



## KINESITHERAPY AND PHYSIOTHERAPEUTIC PROGRAMMES FOR FALLS IN ADULTS

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### ABSTRACT

**Purpose:** To study and present the scientific publications available in reference databases that discuss physiotherapeutic programmes focused on fall prevention among the elderly.

**Material and Methods:** *Material:* The study considers scientific publications from 2019-2024 relative to the keywords "kinesitherapy" fall prevention", "exercises" and "elderly" in scientific databases, such as PubMed, Scopus, Web of Science, and Google Scholar.

*Methods* for assessment of the risk and the complications occurring after falls are proposed, innovations and technologies in aid of fall prevention are introduced, and the role of the physiotherapist is affirmed.

**Results:** 63 full-text scientific articles were recruited, 22 of them (approx. 35%) focused on a specific proposal for a physiotherapeutic complex. Abstracting from the studies implementing virtual reality, augmented reality, and exergames as prevention methods, the study is focused only on the conventional methods. The developments of twenty-two authors' collective present programs for the prevention of falls.

**Conclusion:** Based on the data, researchers create and introduce programmes in the physiotherapeutic practice, with Otago as the most common. The proposed physiotherapeutic procedures include exercises for balance and gait improvement (robot-assisted or not), occupational therapy, classic kinesitherapy, walking and treadmill training, as well as robot-assisted therapy for upper extremities. Exercises for increasing muscle strength and improving balance are present in almost all proposed programmes. Guidelines are being developed in support of clinicians around the world to determine their approach and manage the risk of falls among the elderly.

**Keywords:** kinesitherapy, fall prevention, exercises, elderly,

### INTRODUCTION

Falls accompany a person throughout their whole life, but become a problem at a greater age due to frequent complications, subsequent disability, and, oftentimes, death. WHO's data from the 2020s of the 21st century show that falls are the second leading cause of mortality worldwide over the age of sixty. The distinctiveness of their health status, the predominance of chronic diseases, as well as multimorbidity, categorise the elderly as the most vulnerable concerning falls group. The degenerative somatic, sensory and cognitive changes characteristic of this age increase this risk. With age and due to the increasing osteoporosis, common falls lead to orthopaedic and neurosurgical trauma with subsequent hospitalisations, disability, and a change in the quality of life. The problem justifiably draws the attention of medical specialists towards fall risk screening, challenging their professional creativity to develop applicable prevention programmes.

The selection of kinesitherapeutic methods and means while forming a rehabilitation programme is essential because of the necessity and adaptability to the specifics of different diseases in the multimorbid complex that is the patient. The standard methods and means focused on fall prevention for improving muscle strength, endurance, tone, balance, postural control, coordination, and cognition. Different schoolhouses include a variety of physiotherapeutic exercises in their programmes, which arouses the researchers' interest. Scientific literature reveals ample evidence for the positive effect of physiotherapy on fall prevention among the elderly. There is, however, no answer to the question of which of them is the most optimal.

*The aim of this research* is to study and present the scientific publications available in reference databases that discuss physiotherapeutic programmes focused on fall prevention among the elderly.

## MATERIAL AND METHODS

The study was conducted in the databases PubMed, Scopus, Web of Science, and Google Scholar relative to the keywords “kinesitherapy”, “fall prevention”, “exercises” and “elderly” within the five-year period (2019-2024). The available scientific literature after the search was examined based on the following criteria: age over 60 years, intervention (physiotherapy and rehabilitation) aimed at fall prevention. The criteria for inclusion in the study, approved by all members of the authors’ collective via a thorough discussion, were determined during the preparation stage. The articles fulfilling the admissibility requirements were included in the literature review: they were published in the last five years (2019-2024), written in English, targeted the age group above 60, and focused on fall prevention. The studies published before 2019, written in a language different from English, textbooks, dissertations, monographs, autoreferats, as well as clinical

cases were not permitted in the study. The following stage of the study subjected the search data to review and analysis based initially on title and abstract, and subsequently on full-text. Some of them were allocated in a table due to the mention and description of a specific physiotherapeutic programme.

