Static Analysis of *Stretching* and *Strengthening Exercises* on Balance and Strength in the Elderly: *Literature Review*

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ABSTRACT

Introduction: The literature review study is motivated by the presence of physiological changes indicating a decline in balance and strength in the elderly, considering gender differences. This is attributed to the overall decline in various body systems, including balance and muscle strength, in the elderly. The decrease in muscle quality or strength in the elderly has implications for mobility. **Methods:** The literature review method was applied to five articles obtained from several databases, namely EBSCO, PubMed, and Springer Link. The search keywords for articles included stretching exercise, elderly balance, elderly strength, and resisted exercise for the elderly. The researcher used "AND" as the Boolean operator. **Results:** The findings of the literature review indicate that both static and dynamic stretching models, combined with resisted exercise for the lower extremities, have an impact on the balance and strength of the elderly, considering gender differences. **Conclusion:** The review articles revealed: 1) clinical physiological improvements; 2) increased strength in the elderly, and 3) enhanced balance in the elderly. The literature review results demonstrate an improvement in the balance

***Keywords**: Stretching, Resisted Exercise, Elderly Balance, Elderly Muscle Strength.*

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INTRODUCTION

According to statistics released by the Central Statistics Agency in 2022, there has been an increase in the percentage of the elderly population in Indonesia over the last ten years. In 2012, the percentage of elderly people was 7.57%, and in 2022, this figure will increase to 10.48%. Projections show that this percentage is expected to continue to increase until it reaches 19.9% in 2045. (BPS, 2022). Old age is a phase where there is a decline in body function. During this period, the human body will experience a decrease in functional capacity caused by cumulative changes in tissues and cells. This process includes deterioration in the function of the immune system, nervous system, respiratory system, musculoskeletal, digestive and cognitive abilities. Therefore, the most significant functional decline is seen in the musculoskeletal and cognitive systems, which can have a major impact on the quality of life of the elderly (Kehler et al., 2019).

Reduced muscle quality in elderly people can cause a decrease in mobility, often making them afraid of the possibility of falling. This tends to reduce elderly people's daily activities, which in the end can affect their functional quality (Nur'amalia et al., 2022). The period of old age will decrease the level of independence of the elderly, which can result in greater dependence on the family. One of the consequences of ageing is loss of muscle mass, muscle strength and muscle function (Siparsky et al., 2014). Muscular endurance in women tends to be lower than in

men, with women's muscle strength levels ranging between 37 and 68% of men's muscle strength levels. (Chen et al., 2012).

The impact of ageing can increase the risk of falls in the elderly through changes in motor performance (Bestari and Yuliadarwati, 2022). Ageing causes disturbances in the postural control system, both at rest and in movement. The systems responsible for posture control naturally decline with age, resulting in a decrease in our ability to maintain posture within safe limits. This affects the body's structural balance and increases the risk of falls. (Du Pasquier RA, 2003). Falls are also closely related to the process of maintaining body balance, which is caused by various pathological factors such as neurological disorders, decreased sensory function, or muscle weakness (Nurseptiani et al., 2023).

Research conducted by Saraswati et al (2022) involved carrying out balance therapy exercises with the guidance of researchers during three meetings every week for one month, with an exercise duration of 15 minutes. The results showed that in the first week, the Time Up and GO (TUGT) fall examination test value was 15 seconds (indicating a high risk of falling). However, after four weeks of implementing balance training, the Time up and GO (TUG) test value in the fourth week was 9 seconds (indicating that there was no high risk of falling). These results indicate that implementing balance exercises can effectively reduce the risk of falls.

Based on a systematic review and meta-analysis, exercise modes such as resistance training, whole-body vibration exercise, and mixed exercise can improve muscle strength and physical performance in elderly people with sarcopenia. This study included 26 studies (25 randomized controlled trials and one non-randomized controlled trial) with 1,191 elderly people with sarcopenia. This study found that compared with the control group, resistance training and mixed training significantly increased knee extension strength and walking speed (Lu et al., 2021).

