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Multi-Intervention of Balance Exercise to Prevence of Fall Risk among Vertigo Patient

Faizal Musthofa^{1*}, Kosim², Nita Fitria³, Sidik Maulana⁴

^{1,2,3}Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia ⁴Departement of Fundamental in Nursing, Faculty of Nursing, Bandung, Indonesia *Corresponding author email: faizal17001@mail.unpad.ac.id

Abstract

The condition of vertigo if left unchecked will endanger the patient. Vertigo has an impact on quality of life which includes limitations in carrying out daily activities, the risk of falling and can result in injury. This study was conducted to determine the multi-intervention of balance exercise in preventing the risk of falling in vertigo patients. A rapid literature review was conducted on this study related to multi-intervention balance exercises in preventing the risk of falls in vertigo patients from the PubMed, CINAHL, and Science Direct databases. Inclusion criteria for vulnerable full text research articles in 2017-2021 using English. Balance exercise with vestibular rehabilitation, balance retraining, wobble board exercise can be one way to prevent the risk of falling by maintaining balance in vertigo patients and being able to reduce dizziness symptoms, improve quality of life, compliance in exercise and improve dizziness symptoms. Most studies say that balance exercise interventions with vestibular rehabilitation, balance retraining, and wobble board exercises are effective in improving balance, reducing dizziness symptoms in vertigo patients as a prevention of the risk of falling.

Keywords: Balance exercise, fall risk, and vertigo

1. Introduction

Vertigo is a syndrome due to balance disorders that are often encountered. Vertigo is a condition of a collection of symptoms caused by disturbances in the balance system. Vertigo occurs due to dysfunction of the vestibular system from peripheral or central lesions (Stanton & Freeman, 2021). Symptoms of vertigo include moving around in circles, lightheadedness, nausea, vomiting, sweating, and twisting movements from both the patient and the environment. This occurs usually triggered by head movements (Baumgartner & Taylor, 2021; X et al., 2019). Based on a survey of the general population, the prevalence of vertigo for 1 year is about 5% and the annual incidence is 1.4% in the world. Symptoms of dizziness in vertigo patients about 15% to more than 20% occur in adults each year (Neuhauser, 2016). Thus, the high number of vertigos should be of particular concern because it will potentially result in various other health risks

Vertigo raises the risk of health problems related to balance, including the risk of injury. Persistent vertigo will affect immobility and limitations in activities that are at risk of falling (Alyono, 2018; Uzdan et al., 2019). The risk of falling is responsible for up to 40% of adverse patient safety events (Lara-Medrano et al., 2014). The risk of falls associated with injuries ranges from bruising, scraping, and ecchymosis to fractures, bleeding and post-fall syndrome, among others, increased morbidity and recovery compromise, hospital stay and health care expenditure, and increased mortality at worst (Correa et al. al., 2012). Based on a systematic review of the elderly population, a qualified approach to reducing the risk of falls was found to be balance training (Thomas et al., 2019). Balance is the basis of the ability to get up and move forward, therefore balance training must have a critical point for preventing the risk of falling. Currently, no reviews are showing a similar effect on fall risk in the vertigo population. Thus, this review intends to gather available evidence regarding the effects and forms of balance training on fall risk in the vertigo population. Where this study will be useful to describe the practice both in the clinic and in the community as supportive therapy in patients with vertigo which in turn can reduce the risk of falls and other adverse complications.

2. Methods

2.1. Study Design

This study uses a narrative review method using keywords that have been adapted to the MeSH term: [(vertigo) OR (dizziness) OR (benign paroxysmal positional vertigo)] AND [(balance exercise) OR (balance training) OR (balance program)].

2.2. Source and Criteria Eligibility

The inclusion criteria in this review are qualitative and quantitative research with full text that has gone through a peer-review process from the PubMed, CINAHL, and Science Direct databases. In addition, the inclusion of articles relevant to the 2017-2021 vulnerable years related to the PICO framework:

Population (P): Patients with vertigo;

Intervention (I): Balance exercise;

Comparison (C): No compare with another intervention;

Outcome (O): Fall risk.

