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The effect of Wii Fit exergames on balance in the elderly: a scoping review

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Abstract

Introduction. The elderly are increasingly embracing exercise through video or virtual reality games, such as sports games on platforms like Wii Fit. Additional proof about the specific dosage and types of Wii Fit games that might effectively enhance balance in older individuals is required. This scoping study investigated the efficacy of Wii Fit in improving body balance in older adults, including static and dynamic balance.

Methods. The study used PRISMA Extension for Scoping Review guidelines, conducting systematic searches across ScienceDirect, PubMed, and Google Scholar from January 2011 to August 2023. The quality assessment employed various tools tailored to study types, including the Joanna Briggs Institute, Case Report Guidelines, and Physiotherapy Evidence Database. Data synthesis was facilitated by the TIDIer checklist, encompassing extraction of population, intervention, and outcome measures from 21 articles.

Results. Of the 1,170,131 studies found in the databases, 258 were selected after reviewing the titles and abstracts, and 21 articles were included in the study after examining the full text. The reviewed articles showed that, although there were variations in the Wii Fit balance exercise programme, regular and structured administration of Wii Fit significantly affected balance.

Conclusions. The study suggests that incorporating Wii Fit into elderly fitness routines can notably enhance balance and potentially lower fall risk.

Key words: elderly, balance, fall risk, virtual reality, Nintendo Wii Fit

Introduction

Ageing is an inherent and occasionally subtle process accompanied by a decrease in physical, physiological, psychological, and social circumstances [1]. Maintaining balance becomes more challenging as one gets older due to several factors, including alterations in the sensory system (such as the vestibular, visual, and somatosensory systems), the presence of disease (such as cerebrovascular disorders, arthritis, and peripheral neuropathy), and reduced mobility [2]. Balance disorders among elderly individuals may be influenced by various factors, including age-related alterations in sensory systems such as vision, vestibular function, and somatosensation, as well as declines in musculoskeletal strength, joint flexibility, and bone density [3]. These disorders not only affect physical stability but also diminish confidence in activities of daily living, leading to reduced independence and quality of life. The deterioration of these functions leads to a lower equilibrium state and can give rise to instances of falls [3, 4]. Consequently, understanding the mechanisms behind balance disorders and developing effective methods for early detection and intervention becomes imperative [3].

Most patients seeking emergency care report experiencing balance disorders. In otology and neurology clinics, where balance issues and dizziness are frequently addressed, approximately 20 % of patients are affected by balance disorders [5]. Additionally, 13 % of individuals aged 65–69 and 46 % of those aged 85 and older who live in the community suffer from balance disorders [5]. A 2007 report by the World Health Organization (WHO) examined factors associated with fall risk in the elderly, highlighting that balance disorders contribute significantly to falls and that engaging in balance exercises can be an effective fall prevention strategy [5].

Virtual reality (VR) is a means of communication between humans and computer systems via interactive simulations [6]. The Nintendo Wii Fit, a recent type of VR, is an inventive and interactive technology that presents difficulties to postural control stemming from the complexity of the task and the environment. According to several neuroimaging studies, using VR tools for neurorehabilitation can promote brain plasticity and cortical remodelling [7]. Based on the specific tasks, repetition, intensity, environmental modification and multisensory connections promoted by Wii Fit (e.g., the balance game provided), it is possible to trigger activity-dependent brain plasticity [8]. All sequences involve synaptic plasticity, which is the ability to create long-term experiences as neural connections increase. In addition to the adaptation function, neuroplasticity involves functional reorganisation that can replace the function of the damaged brain region [9]. Although ageing and neurodegenerative disorders can correlate with neuromodulatory decline and contribute to the deterioration of synaptic plasticity, movement stimulus is required to guide neuroplasticity so that a sharp decline in cognitive function can be prevented. The exercises accessible in the various Wii Fit games are essentially an adaptation of the biofeedback activity principle that helps users focus on performance while viewing and concentrating on the instructions to be replicated, such as those showing increased activity and functional connectivity in the frontoparietal network [10, 11].

