International
Journal of Medical and Exercise Science
(Multidisciplinary, Peer Reviewed and Indexed Journal)

ORIGINAL ARTICLE

COMPARATIVEEFFECTS OF POSTURAL EXERCISE AND GAZE STABILITY EXERCISE ON BALANCE AND FUNCTIONAL INDEPENDENCE IN ELDERLY

Search engine:
www.ijmaes.org

Jibi Paul[1*], Kamreen Fathima.S[2]

Author:

[1]BPT Student, Faculty of Physiotherapy, Dr. M.G.R. Educational and Research Institute, Vellappanchavadi, Chennai, Tamil Nadu, India

Corresponding Author:

*[2]Professor, Faculty of Physiotherapy, Dr. M.G.R. Educational and Research Institute, Vellapanchavadi, Chennai, Tamil Nadu, India, E-Mail- physiojibi@gmail.com

ABSTRACT

Background: With increase age, elderly individuals often experience a decline in balance, leading to functional dependence and an elevated risk of fall. Balance issues are frequently associated with age related changes in the sensory and motor system. Postural exercise is aim to strength and stabilizes the body's posture. While gaze stability exercise focus on improving visual tracking and coordination, which are critical for balance. Comparing these two approaches could provide valuable insights into effective interventions for maintaining independence in the elderly. The aim of this study is to compare the efforts of postural exercise and gaze stability exercise on balance and functional independence in elderly individuals. Objective of the study was to determine the effectiveness of two distinct intervention postural exercise and gaze stability exercise in improving Balance, reducing falls and enhancing functional independence among elderly individuals. **Methodology:** It is a Quasi-Experimental Comparative study, with sample size of 30 [postural exercise 15], [gaze stability exercise 15]. Sampling Method was Random sampling [Lottery method] and the study conducted at Faculty of Physiotherapy, Dr. MGR Educational & Research institute for duration of 6 Months and the intervention duration was 30 Minutes per session, 4 Days per Week, 12 weeks. **Result:** Group A intervention found more effective over Group B intervention on Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively. **Conclusion:** Postural exercises are more effective than gaze stability exercises in improving independence, balance, and fall prevention confidence in the elderly.

Keywords: Postural exercise, gaze stability exercise, functional independence, balance, elderly, fall aging, rehabilitation, physiotherapy, exercise intervention.

Received on 18th July 2025; Revised on 18th August 2025; Accepted on 24th August 2025
DOI:10.36678/IJMAES.2025.V11I03.04

INTRODUCTION

The elderly's age-related changes, particularly balance disorders, can significantly impact their ability to perform daily activities, making them susceptible to falls. Balance and lower-limb strength exercises are widely recognized as effective methods for reducing falls in the elderly population. Balance is the ability to maintain posture during movement. Preventing falls in the elderly is crucial to avoid physical and psychological trauma and to preserve their independence[1-3].

Good balance is an essential skill for daily life, integrating sensory information about body position and enabling appropriate motor responses for movement control.] Balance relies on three main systems. The sensory system processes information about the body's position and movement using vision, somatosensory input, and the vestibular system. The musculoskeletal system provides the strength and flexibility needed to control body position. Finally, the central processing system makes decisions for timely responses. Visual, vestibular, and somatosensory inputs are all crucial for maintaining postural stability[4,5].

Balance involves postural control and the ability to maintain positions, essential for daily activities. Various interventions, especially multifactorial ones combining physical strengthening and balance exercises with behavioural strategies, effectively reduce the fear of falling[6].

The geriatric population includes individuals aged 60 and older, accounting for roughly 7.4% of the global population. The elderly represent the fastest-growing demographic in our country. A rising concern in healthcare worldwide is the increasing number of seniors experiencing balance issues, which elevates the risk of serious injuries from falls, and even fatalities. Estimates suggest that about one in three adults over the age of 60 will experience at least one fall during their lifetime[7].

Falls represent a significant issue for the elderly population, leading to considerable morbidity and disability. Each year, more than one-third of individuals aged 60 and older experience a fall. Furthermore, among those who have fallen, about 40% to 70% may develop a fear of falling. However, the fear of falling can greatly affect an individual's balance skills, creating a detrimental cycle that results in decreased physical activity, muscle weakness, impaired balance, and heightened fear of falling[8,9].