Based on this phenomenon, this literature review was carried out to identify Static Analysis of Stretching and Strengthening Exercises on the Balance and Strength of the Elderly. The literature review study aims to obtain results from Static Analysis of Stretching and Strengthening Exercises on the Balance and Strength of the Elderly with the general aim of providing exercise to improve the balance and muscle strength of the elderly (Jung et al., 2023).

Previous research stated that stretching and strengthening exercises given to the intervention group had a significant impact on changes in TUG scores and 6MWT distance compared to the control group. Before the intervention, the average TUG score was 17.07 seconds in the intervention group and 16.53 seconds in the control group. The mean distance of 6MWT was 305.80m and 324m in the intervention and control groups, respectively. After the intervention, the average TUG score decreased to 14.84 seconds in the intervention group, while in the control group, the TUG score remained relatively stable with a value of 17.06 seconds. This change is statistically significant at a significance level of $p<0.05$. Thus, it can be concluded that the intervention given to the intervention group had a positive effect on improving physical function, measured by TUG scores and 6MWT distance, compared to the control group (Reddy et al, 2016).

METHODS

The purpose of a literature review or literature review is to provide a comprehensive overview of research that has been previously conducted in a particular field. The method used in the literature review is a systematic approach to analyzing data using a simplified approach. Randomized Controlled Trials (RCT) research design article by tracing the results of experimental research in English. The articles used are focused on original empirical research articles or research articles containing the results of actual observations or experiments where there are abstracts, introductions, methods, results and discussions.

Article Search Strategy

The article search strategy uses databases available on the e-resources of the National Library of the Republic of Indonesia, including EBSCO, PubMed, and Springer Link. Keywords in finding articles are stretching exercise, balance

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for the elderly, strength for the elderly, and resisted exercise for the elderly. Researchers use "AND" as a Boolean operator. The use of the Boolean operator "AND" aims to combine different concepts and aspects as search keywords to narrow down the documents to be obtained (Ramdhani et al., 2014).

Inclusion data to determine the criteria for literature review material, namely: 1) Randomized Controlled Trials (RCT) research design articles, 2) experimental research, and 3) Original articles from primary sources. 4) Research articles published from 2013 to 2022, 5) Full-text articles in English, 6) Respondents in the articles are elderly aged ≥65 years. The exclusion data are 1) Articles published over the last 10 years/before 2013, and 2) Articles in Indonesian. 3) The article only contains the abstract or part of the text, 4) Respondents in the study are less than 65 years old. 5) Literature review articles.

To maintain the quality of the literature review, the author refers to ethical considerations from Wager & Wiffen (2011), namely avoiding duplication publication, avoiding plagiarism, transparency, and ensuring accuracy. The article search used several sources from databases available on the e-library and e-resources of the National Library of the Republic of Indonesia, namely EBSCO 5 articles, PubMed 22 articles, and Springer Link 327 articles. The total articles obtained at the start of the search according to the specified keywords were 354 articles. In all the articles obtained, there were research articles that did not use RCTs and were experimental, articles that discussed apart from the use of stretching and resisted exercise in the balance and strength of the elderly, not full text, the respondents in the study were less than 65 years old. The data analysis used in this literature review is a simplified approach. The simplified approach is data analysis by compiling each article obtained and simplifying each finding (Aveyard, 2014).

The stages taken in the simplified approach analysis include summarizing each piece of literature. Critical appraisal/critical review is carried out simultaneously to determine the strengths and weaknesses of the literature and to see the relationship between one literature and other literature, identifying themes from the results of each research in the literature where the themes are generated. should reflect the research questions from the literature review, develop themes by combining all the themes

discuss the strength of the findings by considering the research results with stronger evidence or weaker evidence by carrying out a critical appraisal in the first step, naming each theme by considering the appropriate naming of each theme by understanding the literature so that the name of the theme is closer to the results. research on literature, comparing and reviewing each theme by checking two things, namely: each theme has received the correct name, and collecting the themes into one appropriate theme, closely monitoring the similarities and differences of each theme then analyzing in-depth and considering how each theme can be related to each other, reviewing the critical appraisal of each literature so that we can assess whether the existing themes can answer each research question.