## RESULTS

The discovered literature sources relative to the keywords during the assigned period were selected according to the inclusion criteria. 63 full-text scientific articles were recruited, 22 of them (approx. 35%) focused on a specific proposal for a physiotherapeutic complex. Abstracting from the studies implementing virtual reality, augmented reality, and exergames as prevention methods, the study is focused only on the conventional among them. The developments of twenty-two authors’ collective present programmes for the prevention of falls (Table 1):

**Table 1.** Scientific publications presenting programmes for the prevention of falls within the researched period.

Authors’ collective	Programme
Pawlak J. et al, 2020	Comprehensive physiotherapy
Worum H. et al, 2020	Otago exercise programme
Dhargave P. et al, 2020	Exercise protocol prescribed to patients in the experimental group
Anum S.P. et al, 2020	Home-based rehabilitation programme
Iakovidis P. et al., 2021	Otago exercise programme
Stasi S. et al., 2021	“Motor Control Home Ergonomics Elderly Prevention of Falls” (McHeELP)
Senthilkumar M. et al., 2021	The protocol: balance and strength exercises
	Conventional physiotherapy
Vaishnavi G. et, al., 2021	Balance training and conventional exercises programme
Knott S. et al., 2021	Otago-based exercise programme (OBEP) and traditional physical therapy (TPT)
Walid K.A. et al., 2021	Physiotherapeutic programmes for hospitalised patients (NICE 2017, RNAO 2017, AHRQ 2013) and outpatients (USPSTF 2018)
Anwari C. et al., 2022	AVEKSHA-Home-Based Primary Care Programme
Meekes WMA. et al., 2022	Care Programme for Frail Older People
	A Matter of Balance-NL, In Balance, Nijmegen Falls Prevention Programme, OTAGO
Yang Y. et al., 2022	Otago exercise programme
Teresa Liu-Ambrose et al., 2022	Otago exercise programme
Zemp D. et al., 2022	Individualised web-based exercise programme
Ong RHS, et al., 2022	6-month fall prevention community group exercise programme “Steady Feet” (SF)
Lytras D. et al., 2022	Otago exercise programme
Montero-Odasso M. et al., 2022	Guidelines
Khan RMA, et al., 2023	Salah practice
Muhammad Adnan et al., 2023	MPE programme
Santos, Luis Eduardo et al., 2024	Physiotherapeutic exercise protocols
Tsekoura M. et al., 2024	McHELP programme home-based motor control exercise programme

Later on J. Pawlak offers a physiotherapeutic programme including exercises for balance improvement, active exercises, pool exercises, individual exercises, and exercises for gait coordination [1]. H. Worum implements the Otago exercise programme, and P. Dhargave introduces a protocol containing exercises for range of motion, strength, flexibility, and balance improvement [2, 3]. Anum Sadruddin Pidani researches the impact of at-home rehabilitation, including exercises for improving muscle strength and balance, and reducing gait freezing [4]. The emphasis is on the muscles of the lower extremities to influence their strength and postural control. A few of the performed exercises are forward and sideways stepping, walking, sit-to-stand, semi-squats, and heel raises. Paris Iakovidis considers the effect of the Otago exercise programme while comparing two groups and focusing on exercises for muscle strength and balance [5]. S. Stasi implements the programme “Motor Control Home Ergonomics Elderly Prevention of Falls” (McHeELP), which contains motor control exercises divided into six domains, namely, “Warm up”, “Serial skills”, “Cognitive skills”, “Balance”, “Sensory strategy”, and “Dynamic control” [6]. Each programme contains two exercises from each domain. The authors’ collective, including M. Senthilkumar, conducted a comparative study with patients divided into two groups. A protocol implemented in one of the groups includes physiotherapeutic procedures focused on improving balance and strength using weights, dumbbells, elastic bands, etc. Conventional physiotherapeutic exercises (cardio-respiratory exercises, strength and balance exercises) are a method of influence for the second group of elderly patients [7]. G. Vaishnavi applies a conventional exercise programme consisting of balance and gait training, flamingo stand, weight shifting, clock reach, step up and down, towel grabbing and marble pick up, foot roll, tandem walking, toe and heel stance, stepping in all directions [8]. S. Knott implements the Otago-based exercise programme (OBEP) and traditional physical therapy (TPT) [9].

