SEKOLAH TINGGI ILMU KESEHATAN TELOGOREJO

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# LITERATURE REVIEW: PREVENTION OF ANTERIOR LIGAMENT INJURY WITH PLYOMETRIC EXERCISE IN PRE-ELDERLY

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**Abstract:**
**Background** : The aging process is associated with a progressive decline in neuromuscular function, increased risk of injury and fractures, impaired functional performance, and loss of independence. Plyometric training can reduce or even improve the ability of the anterior ligament mass. However, little research has been done on the effects of plyometric training on the elderly.
**Research objective** : To prevent anterior ligament injuries in pre-elderly.
**Methodology** : The method used is a literature review of several articles on plyometric exercises to prevent anterior ligament injuries.
**Results** : Plyometric training can have a significant effect on preventing anterior ligament injuries in pre-elderly.
**Conclusion** : Giving exercise therapy can increase daily physical activity in pre-elderly.

**Keywords :** Anterior ligament injury, Plyometric Exercises, Physiotherapy.

## INTRODUCTION

Pre-elderly is a group that begins to experience the aging process and is prone to various risks of health problems. The problem that often occurs in the elderly is decreased ability to function in body tissues characterized by weakness, limitations, and inability to carry out activities (Saraswati et al., 2022). It happens because the elderly physiologically experiences a decrease in muscle mass and flexibility. Physical decline due to aging can be prevented in the elderly by doing various exercise components (Ibrahim et al., 2015).

Many factors influence flexibility, including muscles, tendons, ligaments, age, gender, body temperature, and joint structure. Lack of flexibility can cause movements to be slower and susceptible to injury to muscles, ligaments, and other tissues. Due to increasing age, a person's flexibility will decrease (Lopez et al., 2018). Strategies that can prevent injury include a variety of interventions, such as neuromuscular, proprioceptive, stretching, plyometrics, core strengthening, balance, endurance, and speed training (Orangia et al., 2021).

*Plyometric training* consists of a prevalent form of physical intervention in the form of jump-type exercises to improve muscle stretching ability (Zubac et al., 2019). This assumption is made because it can increase muscle or ligament mass in old age, although with various pros and cons. However, there is research that *plyometric training* in the long term (from 3 to 5 months) can result in a 5-12% increase in muscle mass in the elderly (Cornish et al., 2020). *Plyometric training* elicits many positive changes in the nervous and musculoskeletal systems, muscle function, and performance in old age (Ramirez-Campillo et al., 2018).



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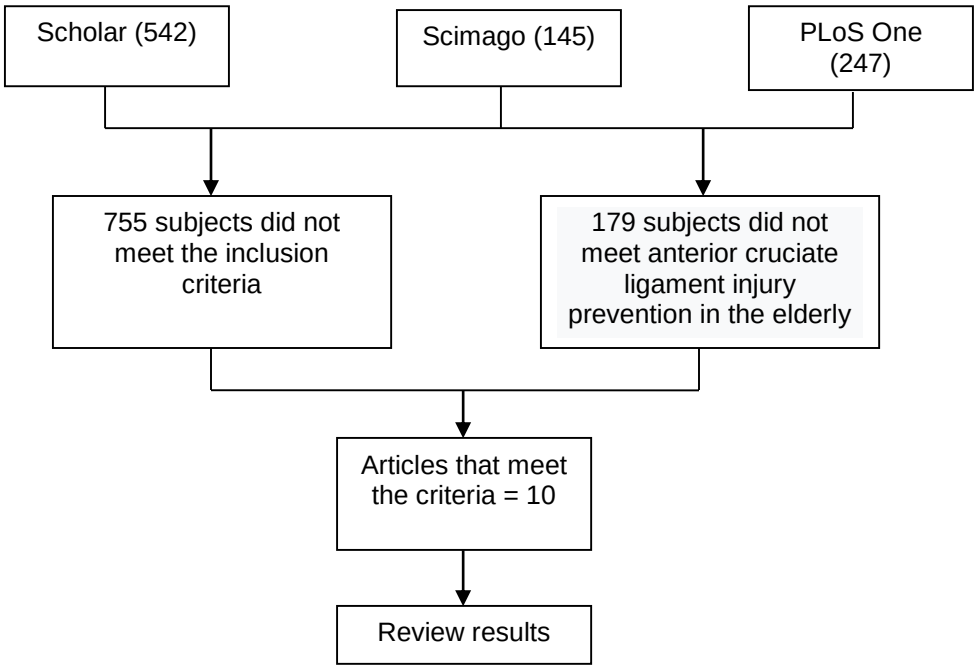
## METHODS

The research method applied in this research is literature reviews from several research articles. This study aims to discover the increase in muscle mass after plyometric exercises. This literature review is based on data sources through Google scholar, Scimago, and PLoS One, which are related to preventing anterior cruciate ligament injuries with plyometric exercises. This analysis was carried out from 2013-2022.