Critical appraisal uses the JBI Critical Appraisal for Experimental Studies instrument to carry out the evaluation and analysis process of the articles being reviewed, especially to see the results, validity and relevance of the articles to the Randomized Controlled Trials (RCT) research design and other experimental research.

RESULTS

Data analysis

Data analysis was carried out systematically using a simplified approach. Search results for articles discussing stretching and strengthening exercises in improving the balance and strength of the elderly contained EBSCO 5 articles, PubMed 22 articles, and Springer Link 327 articles. The total articles obtained at the start of the search according to the specified keywords were 354 articles. There are keywords in finding articles, namely stretching exercise, balance for the elderly, strength for the elderly, and strengthening exercise for the elderly. Researchers use "AND" as a Boolean operator. The use of the boolean operator "AND" aims to combine different concepts and aspects as search keywords to narrow down the documents to be obtained. A discussion of the study flow prism can be seen in Figure 1 (Gradin & Björklund, 2021).

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The critical appraisal/critical study using JBI Critical Appraisal for Experimental Studies included five articles in the inclusion criteria. The discussion of each article can be seen in Table 1.

Summary

A summary of the literature review regarding the static stretching model for balance and strength in the elderly was carried out by creating an analysis matrix. The summary results obtained are that stretching exercises on the lower extremities improves balance in the geriatric population, which in turn can reduce the number of falls (balance disorders). The results of the analysis showed that of the 60 subjects who participated, 50 subjects completed the stretching exercise program for 10 weeks. The measurement results before and after stretching exercise showed a significant increase in standing time on one leg (with eyes open and closed) as well as a Berg balance score with a significance level of less than 0.001. Thus, it can be concluded that stretching exercises on the lower extremities can be an effective approach to improving balance in the geriatric population (Reddy et al, 2016). Research on strengthening exercise shows that strengthening exercise has a positive effect on balance and strength in the elderly population. In a systematic review involving 28 research articles, it was found that the program Strengthening exercise affects gait and balance in the elderly. The main findings of this research are an increase in gait due to increasing straight walking speed in the elderly, an increase in balance because strengthening exercise is an adequate training method for improving balance in the elderly population, an increase in strength attributed to strengthening exercise can increase independence in carrying out daily activities. days as age increases (Wu et al., 2021).