Walid KA, et al. discuss physiotherapeutic programmes for hospitalised patients (NICE 2017, RNAO 2017, AHRQ 2013) and outpatients (USPSTF 2018, NICE 2017, RNAO 2017, NCCN 2017, AGS/BGS 2010) including exercises for strength, balance and cognition, and preliminary medical examinations [10]. C. Anwari practises the AVEKSHA-Home-based primary care programme and describes exercises in bed, from sitting or standing position [11]. The programme emphasises the muscles of the lower extremities, especially the femoral and gluteal muscle groups. Some of the exercises are straight leg raises (SLR), pelvic bridging, hip abduction, marching, and walking with support. Meekes WM, et al. combines a few programmes - Care programme for frail older people, a matter of balance-NL (Dutch: “Zicht op Evenwicht”),

In balance (Dutch: “In Balans”), Nijmegen falls prevention me (Dutch: “Vallen Verleden Tijd”), Otago [12]. Y. Yang utilises the Otago exercise programme while paying particular attention to muscle strength and balance exercises [13]. The twelve balance exercises include standing on one foot, walking in the shape of the number eight, walking sideways, walking backwards, standing-to-sitting position training, knee bending, toe-to-heel standing, toe walking, heel walking, toe walking backwards, heel walking backwards, and stairs climbing. The last section consists of a 10-minute walk to reinforce the effect of the strength and balance training.

T. Liu-Ambrose’s research implements the Otago exercise programme as well, while putting emphasis on walking, functional exercises, balance and muscle strength training [14]. The types of exercises are balance, strength, resistance and three-dimensional exercises such as dance and Tai Chi. D. Zemp considers the use of an individualised exercise programme containing 34 dynamic single- and multiple-joint exercises with a different level of difficulty focused on strength, balance, mobility, gait and coordination [15]. RHS. Ong’s authors’ collective implements a six-month prevention programme with “Steady Feet” (SF) exercises, which combines strength and balance exercises for minimising fall risk factors such as muscle weakness, balance deficit and unstable gait [16]. The Otago exercise programme is applied in D. Lytras’ research, where resistance exercises are combined with balance training (mainly the lower extremities) [17]. Montero-Odasso, Manuel’s et al. work on the development of Guidelines Montero-Odasso and highlight the necessity for recommendations for fall prevention among the elderly by surveying the experts’ opinions using the Delphi method [18]. Roshina Mohd Azam Khan considers the application of the Salah practice with a focus on endurance exercises [19]. Muhammad Adnan implements the MPE programme exercises focused on improving proprioception, muscle development, response time, and balance [20]. In their study, Santos, Luis Eduardo et al. examine a physiotherapeutic exercise protocol with specific training programmes based on exercises for improving muscle strength and balance [21]. M. Tsekoura’s authors’ collective uses the McHeELP programme, which consists of warm-up, serial skills, cognitive skill tasks, balance, sensory strategy, and dynamic control [22].

The reviewed scientific literature shows programmes established in the physiotherapeutic practice. The most common specifically developed programme is Otago. The prevailing procedures include exercises for improving balance and gait (robot-assisted or not), occupational therapy, classic kinesitherapy, walking and treadmill training, and robot-assisted therapy for upper extremities. Exercises for muscle strength increase and bal-

ance improvement are present in almost all of the proposed programmes. The development of Guidelines supports clinicians worldwide in determining their approach and management of the risk of falls among the elderly.

## CONCLUSION

The analysis of the available literature reveals the research approach to developing programmes in aid of fall prevention among the elderly. Researchers study the awareness of the participants in the multidisciplinary team regarding falls and the intended preventive physiotherapeutic measures. Methods are proposed for assessing risk and complications occurring after a fall. Recently, new technologies have been introduced to help prevent

falls, confirming the physiotherapist's role in the complex physiotherapeutic methods. Based on the data, researchers create and introduce programmes in the physiotherapeutic practice, with Otago as the most common. The proposed physiotherapeutic procedures include exercises for balance and gait improvement (robot-assisted or not), occupational therapy, classic kinesiotherapy, walking and treadmill training, as well as robot-assisted therapy for upper extremities. Exercises for increasing muscle strength and improving balance are present in almost all proposed programmes. Guidelines have been developed in support of clinicians around the world to determine their approach and manage the risk of falls among the elderly.

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