficiently in the work to take public responsibility for appropriate portions of the content.

Vliv polykacích cvičení v kombinaci s Bensonovou relaxací na polykací schopnost u pacientů s cévní mozkovou příhodou

Souhrn
Cíl: Cílem této studie bylo prozkoumat účinek polykacího cvičení v kombinaci s Bensonovou relaxací na polykací schopnost u pacientů s cévní mozkovou příhodou.
Design: Kvazi-experimentální studie.
Metodika: K měření účinku polykacího cvičení v kombinaci s Bensonovou relaxací na polykací schopnost u pacientů s cévní mozkovou příhodou byla použita analyticko-kvantitativní a kvazi-experimentální metoda (předtestový a posttestový design). Skupina respondentů byla vybrána technikou postupného odběru vzorků. Na základě vzorce Lemeshow bylo do této studie zapojeno celkem 20 respondentů, kteří splnili kritéria pro zařazení. Schopnost polykání byla měřena pomocí Gugging Swallowing Screen (GUSS). Data byla zpracována pomocí programu SPSS 24.0 a analyzována pomocí *t*-testu párového statistického vzorce. Studie byla provedena ve všeobecné nemocnici Dr. Soekardjo Tasikmalaya mezi 3. srpnem a 10. prosincem 2021.
Výsledky: Byl signifikantní rozdíl v polykací schopnosti před a po intervenci, od průměrného ± SD skóre 8,60 ± 4,21 do 15,70 ± 4,00. Hladina významnosti je potvrzena *p*-hodnotou = 0,0005.
Závěr: Tato studie ukazuje, že kombinace polykacího cvičení a Bensonovy relaxace má silný vliv na zlepšení polykací schopnosti u pacientů s cévní mozkovou příhodou. Výzkum prokázal, že sestry potřebují provádět komplexní ošetřovatelské intervence kombinováním polykacích cvičení a Bensonovy relaxace u pacientů po cévní mozkové příhodě, a to jak v nemocnici, tak u pacienta doma se zapojením rodiny.

Klíčová slova: Bensonova relaxace; cévní mozková příhoda; dysfagie; polykání

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