2.3. Data Extraction and Analysis

The collected articles were extracted manually and analyzed using a descriptive approach.

3. Results

3.1. Description of study findings

The article search results obtained as many as 437 articles based on the initial search results. After 402 articles were screened for duplicates and did not meet the inclusion criteria, 5 articles were analyzed in this study. Details of the results of the literature search can be seen in Figure 1.

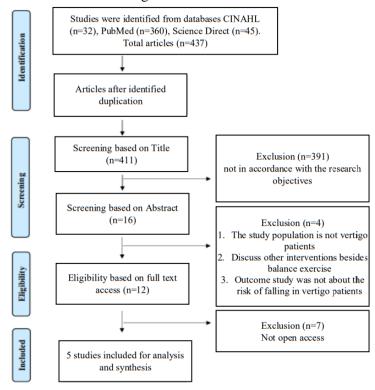


Figure 1. PRISMA Flow Diagram

3.2. Study characteristic

The study characteristics of all the articles obtained, the study design includes RCT (n=2), pre-post experiment (n=1), cohort(n=1), and qualitative studies (n=1). The study obtained 506 respondents with vertigo with 84 men and 327 women. The study was conducted in various countries including England (n=2), China (n=1), India (n=1), Norway (n=1).

Table 1 Study Characteristics

Authors, Year	Country	Age	Participant,	Method	Type of
			Gender		Intervention
Essery et al., (2017)	England	50-79	n = 13 patients with	Qualitative-	Balance
		$66.5 \pm$	vertigo	Longitudinal	Retraining
			Female=13	Study	
Geraghty et al.,	England	67.3-67.5 ±	n=197 patients	RCT	Balance
(2017)	United		with vertigo		Retraining
	Kingdom		female= 197		
Roshan et al., (2017)	India	45-60	n=36 patients with	Pre-post	Wobble Board
			vertigo	Experiment	Balance
			male=12	_	Training
			female= 22		•
Kleffelgaard et al.,	Norwegia	16-60	n= 64 patients with	RCT	Vestibular
(2019)			vertigo		rehabilitation
			male=20		
			female= 45		
Wang et al., (2021)	Cina	61.4-62.6	n= 102 patients	Cohort	Vestibular
			with vertigo		rehabilitation
			female=50		
			male=52		

3.3. Result finding

3.3.1. Types of Balance Exercise

Based on the review findings, the interventions found consisted of vestibular rehabilitation, balance retraining, and wobble board exercise. First, vestibular rehabilitation is a physical therapy exercise that integrates various sports exercises. This therapy is carried out continuously to stimulate the central nervous system moderately, increase vestibule compensation, help the brain to rebuild a state of balance, and is effective in reducing vertigo symptoms (Kleffelgaard et al., 2019; Wang et al., 2021; Wu et al., 2019). Second, balance retraining or internet-based vestibular rehabilitation interventions is physical therapy with balance exercises that can be done at home with the guidelines available on the balance retraining website, has been shown to decrease anxiety, is fun to do visually, is easy to use and experiences changes in symptoms for the better after an intervention. This intervention provides vertigo patients with a means of providing self-management strategies in primary care (Essery et al., 2017; Geraghty et al., 2017). Finally, the Wobble board exercise or also known as balance exercise using a rocking board is able to stimulate the vestibular system to balance the body on a rocking board. Exercise using rocking board intervention can be done by closing the eyes and body condition on an uneven support surface. (Roshan, Haripriya, et al., 2017).

Table 2. Literature Review Results

Authors, Year	Measurement	Measuring Instrument	Findings
Essery et al., (2017)	Effectiveness of vestibular rehabilitation of vertigo patients	Interview	Internet-based vestibular rehabilitation makes it easier for participants to practice at home. Sites that are suitable and easy for participants to perform vestibular rehabilitation techniques. Contribution of active participants because the website used is encouraging to help problems and motivate.
Geraghty et al., (2017)	Vertigo (Symptoms of Dizziness), Balance	Vertigo symptom scale-short form (VSS-SF)	Vestibular rehabilitation intervention was effective in reducing dizziness at 3-6 months, at month 3 as many as 62.3% in the intervention group reported their dizziness symptoms felt slightly much better compared to 32.8% in the usual treatment group.
Roshan et al., (2017)	Vertigo (Symptoms of Dizziness), Balance	Activity Spesific Balance Confidance Scale (ABC)	Balance training using wobble board exercise improves balance in patients with benign paroxysmal positional vertigo after canalith repositioning

