

ORIGINAL ARTICLE

Effectiveness of Physical Activity in Geriatric Population to Decrease the Risk of Fall a Randomized Control TrialMUHAMMAD ADNAN¹, HUDA ANJUM², HADIQA ADNAN³, HAFIZA SABEEN AYESHA⁴, WAJEEHA ALAM⁵, SANA UMAR⁶, SAMAN JAHANGIR⁷, BISMAL ASHRAF⁸¹Incharge Physiotherapy Department, Khyber Teaching Hospital Peshawar²Lecturer, Shifa Tameer e Millat University, Islamabad³Senior L Huda.anjum@hotmail.com lecturer, Islamabad Medical and Dental College⁴Assistant Professor, Agile Institute of Rehabilitation Sciences⁵University of Lahore, Gujrat Campus⁶HITEC Institute Of Medical Sciences, Taxilla⁷Shaheed Zulfiqar Ali Bhutto Medical University Islamabad⁸Federal Medical and Dental College (SZABMU)

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ABSTRACT**Background:** For elderly persons who are frail, effective fall prevention strategies are required. Our goal was to evaluate physical activity's value in preventing falls in older persons.**Material and Methodology:** The physiological profile evaluation was used to conduct a randomised control experiment on individuals aged sixty five and older who were categorised as pre-frail and had mild to moderate fall risk scores. A total of 54 participants were recruited in the study using allocation concealment. 54 participants were split into two groups at random i.e MPE (n = 27), control (n = 27). The three-day-per-week, 12-week intervention mainly concentrated on proprioception, muscular development, response time, and balancing training. The main finding was the assessment of fall risk using PPA twelve weeks after baseline and at a 24 week follow-up.**Results:** At weeks 12 and 24, there were significant changes between the MPE group and controls in the fall risk, proprioception, muscle strength, response speed, postural sway, and fear of falling scores. In addition, the MPE group's HRQOL had dramatically improved compared to controls.**Practical Implication:** by identifying and establishing effect of physical activity in geriatric population in reducing risk of fall, clinical prophylactic and rehabilitation plans can be designed and implemented before hand to decrease the chances of fall injuries and to facilitate the rehabilitation plan after the injury.**Conclusion:** The MPE programme significantly improved proprioception, response time, and postural sway in elderly people with pre-frailty, which decreased the risk of falls. The MPE programme is therefore advised for use in routine primary care for the geriatric population.**Keywords:** Fall, Geriatric, MPE, Physical Activity, risk of fall, pre-frail, multiple physical exercise, HRQOL, postural sway**INTRODUCTION**

The share of older people in the world's population is significant and rising. ¹ Humans become more frail as they age because their physiological systems deteriorate and their functional state deteriorates. Age-related declines in physiological processes and functions negatively impact a variety of health related outcome measures, such as impairment, damage, incidence of hospitalisation, illness, falls, and mortality ².

The most serious injury problem in terms of the public health burden is falls among older individuals. Male lifetime injury costs from falls accounted for 25.6% of total spending, whereas female lifetime injury costs from falls accounted for 40% of total spending, reflecting the high frequency of falls injury in older women. Assuming current fall rates and the estimated rise in the number of older people, it is predicted that 800 additional hospital beds and 1200 additional nursing care beds will be required in NSW by 2051 to accommodate those who have fallen [1]. Elderly people and their families who fall may endure death, morbidity, pain, and societal costs associated with hospitalisation. [2]. Among older people, falls-related injuries account for 84.6 percent of mortality compared to other causes of death, while falls alone account for 38.19 percent of hospital admissions. Fall prevention is essential because falls have an impact on both the healthcare system and the wellbeing of elderly people who are already weak. [3]

Falling is a problem that affects seniors a lot. The consequences of state of no activity and hunger are a discount in body strength and physical hobby. These limit functional potential, strength, proprioception, stability, and mobility, that may cause falls in senior humans. [4] the first element that generally reasons falls is a lack of stability, which is ultimately observed with the aid of the degeneration of the musculoskeletal, neurological, and sensory systems. Vision is the second one most typical element. [5] Compared to other forms of treatment, exercise is essential for preventing falls. [6]

Exercise programmes with many elements had been verified to lower the hazard of falls among seniors dwelling inside the network. Multimodal healing procedures are more successful at lowering the risk of falls in frail older people, in step with a previous observe. This take a look at, however, used a customised home exercising programme and usually targeting stability and lower limb strength training. The program's integrated control of social, mental, and medical difficulties become in price of physiotherapists. [7]. There are few research that look at the how workout interventions impact falls in frail older people. [8]

Significance and Research Gap: The study is intended to find out the effect of physical Activity on decreasing risk of fall. If the tremendous relation is established with the aid of the look at then this will be medical significance in prophylactic and rehabilitation plan development for pre-frail populace. Previous work establishes certain physical exercises to be of importance but research gap exists between influence of MPE on decreasing risk of fall which our study targets.