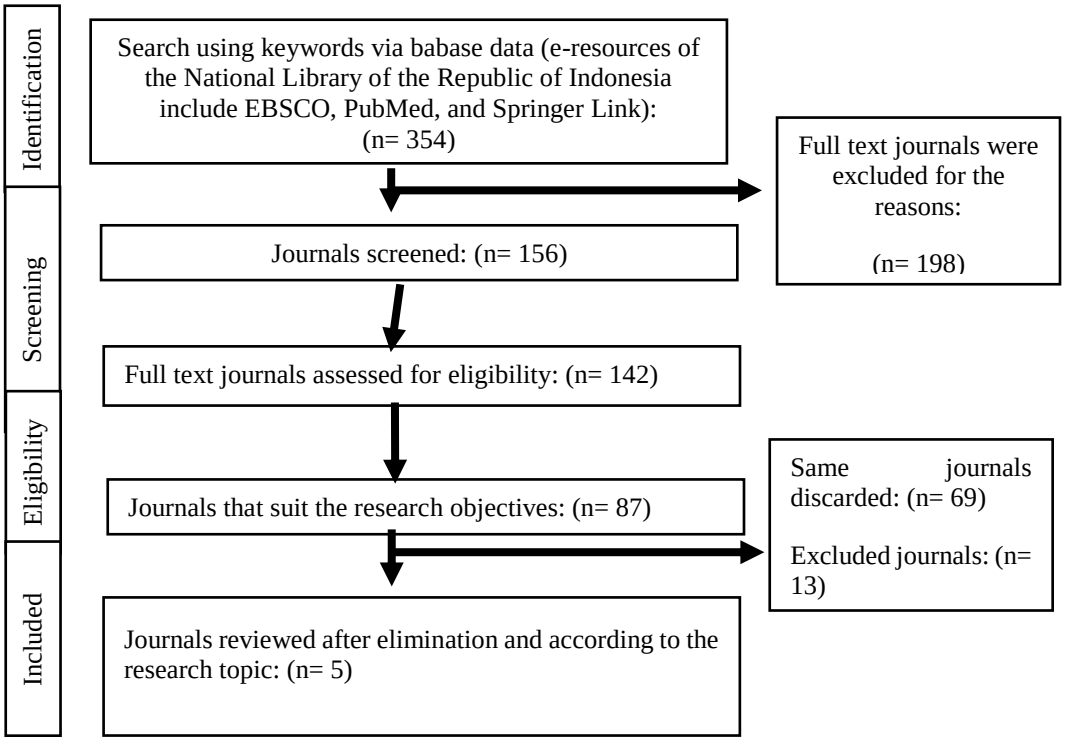

Figure 1. Prism study flow diagram

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Table 1. Data analysis matrix in articles used in the *literature review*

Author, Title, Journal	*Method Design*	*Result*
Gabriel Nasri Marzuca-Nassr, Andrea Alegría-Molina, Yuri SanMartín-Calísto, Macarena Artigas-Arias, Nolberto Huard, Jorge Sapunar, Luis A. Salazar, Lex B. Verdijk,Luc J.C. van Loon. Muscle mass and strength gains following resistance exercise training in older adults 65–75 years and older adults above 85 years. International Journal of Sport Nutrition and Exercise Metabolism, https://doi.org/10.1123/ijsnem.2023-0087.	*Randomized controlled trial*	Based on the results of this study, it can be concluded that a twelve-week resistance training program resulted in significant improvements in several parameters in the elderly population. Some of the key findings include: 1. Increase in Quadriceps Cross-sectional Area: A twelve-week resistance training (RET) program resulted in increases in quadriceps cross-sectional area of 10% ± 4% in the 65–75 year age group and 11% ± 5% in the 85+ age group, with changes statistically significant ($p < .001$; $\eta2 = .67$). 2. Increase in Lean Body Mass: There was an increase in lean body mass of 2% ± 3% in both age groups (65–75 years and 85+), which was also statistically significant ($p = .001$; $\eta2 = .22$). 3. Increase in Leg Extensor Muscle Strength:** The RET program led to significant increases in leg extensor muscle strength, with increases of 38% ± 20% in the 65–75 year age group and 46% ± 14% in the 85+ age group ($p < .001$; $\eta2 = .77$). 4. No Difference between Age Groups:** There is no significant difference in response to RET between the 65–75 years and 85+ age groups. These results indicate that the benefits of this resistance training program can be applied uniformly in both age groups. 5. Improved Physical Performance: The results also showed improvements in physical performance, measured by the Short Physical Performance Battery (SPPB) and Timed Up and Go (TUG), with no significant differences between the two age groups ($p > .015$; $\eta2 \leq . 07$). Thus, it can be concluded that a resistance training program carried out for twelve weeks has a positive impact on muscle mass, strength and physical performance in the elderly population, with no significant differences between the 65–75 years and 85+ age groups.
R. Gomathy dan D. Karaline Karunagari. Effect of stretching and strengthening exercises on mobility among the elderly. International Journal of Research and Review Vol.8; Issue: 3; March 2021, E-ISSN: 2349-9788; P-ISSN: 2454-2237.	*True experimental study*	Based on the research results presented, we can conclude that the intervention given to the intervention group had a significant impact on changes in TUG scores and 6MWT distance compared to the control group. Before the intervention, the average TUG score was 17.07 seconds in the intervention group and 16.53 seconds in the control group. The mean distance of 6MWT was 305.80m and 324m in the intervention and control groups, respectively. After the intervention, the average TUG score decreased to 14.84 seconds in the intervention group, while in the control group, the TUG score remained relatively stable with a value of 17.06 seconds. This change is statistically significant at a significance level of $p<0.05$. In addition, the average distance