A decline in muscle quality among the elderly can lead to reduced mobility, often instilling a fear of falling. This fear typically results in decreased daily activities, ultimately impacting their overall functional quality. As individuals age, their level of independence tends to diminish, leading to increased reliance on family members[10].

Preventing falls among the elderly is crucial to avoid both short- and long-term disabilities, as the consequences of a fall can significantly affect the quality of life for their families[11].

Independence in the elderly refers to the level of personal autonomy they have in fulfilling their daily needs, such as eating, dressing, and personal grooming, reflecting their right to make choices. As individuals age, various physical, psychological, and social changes, as well as the need for physiotherapy, can lead to disabilities in daily activities and diminish their independence[12]. Postural control refers to the ability to maintain body position in space while

standing or walking, ensuring stability and proper orientation[13].

Poor postural balance can be a predictor of fall occurrences in elderly individuals as they age. The mechanisms of postural control become compromised due to these changes, along with the effects of physical activity, which can directly influence the neuromuscular system's ability to maintain balance[14]. Postural Control pertains to the management of the body's position in space, serving two main functions: stability and orientation. It represents the limits of stability, which is the range within which the centre of mass can shift without altering the supporting base. Insufficient postural control is often observed in the elderly, posing a significant risk for falls and fractures. Research can explore how the body compensates for altered sensory feedback in real-life situations, providing valuable insights into evaluating postural control[15].

Gaze stability exercise (GSE) is a method that aids in the recovery of vestibular response by promoting the reciprocal interaction between the visual and vestibular systems during head movement. Gaze stability exercise (GSE) improves balance and subjective confidence in healthy elderly populations, coordinating head, trunk, and pelvis movements during walking[17].
To assess if adding GSE to balance rehabilitation enhances symptom improvement for individuals with normal vestibular function and to identify predictors of rehabilitation outcomes, including symptoms and fall risk. GSE are exercises that help adapt the vestibular system to adjust the vestibulo-ocular reflex (VOR) during head movements. They can improve balance and confidence in Balance for healthy elderly people.

Aim of the Study: The study aims to compare the effects of postural exercise and gaze stability exercise on balance and functional independence in the elderly population. It seeks to determine which intervention is more effective in improving postural control, reducing fall risk, and enhancing daily functional abilities among older adults.

Need of the Study: Aging leads to decreased postural control, muscle strength, and vestibular function, increasing fall risk. Falls are a major cause of injury and loss of independence in the elderly, making balance training crucial. While postural exercises focus on body control and stability, gaze stability exercises improve vestibular function and head movement control. A comparative analysis will help identify the most effective approach. The findings can aid healthcare professionals in developing targeted exercise programs for elderly individuals to maintain independence and improve quality of life.

METHODOLOGY

This study that has been chosen for this research is a Quasi-experimental study. This study type is pre and post experimental study. 30 subjects were selected for this study. Samples were selected by random sampling [lottery method], samples were divided into two groups. The study conducted at Out Patient department of faculty of physiotherapy, Dr. M G R. Educational and research institute, ASC Medical College and hospital. This study was conducted for a total period of 6 months. This study duration is 30 Minutes per session, 4 Days per week, 12 weeks. Elderly individuals aged 60 above, Individuals with mild to moderate balance impairments, Ability to participate in exercise

and No major cognitive provided were included in the study. Outcome measure were Balance, Functional independence and Fall rate

Measurement tools: Y Balance test [YBT]: That measures a person's Balance, Strength and neuromuscular control, Functional independence measure [FIM]: To assess overall functional independence, fall efficacy scale-international [FES-I]: To evaluate fear of falling.

Procedure: This study was Quasi-experimental study design with comparative type. This was conducted in the physiotherapy out Patient department in A.C.S. Medical college and hospital of 30 subjects were randomly divided into two groups based on inclusion criteria. The study includes a sample of age above 60, both male and female. Group A postural exercise and Group B Gaze stability exercise. The outcome measure is focus on strengthening and stability the core muscle and lower extremity and coordination to enhance balance and functional independence in elder people. The pre and post Test measure were compared before and after the intervention.