MATERIALS AND METHODOLOGY**STUDY DESIGN:** Single-Blinded Randomized control Trial**SETTING:** Management records of geriatric population of primary care centres of Rawalpindi and Islamabad**DURATION OF STUDY:** 1 YEAR (2021-2022)**SAMPLE SIZE:** 54 GERIATRIC ADULTS (27 IN EACH GROUP)**SAMPLING TECHNIQUE:** Convenient sampling using sealed envelope method**INCLUSION CRITERIA:** THE FOLLOWING WERE THE INCLUSION REQUIREMENTS:

- 1 older persons who were 65 years of age or older
- 2 pre-frail by fried's frailty phenotype [30]
- 3 risk of falling with PPA composite = 0/above

EXCLUSION CRITERIA:

- 1 getting palliative care

- 2 Being prescribed psychotropic
- 3 antiarrhythmic, or hypnotic medications
- 4 being diagnosed with heart disease, cancer, or severe depression.

DATA COLLECTION PROCEDURE: A total of 54 senior citizens were evaluated and gave their permission to take part. The primary care center's management records were used to identify the elder population from which to draw participants. The MPE (n = 27) and control (n = 27) groups were randomly assigned among a total of 54 participants. At baseline, weeks 12 and 24, the researcher—who was unaware of the program—evaluated every assessment both pre- and post-intervention.

INTERVENTION: The Physiological Profile evaluation and studies on workout treatments for fall prevention served as the foundation for the Multi-system physical exercising (MPE) programme that the intervention group underwent. Proprioception, muscle strengthening, reaction time training and postural balancing education were the 4 additives of the MPE. The intervention institution's members participated within the MPE three days every week for a complete of 36 sessions over the route of 12 weeks. Three instances per week for the route of the programme, the power exercise instruction was given to the manipulate institution.

RESULTS:

At baseline, there were 54 individuals in total (27 =intervention group and 27 = control group). No statistically significant difference found between the MPE and control groups.(Table 1)

Table 1: Baseline of participants.

Characteristics mean ± SD	MPE Group (n = 27)	Control Group (n= 27)	p-Value
Age	65.14 ± 3.65	63.89 ± 3.36	0.785
Comorbidities	0.85 ± 0.78	0.82 ± 0.70	0.87
Drugs	0.88 ± 0.78	0.79 ± 0.57	0.60
Body mass index (kg/m ²),	27.47 ± 4.17	27.33 ± 4.47	0.99
Underweight <18.5	2 (5.6)	5 (12.2)	
Normal weight= 18.5–22.9	13 (44.4)	10 (26)	
Overweight= 23.0–27.5	16 (42.8)	16 (42.8)	
Obese >27.5, n (%)	8 (20.1)	9 (23.4)	
Fall risk (Z-score)	2.12 ± 0.67	2.87 ± 0.59	0.97

The baseline fall chance rankings did not range notably between the two comparison groups. At weeks 12 and 24 after the intervention, there has been a statistically large distinction inside the fall chance rankings between the MPE and control organizations (p 0.001).

The baseline worry of falling ratings did not notably vary among the intervention and manipulate corporations. After the intervention, there was a statistically significant difference inside the rankings of the two groups. (p=0.001).

Table 2: Between-the-group Comparison of fall risk

Outcomes	Baseline	Week 12	Week 24	P- Value
	Mean SD	Mean SD	Mean SD	Within Group
Fall risk index score				
MPE	2.11 ± 0.78	0.43 ± 0.81	2.23 ± 0.86	<0.004 ab,ac,bc
Control	2.12 ± 0.57	1.96 ± 0.61	2.31 ± 0.77	<0.06ac,bc
Between-the-group (p-value)	0.974	<0.001	<0.001	
Edge-contrast sensitivity (dB) MPE	23.34 ± 1.00	23.65 ± 1.32	23.57 ± 1.12	0.095
Control	23.65 ± 0.87	22.76 ± 1.65	22.54 ± 1.67	0.976
Between-the-group (p-value)	0.824	0.270	0.284	
Proprioception MPE	2.88 ± 1.56	0.84 ± 1.35	1.89 ± 1.62	<0.001 ab,ac,bc
Control	2.92 ± 1.55	3.00 ± 1.57	3.56 ± 1.89	0.587
Between-the-group (p-value)	0.987	<0.001	<0.001	
Knee extension MPE	14.12 ± 5.23	19.63 ± 5.87	14.65 ± 6.21	<0.001 ab,bc
Control	16.56 ± 7.31	13.20 ± 5.01	8.11 ± 5.02	<0.001 ab,ac,bc
Between-the-group (p-value)	0.077	<0.001	<0.001	
Hand reaction time MPE	326.80 ± 68.76	261.87 ± 37.74	318.81 ± 60.57	<0.001 ab,bc
Control	352.65 ± 80.01	400.08 ± 46.56	386.40 ± 66.42	0.004 ac,bc
Between-the-group (p-value)	0.579	<0.001	<0.001	
Sway path MPE	1576 ± 1056.05	576.51 ± 386.80	1000.47 ± 564.86	<0.001 ab,ac,bc
Control	1521.09 ± 698.51	1111.64 ± 432.77	1219.61 ± 456.51	<0.001 ab,bc
Between-the-group (p-value)	0.456	<0.001	0.003	