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		of 6MWT increased significantly after intervention in the intervention group to 419.03m, while in the control group, the distance decreased to 300.40m. This change was also statistically significant at the p<0.001 level. Thus, it can be concluded that the intervention given to the intervention group had a positive effect on improving physical function, measured by TUG scores and 6MWT distance, compared to the control group.
Yuxiang Liang, RenjieWang, Jiaojiao Jiang, LinglingTan & MingYang. A randomised controlled trial of resistance and balance exercise for sarcopenic patients aged 80–99 years. Sci Rep 10, 18756 (2020).https://doi.org/10.1038/s41598-020-75872-2	*Randomized controlled trial*	Based on the results of this research, it can be concluded: 1. Improvement on the Barthel Index: The intervention group showed an average improvement of 9.5 points on the Barthel Index. The control group also showed improvement but with a slightly lower average, namely 6.3 points. With a 95% confidence interval, the difference between the two groups was significant, with the intervention group providing greater improvement (adjusted mean difference: 6.8 points; 95% CI 1.4–12.1). 2. Mixed vs. Mixed Exercise Programs Resistance Training: Mixed exercise programs provide significant benefits compared to resistance training alone, especially regarding changes in the Barthel Index. 3. Number of Fall Sufferers: The percentage of people who fell was lower in the intervention group (13.3%) compared to the control group (23.3%). However, this difference was not statistically significant (risk ratio 0.89, 95% CI 0.69–1.13, p = 0.506). Thus, it can be concluded that the mixed exercise program provides benefits greater in increasing the Barthel Index compared to resistance training alone. Although there was a trend towards a decrease in the number of falls in the intervention group, this difference did not reach the level of statistical significance.
Ravi Shankar Reddy dan Khalid A Alahmari. Effect of Lower Extremity Stretching Exercises on Balance in Geriatric Population. International Journal of Health Sciences, 10(3), 371–377. https://doi.org/10.12816/0048733	*Experimental study*	This research concludes that *stretching exercises* on the lower extremities improves balance in the geriatric population, which in turn can reduce the number of falls (balance disorders). The results of the analysis showed that of the 60 subjects who participated, 50 subjects completed the *stretching exercise* program for 10 weeks. The measurement results before and after *stretching exercise* showed a significant increase in standing time on one leg (with eyes open and closed) as well as a Berg balance score with a significance level of less than 0.001. Thus, it can be concluded that *stretching exercises* on the lower extremities can be an effective approach to improving balance in the geriatric population. This has positive implications in efforts to prevent falls (balance disorders) in this group.
Tomicki, C., Zanini, S. C. C., Cecchin, L., Benedetti, T. R. B., Portella, M. R., & Leguizamo, C. P. Effect of physical exercise program on the balance and risk of falls of institutionalised elderly	*Randomized controlled trial*	Participants were divided into a control group (G1) and an intervention group (G2). The control group (G1) did not receive any intervention, while the intervention group (G2) followed an exercise program three times a week for twelve weeks. Both groups were evaluated using the *Berg Balance Scale* (BBS) and the *Timed Up and Go Test* (TUGT). After the intervention, the G2 group achieved better scores in both

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persons: a randomised clinical trial. Revista Brasileira de Geriatria e Gerontologia, 19(3), 473–482.https://doi.org/10.1590/ 180998232016019.150138	BBS and TUGT, showing significant improvements in body balance and reduced risk of falls compared with G1. Spearman's ordinal correlation shows that there is a statistically significant relationship between BBS and TUGT ($p<0.001$). The G1 group did not show positive results compared to G2, either at the start of the study or after the intervention. Thus, it can be concluded that the proposed *balance exercise* is effective in improving body balance and performance of functional tasks, contributing to a reduction in the risk of falls.

Literature Review Results

As a result of the literature review in the article, the author found the influence of Static Stretching and Strengthening Exercises on the Balance and Strength of the Elderly. Each result produces three major themes, namely: clinical physiological improvement, increasing the strength of the elderly, and improving the balance of the elderly.