Group A: Postural Exercise: The participants will receive postural exercise targeting the lower limb, focusing on static and dynamic balance training, core and lower limb strengthening exercise and proprioceptive training. This exercise will be applied by aiming to improve balance and functional independence, fear of falling. This intervention will be conducted 30 minutes per session 4-5 days per week. The pre and post Test measure with using of Y balance test [YBT] and Functional Independence Measures [FIM], Fall Efficacy Scale-International [FES-I].

Intervention Protocol

1. **Static balance training:**
   Single leg stance:
   - Stand front of the therapist and hold the hands, lift one leg, hold for 10-20 seconds, switch legs.
   - Repeat 3 times per leg, 2-3 time per session for 4 days per week.
2. **Dynamic balance training: tandem stance [with weight shifting]:**
   - Placing one foot directly on front of other leg toes.
   - Shifting your weight from the front foot to the back foot as you take the step.
   - This training is done for 2-3 rounds per session 4 days per week
3. **Core & Lower Limb Strengthening: Side Leg Raise:**
   - Stand behind a chair, lift the one leg to the side, hold for 10-20 seconds, switch legs.
   - Repeat 4 times per leg, 2-3 times per session for 4 days per week.

Group B: Gaze Stability Exercise: The participants will receive gaze stability exercise [GSE] targeting the head movements and focusing on vestibulo-ocular reflex [VOR] and head movement coordination with visual focus and balance tasks incorporating head movement. This exercise will be Improve the balance and function independence, fear of falling, each exercise held for 30 seconds to 1 minute and repeated 2 to 4 time per session. After completing the intervention period, all participants will undergo a post treatment evaluation using the same outcome measures-Y balance test [YBT], functional Independence Measures [FIM], Fall Efficacy Scale-International [FES-I].

Intervention protocol

1. Vestibulo-ocular Reflex:

- Hold a target [paper or card] at eye level about 3 feet away, move your head left and right while keeping your eye focused on the target.
- Repeat this 30 second to 1 minute per direction and 24 time per session for 4 days per week.

2. Near And Far Focus:

- Hold your finger close to your face and focus on it, then shift your focus to an object in the distance.
- Repeat this 30 second to 1 minute per direction and 2-4 times per session for 4 days per week.

The collected data will be analysed to determine which intervention is more effective **Group A** in balance, coordination, stability, fear of falling and enhancing balance and functional independence in elder patient.

Data Analysis: The collected data were tabulated and analysed using both descriptive and inferential statistics. All the parameters were assessed using Graph Prism Pad version 8.4.3, with a significance level of p value less than 0.05 and a 95% confidence interval set for all analysis. The Shapiro Wilk test was used to determine the normality of the data. In this study, Shapiro Wilk test showed that the data was normally distributed on the dependent values at P > 0.05. Hence parametric test was adopted. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

Table 1: Paired t test within Group Aon Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale.

Group A	Number of Pairs	Mean Diff.	SD, SEM	df	t	P value	Sig. Diff. (P <0.05)
Y Balance Anterior	15	10.33	4.91 1.26	14	8.15	<0.0001	****
Post. Medial	15	6.99	2.84 0.73	14	9.52	<0.0001	****
Post. Lateral	15	4.28	3.99 1.03	14	4.15	<0.001	****
FIM	15	28.47	10.91 2.82	14	10.10	<0.0001	****
Fall Efficacy scale	15	21.60	2.13 0.55	14	39.25	<0.0001	****

The above table 1 shows significant difference in Y- Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale within Group A with P value >0.0001 and >0.001.

Group B

Table 2: Paired t test within Group Bon Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale

Group B	Number of Pairs	Mean Diff.	SD, SEM	df	t	P value	Sig.Diff. (P < 0.05)
Y Balance Ant	15	4.73	3.09 0.79	14	5.91	<0.0001	****
Post. Medial	15	4.53	2.13 0.55	14	8.25	<0.0001	****
Post. Lateral	15	4.21	2.54 0.66	14	6.41	<0.0001	****
FIM	15	26.27	7.99 2.06	14	12.74	<0.0001	****
Fall Efficacy scale	15	19.33	2.06 0.53	14	36.37	<0.0001	****

The above table 2 shows significant difference in Y Balance Ant, Post. Medial, Post Lateral, FIM, Fall Efficacy within Group B with P value >0.0001