The search was based on the following keywords: anterior cruciate ligament injury, injury prevention programs, plyometrics training, injury level, and knee injuries in pre-elderly.




## RESULT AND DISCUSSION

There is much evidence that aging has a negative impact on the neuromuscular system and reduces the workability of muscle mass. Cases of ligament injuries can also occur in the elderly with high activity. Signs and symptoms include pain and inflammation. So it requires sufficient heating and stretching to prevent injury to the anterior ligament (Power et al., 2016).

*Plyometric exercises* can reduce joint stiffness, increase body flexibility, strengthen muscles and improve body balance for the elderly (Putri et al., 2020). In addition to the above functions, plyometric exercise significantly improves coordination and neuromuscular function in the human body (Saputra & Yudi, 2019). The method of providing interactive and attractive training in the form of games causes the training to increase agility without the partner realizing it (Rimpung, 2021). The expected target of this activity is the implementation of activities and participants knowing the activity therapy of the elderly through *plyometric exercises* that are appropriate for the elderly so that there is a transfer of knowledge and practice, as well as changes in individual behavior patterns of the elderly in order to increase the capacity and quality of life of the elderly.

The study results explained that plyometric training intervention lasted from 8 weeks. The number of exercises occurs 2-7 times/per week but can also change throughout the intervention. Some studies



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are designed so that the impact of plyometric training can be evaluated separately, namely by having a group allocated to pure plyometric training (Vetrovsky et al., 2019).

In another study, plyometric training was part of a multifaceted training intervention that included resistance training (Al Attar et al., 2022), aerobic training, balance training (Roie et al., 2020), or agility training (Zubac et al., 2019 ). In most of the studies, plyometric training consisted of various types of jumping and running. Subjects identified were only ten randomized trials (179 subjects) examining the effect of plyometric training on pre-elderly. Subsequently, only five articles that had the effect of plyometric training were evaluated, and one study compared plyometric training with alternative forms of exercise.

A study by Zubac et al. (2019) based on post hoc analysis showing significance in plyometric exercises p=0.01 supports the application of supervised plyometric exercises in the elderly. It is because bone strength, muscle contractility, and electromagnetic efficiency in the lower limbs increase markedly after exercise. Nusantara et al. (2022) explained that the training was aimed at increasing knowledge and physical training by using the plyometric training method for the elderly, elderly families, and cadres so that they could apply plyometric training to prevent injury to the elderly. Research Roie et al. (2020) by comparing the effects of plyometric training on performance, function, and ligament productivity to training endurance and walking in the elderly.

Therefore, it is not scientifically justified to draw conclusions related to the effect of plyometric training alone with plyometric training in combination with other training methods. Given the potential benefits of plyometric training in older adults and the number of small studies allowing direct comparisons between exercise modes, further studies with larger sample sizes and well-designed active control groups are needed in this population.

In a study conducted by Silva et al. (2018), the elderly who do regular exercise, clean the house and do physical exercise have a good quality of life. Because the activity will make a series of muscles contract and relax physically, thus stimulating a relaxation response both physically and mentally, it can cause waves of brain decreases and makes the elderly feel more calm and relaxed. On the other hand, continuing to do physical activity in daily life can improve body balance, increase muscle strength, and strengthen joints so that the elderly can avoid the risk of falling. In line with this, the higher the functional activity or physical activity that can be carried out by the elderly, the lower the risk of injury they have (Nusantara et al., 2022).

## CONCLUSION

In conclusion, this research has found that, plyometric exercises can effectively prevent anterior cruciate ligament injuries that occur in healthy pre-elderly. These exercises can also increase muscle mass and loss of movement coordination. This therapy will significantly increase if done routinely for 12 weeks. Of course, it should be stabilized with a balanced diet and adequate nutrition.

## THE AUTHOR'S CONTRIBUTION

Endah Sri Wulandari is the principal researcher who selects topics, writes papers, and collects data. Linda Pramusinta searched, reviewed study documents, and collected data. Ismonah reviews research documents.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.



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