The findings in the first thematic were twelve weeks evaluating the effect of a resisted exercise program in the elderly population, with the following main findings: (1) an increase in quadriceps cross-sectional area of 10% ± 4% in the 65–75 year age group and 11% ± 5% in the 85+ age group. The change was statistically significant ($p < .001$; $\eta2 = .67$). (2) Increase in body mass by 2% ± 3% in both age groups (65–75 years and 85+. This increase was also statistically significant ($p = .001$; $\eta2 = .22$). (3) Increase in extensor muscle strength legs by 38% ± 20% in the 65–75 year age group and 46% ± 14% in the 85+ age group ($p < .001$; $\eta2 = .77$). (4) Increased physical performance was measured by the Short Physical Performance Battery (SPPB) and Timed Up and Go (TUG) Where there were no significant differences between the two age groups ($p > .015$; $\eta2 \leq .07$). Thus, it can be concluded that the twelve-week resistance training program has a positive impact on muscle mass, strength, and physical performance in the elderly population. These results indicate that the benefits of resistance training programs can be applied uniformly in both age groups, namely 65–75 years and 85 and over.

The second thematic finding was that the stretching and strengthening exercises given to the intervention group had a significant impact on changes in TUG scores and 6MWT distance compared to the control group. Before the intervention, the average TUG score was 17.07 seconds in the intervention group and 16.53 seconds in the control group. The mean distance of 6MWT was 305.80m and 324m in the intervention and control groups, respectively. After the intervention, the average TUG score decreased to 14.84 seconds in the intervention group, while in the control group, the TUG score remained relatively stable with a value of 17.06 seconds. This change is statistically significant at a significance level of $p<0.05$.

Strengthening exercise or resistance training, such as using weights or other training equipment, has been proven to have many benefits for muscle health in the elderly. Several studies show that strengthening exercise can increase physiological muscle strength in the elderly by several mechanisms such as strengthening exercise can cause muscle hypertrophy, namely an increase in muscle size and mass.

The findings in the third theme are (1) an increase in the Barthel Index by an average of 9.5 points on the Barthel Index. (2) The resistance exercise and balance exercise training program provides significant benefits compared to resistance exercise alone, especially regarding changes in the Barthel Index. (3) The number of fall sufferers was lower in the intervention group (13.3%) compared to the control group (23.3%). Thus, it can be concluded that the resisted exercise and balanced exercise program provide greater benefits in increasing the Barthel Index compared to resistance training alone. An increase in muscle physiology affects balance because muscles have a major role in maintaining body posture and responding to changes in position or movement. Strong muscles can provide the support and stability necessary to maintain balance.

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The fourth thematic finding was a significant increase in several balance parameters, including one-legged standing time (with eyes open and closed) and Berg balance score. This increase is statistically significant with a significance level of less than 0.001. It can be concluded that stretching exercises on the lower extremities are effective in improving balance in the geriatric population. The implications are positive in efforts to prevent falls or balance disorders in this group. With these findings, this study supports that a stretching exercise program for the lower extremities can be considered an effective approach to improve balance in the geriatric population, which in turn can contribute to reducing the risk of falls in this group.

There are clinical physiological improvements in muscle stretching starting with the sarcomere, the basic unit of muscle fiber contraction. When a muscle fibre is at its maximum resting length (all sarcomeres are fully stretched), the additional stretch puts stress on the surrounding connective tissue. Therefore, when stretching, the muscle fibre is pulled out of the sarcomere until its full length by the sarcomere, and then the connective tissue takes up the rest. When this happens, it helps realign the disordered fibres in the direction of tension. Lower extremity stretching exercise for 10 weeks is effective in increasing one-leg standing time and balance scores (berg balance test) in the geriatric population. With the results of analysis using the paired t-test, a significant increase in standing time on one leg (both with eyes open and closed) was found after the exercise program.

The fifth thematic finding was a significant improvement in body balance and a reduced risk of falls compared to the control group ($p<0.001$). The control group did not show positive results compared to the intervention group (balance exercise), both at the start of the study and after the intervention. It can be concluded that the proposed balance exercise program is effective in improving body balance and functional task performance. Its contribution was seen in reducing the risk of falls, while the control group that did not receive the intervention did not show the same improvement either at the start of the study or after the intervention. The presence of postural instability, namely a geriatric syndrome with symptoms that directly influence falls, is common. Structural and functional changes resulting from the natural ageing process affect the systems responsible for balance, with reduced responsiveness and compensation resulting in increased instability in the elderly. The results showed that after three months of intervention, the intervention group achieved better scores in the BBS (Berg Balance Scale) and TUG (Timed Up and Go Test), indicating significant improvements in balance and a decrease in the estimated risk of falls when compared with the control group.