Comparative Test between Group A and Group B

Table 3: Independent t test between Group A and Group B

Group A&B		Number of Pairs	Mean Diff. ± SEM	R	DF	t	P value	Sig. Diff. (P < 0.05)
Pre test	**Y Balance Ant**	30	0.05 0.64	0.0002	28	0.73	0.94	NS
	Post Medial	30	1.51 0.99	0.076	28	1.53	0.138	NS
	Post. Lateral	30	1.22 0.83	0.07	28	1.46	0.16	NS
	FIM	30	0.60 2.45	0.002	28	0.244	0.81	NS
	Fall Efficacy scale	30	1.00 0.58	0.097	28	1.73	0.09	NS

Post test	**Y Balance Ant**	30	5.65 1.64	0.299	28	3.46	0.002	**
	Post Medial	30	2.11 0.98	0.14	28	2.15	0.40	*
	Post. Lateral	30	2.07 0.86	0.17	28	2.41	0.023	*
	FIM	30	4.2 1.66	0.18	28	2.52	0.017	*
	Fall Efficacy scale	30	2.07 0.64	0.27	28	3.25	0.003	**

The above table 3 shows NO significant difference on Pre Test of Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy scale between Group A and Group B with P value 0.94, 0.38, 0.16, 0.81and 0.09 respectively, Post Test of Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy between Group A and Group B, shows significance on P value with >0.002, 0.40, 0.023, 0.017, and 0.003 respectively.

RESULT

Total 30 participants, male and female combined subjects were included in the study based on specific selection criteria and divided into 15 samples in each Group A and Group B. Participants were with age group above 60 years.

In this study, the comparative effect of Group A over Group B on Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy scale shows significant difference with P value >0.002, 0.40, 0.023, 0.017, and 0.003 respectively.

Group A found effective on Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy scale with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively with p value <0.0001.

Group B also found effective on Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy scale with mean score difference of 4.73, 4.53, 4.21, 26.27 and 19.33 respectively with p value <0.0001.

Group A intervention found more effective over Group B intervention on Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy scale with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively.

DISCUSSION

This study aimed to assess and compare the effects of postural exercises and gaze stability exercises on balance and functional independence in elderly individuals, using the Functional Independence Measure

(FIM), Y Balance Test, and Fall Efficacy Scale (FES) as outcome measures.

A total of 30 elderly participants were randomly assigned into two groups: Group A (n=15) received postural exercises, while Group B (n=15) underwent gaze stability exercises. The intervention lasted for 12 weeks, with regular monitoring and both pre- and post-intervention assessments conducted.

Postural exercises include core strengthening, alignment correction, and dynamic control of the trunk and lower limbs. These exercises aim to enhance both static and dynamic postural control. Gaze stability exercises, a type of vestibular rehabilitation, focus on improving eye-head coordination. They help strengthen the ability to maintain visual focus during head movements, which is essential for sustaining balance.

Falls are a significant health issue among older adults and are the leading cause of injuries and decreased functional independence in individuals over the age of 60. As people age, various physiological systems deteriorate, which heightens the risk of falls.

The Y Balance Scale is a tool used to assess balance by measuring reach distances in three directions: anterior, posteromedial, and posterolateral. Group A showed greater improvement across all three directions, indicating enhanced postural control, balance, and strengthened core and lower limb muscles. In contrast, Group B exhibited moderate improvement, particularly in maintaining control during head movements or visual tasks, but showed less progress in dynamic reach.

The Functional Independence Measure (FIM) assesses functional abilities across physical, psychological, and social domains. Group A (postural exercise) showed a significant increase in FIM scores, particularly in areas such as mobility, transfers, self-care, and locomotion. Group B (gaze stability exercise) demonstrated modest improvements, mainly in cognitive areas like orientation, with less impact on gross motor functions.

The Fall Efficacy Scale evaluates the level of fear or concern about falling during daily activities. Group A (postural exercise) achieved more consistent improvements across various tasks, indicating enhanced physical stability and strength. Group B (gaze stability exercise) showed slightly greater gains in confidence during activities that involve head and visual movement, such as navigating crowded environments or turning while walking.

study on "Role of central per programming in dynamic Visual acuity during Locomotion" This study concluded on Who found that gaze Stability exercise reduce dizziness and improve confidence, especially in elderly Individuals with Vestibular dysfunction[15].

study on "Trunk control training improves mobility in post stroke elderly" This study concluded on that trunk control training significantly Improved mobility and Independence in older adult post-stroke[17].