Authors, Year	Measurement	Measuring Instrument	Findings
			maneuver. Based on the t-test, the wobble board exercise was effective in the intervention group with a value (p=0.003) different from the control group with the canalith repositioning maneuver intervention with a value (p=0.707).
Kleffelgaard et al., (2019)	Vertigo (symptoms of dizziness), balance, psychological	VSSF, The Balance Error Scoring System, The Hospital Anxiety and Depression Scale	There was an increase in symptom improvement and balance after vestibular rehabilitation interventions.
Wang et al., (2021)	Balance, vertigo, physical, function, emotional	Berg Balance Scale Scores (BBS), The Vestibular Symptom Index (VSI), Dizziness Handicap Inventory (DHI), Dizziness Handicap Inventory- Emotional (DHI-E), Dizziness Handicap Inventory- Function (DHI-F), Dizziness Handicap Inventory Physical (DHI-P),	After 4 weeks of treatment BBS scores, VSI, balance and vertigo scores in the experimental group increased compared to the control group.

3.3.2. Effectiveness of Balance Exercise

The articles analyzed show that balance exercise with vestibular rehabilitation, balance retraining, and wobble board exercise is effective in preventing the risk of falling in vertigo patients by increasing patient balance, compliance in exercise, and also being able to improve dizziness symptoms, reduce chronic dizziness symptoms, provide motivation. exercise, affordable and easy to do at home and improve the patient's quality of life (Essery et al., 2017; Geraghty et al., 2017; Kleffelgaard et al., 2019; Roshan, S., et al., 2017; Wang et al., 2021; Wu et al., 2019).

3.3.3. The intensity of the effectiveness of balance exercise in preventing the risk of falling

The balance of vertigo patients, decreased symptoms of dizziness, improved anxiety optimally increased at 3-6 months when the balance exercise intervention was given. At 6 months, in the younger age group, the effect of the intervention was not significant (P = 0.48); however, in the older age group, the intervention effect was significant (P = 0.04) (Geraghty et al., 2017).

4. Discussion

Most studies show that balance exercise is significant in reducing dizziness symptoms as a prevention of the risk of falling in vertigo patients. The types of interventions that can be carried out include vestibular rehabilitation, whether internet-based or not or balance retraining, interventions with wobble board exercises are able to improve the balance ability of vertigo patients in preventing the risk of falling. Optimal internet-based vestibular rehabilitation interventions improve symptom improvement at 3-6 months (Essery et al., 2017; Geraghty et al., 2017; Kleffelgaard et al., 2019; Roshan, S., et al., 2017; Wang et al., 2021; Wu et al., 2019).



Figure 2. Balance Exercise

Vertigo is most often caused by dysfunction of the vestibular system from peripheral lesions or central disturbances of the brainstem or cerebellum. The vestibular system functions to maintain vision during rotation through the vestibular ocular reflex. When there is a dysfunction in the system, what will happen is the eye drifts slowly away from the target and then corrects with a rapid movement in the opposite direction (Stanton & Freeman, 2021). The symptoms of dizziness caused by dysfunction of the vestibular system are not permanent as the central nervous system adapts over days to weeks. (Ken, 2021). The dizziness symptom of vertigo means a twisting motion of either the patient or their surroundings, usually triggered by head movements, such as movements in bed such as turning over or looking up. (Stanton & Freeman, 2021). So that patients with vertigo experience disturbances in the vesticular system which can lead to a risk of falling and if left unchecked can interfere with the patient's daily activities including work and the need for additional medical attention.