DISCUSSION

Clinical Physiological Improvement

Muscle *stretching* begins with the sarcomere, the basic unit of muscle fibre contraction. When sarcomeres contract, the area of overlap between thick and thin myofilaments increases. When stretched, this area of overlap decreases, resulting in the muscle fibres lengthening. When a muscle fibre is at its maximum resting length (all sarcomeres are fully stretched), the additional stretch puts stress on the surrounding connective tissue. As tension increases, collagen fibres in connective tissue align themselves along lines of force equal to the tension. Therefore, when stretching, the muscle fibre is pulled out of the sarcomere to its full length by the sarcomere, and then the connective tissue takes up the rest. If this happens, it will help realign the disordered fibres in the direction of tension (Gomathy & Karunagari, 2021).

Increased Strength of The Elderly

Strengthening exercise or resistance training, such as using weights or other training equipment, has been proven to have many benefits for muscle health in the elderly. Several studies show that *strengthening exercise* can increase physiological muscle strength in the elderly by several mechanisms such as *strengthening exercise* can cause muscle hypertrophy, namely an increase in muscle size and mass. This process involves increasing the amount of muscle proteins, especially actin and myosin, which can increase the strength of

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muscle contractions. Resistance training can increase muscle fibre recruitment, especially type II fibres (fast contracting fibres), which have greater strength potential than type I fibres. Increased muscle fibre recruitment can increase muscle power and strength. Resisted exercise can help prevent or slow the progression of sarcopenia, the loss of muscle mass associated with ageing. By maintaining muscle mass, muscle strength can be maintained or increased in the elderly (Liang *et al*., 2020).

Improved Balance

The physiological increase in muscles affects balance because muscles have a major role in maintaining body posture and responding to changes in position or movement. Strong muscles can provide the support and stability necessary to maintain balance. The main muscles involved in maintaining balance include the core muscles, pelvic muscles, and leg muscles. Good muscle coordination is needed to maintain balance when moving or standing. Muscles work together in specific movement patterns to produce coherent and stable movements.

CONCLUSION

Based on the results of the *literature review* of five articles, several main conclusions can be drawn, namely Static Analysis of *Stretching* and *Strengthening Exercises* on Balance and Strength in the Elderly. Provision of *stretching* shows that muscle stretching has a positive impact on clinical physiological improvement. Providing *resisted exercise* increases physiological muscle strength by triggering mechanisms such as muscle hypertrophy. The increase in strength in balance shows that an increase in muscle physiology, including muscle strength, can contribute positively to balance in the elderly.

REFERENCES

Aveyard, H. (2014). Doing a literature review in health and social care: A practical guide (ed.3). New York: McGrawHill Companie.

Badan Pusat Statistika. Statistika Penduduk Lanjut Usia. 2022.

Bestari, N.P. and Yuliadarwati, N.M. (2022) 'Literature Review: The Effect of Square Stepping Exercise on Balance Levels in Reducing The Risk of Falling in the Elderly', Jurnal Keperawatan Dan Fisioterapi (Jkf), 5(1), pp. 179 189. Available at: https://doi.org/10.35451/jkf.v5i1.1 13.

Chen, G., Liu, L., & Yu, J. (2012). A Comparative Study on Strength between American College Male and Female Students in Caucasian and Asian Populations. Sport Science Review 21(3–4), 153 165 https://doi.org/10.2478/v10237 012 0015-5.

Du Pasquier RA, Blanc Y, Sinnreich M, Landis T, Burkhard P, Vingerhoets FJ. Pengaruh penuaan terhadap stabilitas postural: studi cross sectional dan longitudinal. Klinik Neurofisiol. 2003;33(5):213-.

Gomathy, R., & Karunagari, D. K. (2021). Effect of Stretching and Strengthening Exercises on Mobility among the Elderly. 8(March), 665–671.

Gradin, K. T., & Björklund, A. (2021). The common understanding of simplification approaches in published LCA studies—a review and mapping. *International Journal of Life Cycle Assessment*, *26*(1), 50–63. https://doi.org/10.1007/s11367-020-01843-4.