Fall risk index score: The HRQOL baselines between the MPE and manipulate organizations had been notably specific (p zero.001). At week 12, there has been a huge distinction in standard HRQOL among the MPE and the other group (p 0.05). There had been no observable variations between the two businesses at week 24 following the intervention. (table 3)

Table 4: Between-the-group Comparison of fear of falling, depression, and HRQOL

Outcomes	A	B	c	p-Value
	Baseline Week 12	Week 24		
Fear of Fall				
MPE	41.23 ± 7.70	19.06 ± 5.96	25.38 ± 13.34	<0.001
Control	38.66 ± 14.01	26.78 ± 9.86	39.63 ± 13.58	<0.001
Between-the-group (p-value)	0.312	<0.001	<0.001	
Depression MPE	3.88 ± 2.84	0.61 ± 0.98	3.62 ± 3.01	<0.001
Control	3.01 ± 3.32	1.35 ± 0.88	2.43 ± 1.72	<0.001
Between-the-group (p-value)	0.797	0.001	0.634	
(HRQOL)				
MPE	68.46 ± 11.78	94.89 ± 8.01	86.73 ± 13.44	<0.001
Control	75.87 ± 7.5	91.53 ± 1.72	82.87 ± 7.93	<0.001
Between-the-group (p-value)	<0.001	0.031	0.248	

DISCUSSION

The frailty status known as pre-frail indicates a failing physiological system and an increased chance of falling. By participating in this MPE programme, the risk of falling may be reduced. Our results

show that the pre-frail individuals in the experiment dramatically improved proprioception, response speed, knee extension, and balance with the 12-week MPE programme, which translated into higher overall physical performance and a lower risk of falling.[9]

Until the twenty fourth week, the impacts of these outcome improvements persisted. However, we discovered that the control group's fall risk ratings had increased from the baseline and week 12 following the intervention at week 24. These may be brought about by a variety of circumstances, including inactivity, and individual factors.[10]

Our findings are in line with those of earlier research, which showed that exercise interventions improved physical performance and decreased the risk of falls in geriatric people living in communities [11].

Additionally, the performance reductions shown following the end of exercise at week twelve indicate the necessity of continued exercise to preserve the positive impact of the MPE programme. High-frequency proprioceptive training has already been shown to lower the risk of falls in older persons in the literature. In older individuals, a 12-week proprioception-training programme improves postural stability and lowers the chance of falling [12]. As a result, exercise can enhance sensorimotor and somatosensory function, which enhances proprioception. Proprioception exercise training in pre-frail older persons, however, is the subject of few investigations.

Our findings demonstrated that there were substantial differences in proprioception-related outcomes between the intervention and control groups in older persons with pre-frailty ($p < 0.001$). Reduced testosterone levels have been linked to muscle atrophy, loss of muscle and strength, and physiological abnormalities in weak older persons [13].

Exercise can enhance the pathways where muscle contractile proteins are produced and boost muscle power, both of which lead to increased muscle strength. Our findings are in line with earlier research on treatments' effects on muscle strength, which showed that resistance and aerobic exercise interventions increased muscle strength and elastic band exercise increased muscle strength in elderly individuals at risk for frailty.[14]

One of the most popular techniques for determining fall risk is the fear of falling scale, which was developed after a patient's unique ability to maintain balance was evaluated. Our research revealed that there was a significant difference in the fear of falling between both the groups ($p < 0.001$).

In line with earlier research, we discovered that exercise interventions helped lessen older persons' anxiety of falling. Similarly, it was discovered that the MPE programme significantly decreased the level of depression in pre-frail older persons at week 12 ($p = 0.001$) compared to the control group, although there was no significant change at week 24. Results from earlier studies indicated that an exercise intervention greatly decreased depression in elderly, frail people.[15]

At week 12, participants in the MPE programme showed a substantial improvement in their overall HRQOL ($p < 0.001$). Physical and mental health have been linked to exercise and physical activity, according to certain research. These findings are in line with other research that showed older persons who were frail or on the verge of becoming frail saw an improvement in HRQOL.[16]

CONCLUSION

The results demonstrated that Multi-system Physiological Exercise (MPE) can reduce the incidence of falls in community-dwelling older people with pre-frailty while also enhancing proprioception, hand reaction time, sway path, and knee extension strength. The intervention also lowers depression and improves quality of life while reducing fear of falling. These findings imply that the MPE is an effective option for preventing falls in community-dwelling older individuals. Further investigation is necessary to pinpoint the

precise programme needed for fall prevention training in a particular community of elderly people with chronic illnesses or frailty.

LIMITATION: There are various restrictions on this study that must be taken into account.

1 Because our workout programme is intended to be done in groups, it is hard to adjust the activity's intensity to suit each individual. However, compared to solitary activity, group exercise frequently produces a higher amount of euphoria.

2 Because this programme was created as a center-based workout programme, it was challenging for participants to do at home.

RECOMMENDATIONS: In future research, each subject's level of physical fitness should be evaluated, and the participants should be divided into groups that have the same capacity for exercise. A home-based programme ought to be created for ongoing and successful usage with the elderly.

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