Study on "Exercise to prevent falls in older adults" This study concluded that balance and strength training significantly reduces

fall risk, and efficacy scales reflect this improvement [18].

Study on" Training effects of Visual feedback balance training is elderly subjects". Study concluded visual and Vestibular feedback training Improved postural Stability and reduced Sway in elderly subjects. Incorporating sensory-motor feedback mechanisms, like gaze Stabilization, is beneficial for balance rehab[19].

Study on "Rehabilitation of balance in patients with balance disorders". study concluded A combination of dynamic balance and gaze stability exercise improved postural control in patients with age-related balance impairments, especially in those with Vestibular loss[20].

Study on "postural orientation and equilibrium: What do we need to know about neural control of balance to prevent fall?" study concluded fall prevention must target sensory integration, postural alignment, and motor response training, Elderly benefit mat from programs that address both postural and vestibular contract[21].

study on "Training balance and Strength in older adults: a meta-analysis". Study Concluded. Exercise interventions that particularly postural Stability work, significantly improve functional ability and reduce fall risk in older adults[22].

Group A found effective on Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively with p value <0.0001.

Group B also found effective on Y Balance Ant, Post Medial, Post. Lateral, FIM, Fall Efficacy with mean score difference of 4.73, 4.53, 4.21, 26.27 and 19.33 respectively with p value <0.0001.

Group A intervention found more effective over Group B intervention on Y Balance Ant, Post. Medial, Post. Lateral, FIM, Fall Efficacy with mean score difference of 10.33, 6.99, 4.28, 28.47, and 21.60 respectively.

Ethical Clearance: Ethical clearance has obtained from Faculty of Physiotherapy, Dr. MGR. Educational and Research Institute, Chennai, Tamil Nadu, India. Reference number: No: BPT IV Year-C Sec, 22/ PHYSIO/ IRB/ 2024-2025, dated: 16/12/ 2024.

Conflict of interest: There was no conflict of interest to conduct and publish this study.

Fund for the study: It was a self-financed study.

CONCLUSION

This study confirms that postural exercises are more effective than gaze stability exercises in enhancing functional independence, balance, and confidence in preventing falls among elderly individuals. Although gaze stability training is beneficial—particularly for those with vestibular disorders—postural training results in more comprehensive improvements in physical mobility and balance.

An integrated exercise program that combines both postural and gaze stability components could provide the most effective approach for improving balance, reducing fall risk, and promoting functional independence in the aging population.

REFERENCES

1. Ulfiana, E., Dewi, T. P., & Yusuf, A. (2019). The Effect of Balance Exercise on Postural Balance of Elderly as Fall Prevention in Institutionalized Elderly. Indian Journal of Public Health Research and Development, 10(8), 2708–2712.
2. Perera, G. A. D., Pramoedya, O., & Kandege, I. M. (2024). Quadriceps muscle strength and postural balance as intrinsic risk factors of falls in institutionalized healthy older adults: A cross-sectional study in two selected elders' homes in Colombo, Sri Lanka. GSC Advanced Research and Reviews, 18(2), 331-337.
3. Putri F, Nazhira F, Swandari A, & Larasati N, (2024). Implementation Of Gaze Stability Exercise with Ergonomic Approach Based on Home Training Program in Improving Balance in The Elderly. FISIO MU: Physiotherapy Evidences, 5(2), 125128.
4. Janani Muthusamy, Vijayaraj Vediappan. The effect of gaze stability exercises on balance and gait in elderly population-A comparative study. Int. J. Neurol. Res. 2022;4(1):14-20.
5. Hidayatullah, M. F., Riyadi, S., & Bramastia, B. (2024). Static Analysis of Stretching and Strengthening Exercises on Balance and Strength in the Elderly: Literature Review. FISIO MU: Physiotherapy Evidences, 5(1), 85-100.
6. Motamed-Jahromi, M., & Kaveh, M. H. (2021). Effective interventions on improving elderly's independence in activity of daily living: a systematic review and logic model. Frontiers in Public Health, 8, 516151.
7. Sedaghati, P., Goudarzian, M., Ahmadabadi, S., & Tabatabai-Asl, S. M. (2022). The impact of a multicomponent-functional training with postural correction on functional balance in the elderly with a history of falling. Journal of Experimental Orthopaedics, 9(1), 23.
8. De Oliveira, M. R., da Silva, R. A., Dascal, J. B., & Teixeira, D. C. (2014). Effect of different types of exercise on postural balance in elderly women: a randomized controlled trial. Archives of Gerontology and Geriatrics, 59(3), 506–514.
9. Burke, T. N., França, F. J. R., Meneses, S. R. F. D., Pereira, R. M. R., & Marques, A. P. (2012). Postural control in elderly women with osteoporosis: comparison of balance, strengthening and stretching exercises. A randomized controlled trial. Clinical Rehabilitation, 26(11), 1021–1031.
10. Sarvari, M., Shanbehzadeh, S., Shavehei, Y., & Shah Ali, S. (2024). Postural control among older adults with fear of falling and chronic low back pain. BMC Geriatrics, 24(1), 862.
11. Pimenta, C., Correia, A., Alves, M., & Virella, D. (2017). Effects of oculomotor and gaze stability exercises on balance after stroke: Clinical trial protocol. Porto Biomedical Journal, 2(3), 76–80.
12. Hall, C. D., Heusel-Gillig, L., Tusa, R. J., & Herdman, S. J. (2010). Efficacy of gaze stability exercises in older adults with dizziness. Journal of Neurologic Physical Therapy, 34(2), 64–69.
13. Bhardwaj, V., & Vats, M. (2014). Effectiveness of gaze stability exercise on balance in healthy elderly population. International Journal of Physiotherapy and Research (IJPR), 2(4), 642–647.
14. Jang, H. R., & Kim, M. K. (2024). Effects of Gaze Stabilization Exercise and Cognitive Training on Balance and Gait in Subacute Stroke Patients: Randomized Controlled Trial. 19(1), 155-164.