Jung, E. Y., Jung, J. H., Cho, H. Y., & Kim, S. H. (2023). Effects of Plantar Flexor Stretching on Static and Dynamic Balance in Healthy Adults. International Journal of Environmental Research and Public Health, 20(2). https://doi.org/10.3390/ijerph2002 462.

Keller, K., & Engelhardt, M. (2013). Strength and muscle mass loss with aging process. Age and strength loss. Muscles, Ligaments and Tendons Journal, 3(4), 346–350. https://doi.org/10.11138/mltj/2013 3.4.346.

Liang, Y., Wang, R., Jiang, J., Tan, L., & Yang, M. (2020). A randomized controlled trial of resistance and balance exercise for sarcopenic patients aged 80–99 years. Scientific Reports, 10(1), 1–7. https://doi.org/10.1038/s41598020 5872-2.

ISSN 2722 – 9610
E –ISSN 2722 - 9629

Lu, L., Mao, L., Feng, Y., Ainsworth, B. E., Liu, Y., & Chen, N. (2021). Effects of different exercise training modes on muscle strength and physical performance in older people with sarcopenia: a systematic review and meta-analysis. BMC Geriatrics, 21(1), 1–30. https://doi.org/10.1186/s12877 02102642-8

Marzuca-Nassr, G. N., Alegría-Molina, A. SanMartín-Calísto, Y., Artigas Arias, M., Huard, N., Sapunar, J., Salazar, L. A., Verdijk, L. B., & van Loon, L. J. C. (2023). Muscle Mass and Strength Gains Following Resistance Exercise Training in Older Adults 65–75 Years and Older Adults Above 85 Years. International Journal of Sport Nutrition and Exercise Metabolism, 1–9. https://doi.org/10.1123/ijsnem.202-0087.

Nur'amalia, R., Mutmainnah, M., Lestari, A. I., & Sulastri, S. (2022). Pengaruh Latihan Kesimbangan dan Ankle Strategy Exercise Terhadap Risiko Jatuh Pada Lansia. Jurnal Ilmiah Kesehatan Sandi Husada, 11, 1–7. https://doi.org/10.35816/jiskh.v11i 803.

Nurseptiani, D., Tresnowati, I., Maghfiroh, A., Kejadian, A., Muskuloskeletal, G., Lanjut, P., Di, U., & Kedungwuni, W. K. (2023). Analysis Of The Occurrence Of Muskuloskeletal Disorder In The Elderly In Kedungwuni.

Ramdhani, A., Ramdhani, M. A., & Amin, A. S. (2014). Writing a Literature Review Research Paper: A step-by step approach. International Journal of Basic and Applied Science, 03(01), 47–56

Reddy, R. S. and Alahmari, K. A. (2016) Effect of Lower Extremity Stretching Exercises on Balance in Geriatric Population, International journal of health sciences, 10(3), pp. 389–95.

Saraswati, R., Fasya, Z. A., Santoso, E. B.,& Artikel, I. (2022). Balance Exercise Menurunkan Risiko Jatuh. 18(1).

Siparsky, P. N., Kirkendall, D. T., & Garrett, W. E. (2014). Muscle Changes in Aging: Understanding Sarcopenia. Sports Health, 6(1), 36–40.

Tomicki, C., Zanini, S. C. C., Cecchin, L., Benedetti, T. R. B., Portella, M. R., & Leguisamo, C. P. (2016). Effect of physical exercise program on the balance and risk of falls of institutionalized elderly persons: a randomized clinical trial. Revista Brasileira de Geriatria e Gerontologia, 19(3), 473–482. https://doi.org/10.1590/1809 98232016019.150138.

Wager, E. and Wiffen, P.J. (2011) Ethical Issues in Preparing and PublishingSystematic Reviews. Journal of Evidence-Based Medicine, 4, 130 134.

Wu, J., Wang, X., Ye, M., Wang, L., & Zheng, G. (2021). Effect of regular resistance training on memory in older adults: A systematic review. Experimental Gerontology, 150. https://doi.org/10.1016/j.exger.202 .1113

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