This literature review study found that balance exercise with vestibular rehabilitation, both internet-based and non-internet-based or balance retraining, and wobble bord exercise were effective in reducing dizziness symptoms in vertigo patients as a prevention of fall risk (Essery et al., 2017; Geraghty et al., 2017). Previous studies have shown that vestibular rehabilitation has shown benefits for adult patients with chronic vertigo related to an increase in the scale of fall risk, balance and emotional status (Kundakci et al., 2018).

Vestibular rehabilitation compensates the central nervous system through a series of simple exercises involving head movements (gaze stabilization), balance exercises, active body movements (improved vestibulospinal regulation), visual dependence exercises, habituation exercises, and providing education for the use of assistive devices and safety techniques for avoid falling. After the vestibular rehabilitation intervention, symptoms will decrease because the brain will use other senses (sight and somatosensory-body senses) to replace the disturbed vestibular system (Herdman, 2013). In its implementation before starting the intervention, it is necessary to use simple techniques to reduce tension including: shoulder shrugging, shoulder/arm rotation and gentle stretching exercises specifically for the neck area. Vestibular rehabilitation techniques with head movement should be encouraged to induce vestibular adaptation and familiarize movement-induced symptoms. The patient must practice functional movements in a variety of contexts, such as maintaining balance when changing head and torso orientation, and maintaining balance when performing upper extremity movements. The duration of exercise that can be done for visual stability is 4-5 times a day for a total of 20-40 minutes/day, plus 20 minutes/day of balance training and gait training. Each exercise can be performed at least 2 times a day, starting with 5 repetitions of each and increasing to 10 repetitions of each exercise (Han et al., 2011). Vestibular rehabilitation can be performed in patients with stable vestibular lesions whose vestibular function is not well compensated, regardless of age, cause of the lesion, and duration and intensity of symptoms (Han et al., 2011; Stanton & Freeman, 2021).

The application of internet-based vestibular rehabilitation interventions or balance retraining helps in improving balance, decreasing symptoms in vertigo patients. The intervention consists of special exercises that can be accessed through the website and can be used anytime and anywhere (Essery et al., 2017). This internet-based balance exercise makes it easier for the patient because it includes a booklet that explains the exercise technique, video demonstrations with audio of all the exercises. The website provides information on coping strategies every week to reduce anxiety such as relaxation, breathing techniques and cognitive restructuring that are integrated with vestibular rehabilitation materials. There are self-management techniques that are guided by the principle of change after the intervention (Geraghty et al., 2017). The benefits obtained after this balance retraining intervention is that the patient experiences a decrease in dizziness-related disorders, a decrease in anxiety, and more subjective improvement of vestibular symptoms, pleasant because it is given a view that makes it easy to exercise at home (Essery et al., 2017; Geraghty et al., 2017). So, the intervention with balance retraining or vestibular rehabilitation is significant in improving balance, and decreasing symptoms in vertigo patients as a prevention of the risk of falling.

In addition to vestibular rehabilitation interventions, a meta-analysis study by Ray & Jennifer, (2021) found that intervention with wobble board exercise significantly improved dynamic postural control in individuals with foot imbalance or instability. Balance training with wobble board intervention has benefits in improving balance and stability. Supported by studies from Biosci et al., (2014); Silva et al., (2016) that the wobble board trains the neuromuscular to improve proprioceptive control and helps increase muscle strength when experiencing balance disorders and is effective in improving balance and reducing the risk of falling.

In the intervention, nurses have a relationship in meeting the safety needs to prevent the risk of falling, providing interventions by considering the severity of vertigo patients, and playing a role in providing medication interventions and providing therapy using this balance exercise. Thus, the balance exercise intervention can be used as one of the interventions with vestibular rehabilitation interventions both internet-based or not internet-based and wobble board exercises to reduce symptoms of dizziness, balance disorders in vertigo patients as prevention of the risk of falling.

5. Conclusion

Based on the results of the review, most of the studies said that balance exercise interventions with vestibular rehabilitation, balance retraining and wobble board exercise were effective in improving balance, reducing dizziness symptoms in vertigo patients as a prevention of the risk of falling. The effectiveness of balance retraining is optimal at

3, 6 months. In addition, symptom improvement and balance improvement are determined by routine exercise for vertigo patients to prevent the risk of falling.

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