15. Brodowski, H., Strutz, N., Mueller-Werdan, U., & Kiselev, J. (2022). Categorizing fear of falling using the Survey of Activities and Fear of Falling in the Elderly (SAFE) questionnaire in a cohort of hospitalized older adults: A cross-sectional design. International Journal of Nursing Studies, 126, 104152.
16. Philippe, A. G., Goncalves, A., Martinez, C., Deshayes, M., & Charbonnier, E. (2022). Can an eight-session multi component physical exercise program reduce fall risk and fear of falling among the elderly? International Journal of Environmental Research and Public Health, 19(14), 8262.
17. Ambrens, M., Alley, S., Oliveira, J. S., To, Q., Delbaere, K., Vandelanotte, C., & Tiedemann, A. (2022). Effect of eHealth-delivered exercise programmes on balance in people aged 65 years and over living in the community: a systematic review and meta-analysis of randomised controlled trials. BMJ Open, 12(6), e051377.
18. Soleimani, R., Alvandi, H., Azari, N., Mobasheri, M., Hasanzadeh, A., & Bagherikholenjani, F. (2022). Impact of balance training on fear of falling and fall rate in older women. Journal of Education and Community Health, 9(3), 155–161.
19. Garcia, P. A., de Queiroz, L. L., Caetano, M. B. D., e Silva, K. H. C. V., & da Silva Hamu, T. C. D. (2021). Obesity is associated with postural balance on unstable surfaces but not with fear of falling in older adults. Brazilian Journal of Physical Therapy, 25(3), 311–318.
20. Tavares, G. M. S., Pacheco, B. P., Gottlieb, M. G. V., Müller, D. V. K., & Santos, G. M. (2020). Interaction between cognitive status, fear of falling, and balance in elderly persons. Clinics, 75, e1612.
21. Stanghelle, B., Bentzen, H., Giangregorio, L., Pripp, A. H., Skelton, D. A., & Bergland, A. (2020). Effects of a resistance and balance exercise programme on physical fitness, health-related quality of life and fear of falling in older women with osteoporosis and vertebral fracture: a randomized controlledtrial. Osteoporosis international, 31, 1069-1078.
22. GranacherUrs, et al. "The importance of trunk muscle strength for balance, functional performance, and fall prevention in seniors: a systematic review." Sports medicine 43.7 (2013): 627-641.

Jibi Paul, Kamreen Fathima.S (2025). Comparative effects Of Postural Exercise And Gaze Stability Exercise On Balance And Functional Independence In Elderly, ijmaes; 11(3); 3286-3296.