VR offers several advantages over traditional balance training methods. Unlike conventional therapies, VR provides an immersive three-dimensional environment where users can engage in interactive exercises that simulate real-world scenarios or entirely novel environments [12]. This realism not only enhances motivation but also encourages greater engagement and adherence to exercise routines crucial for

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patients undergoing treatments like chemotherapy or radiotherapy [12, 13]. VR's ability to gamify experiences reduces the fear and anxiety associated with rehabilitation, especially during challenging health crises like coronavirus disease 19 (COVID-19), where face-to-face interactions are limited [14]. Moreover, VR-based exercises can be tailored to individual needs, promoting cognitive and physical improvements while offering a safe, low-cost alternative to traditional inpatient rehabilitation [12, 13, 15]. By integrating VR into balance training, therapists can enhance patient outcomes by fostering a more enjoyable and effective experience that supports long-term health and wellness goals [3, 12, 16, 17].

Research on the use of VR and interactive interventions in the elderly population to enhance physical activity and improve balance function has significantly increased, but the optimal Wii Fit exercise programme dose remains a topic of debate. Therefore, we conducted a scoping study to meticulously outline the existing research in this field and identify any knowledge gaps. The study intended to gain a deeper understanding of the optimal Wii Fit dose and determine if other factors contribute to its impact on the balance of older individuals by reviewing the relevant literature.

Subjects and methods

The articles were chosen using the PRISMA-ScR scoping review approach, which follows the selected reporting items for the PRISMA Extension for Scoping Review [18], to synthesise the impact of Wii Fit on the balance of senior individuals. The protocol involved (1) formulating research questions, (2) locating relevant studies, (3) selecting studies, (4) organising data, and (5) assembling, summarising, and reporting the results. Completion of each review stage was accomplished by following a guide and using the Template for Intervention Description and Replication (TIDIeR) checklist methodology.

Information sources

English language articles were searched in the ScienceDirect, PubMed, and Google Scholar databases. The search period was between January 2011 and August 2023.

Table 1. Search terms

Description	Search terms
Focus	Wii Fit
What	usage dosage and types of Wii Fit games
Who	aged > 60 years
Why	effects of Wii Fit on balance and fall risk
Where	hospital, clinic, nursing home, and home

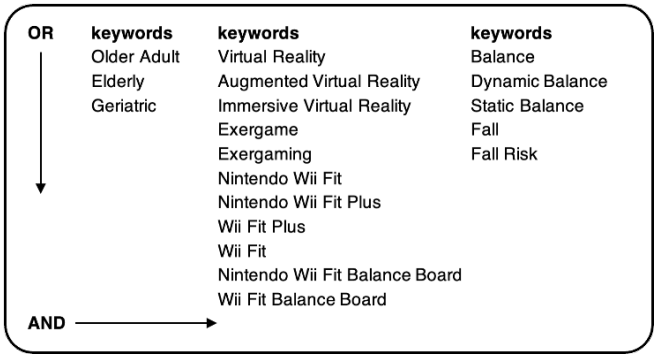

Figure 1. Search terms used to select the studies

Search strategy

The literature search for this investigation accounted for the suggestions made by Peters et al. [19]. The initial approach involved addressing a series of inquiries pertaining to the impact of Wii Fit administration on the balance of senior individuals[19]. The search approach shown in Table 1 used the population intervention comparison (PICO) findings method, which involved selecting relevant keywords and organising search terms using the "OR," "AND," and "NOT" operators (Figure 1).

Eligibility criteria

Studies were selected to answer the research questions according to the inclusion criteria described in Table 2. In general, studies were eligible if the Wii Fit intervention aimed to

Table 2. Eligibility criteria

Study attributes	Research question	
	Wii Fit in improving elderly balance	
	inclusion	exclusion
Population	individuals aged 60 years and older, all genders, independent ambulation minimum of four minutes, no vision or hearing problems, and no cognitive issues	individuals aged < 60 years old, vision or hearing problems, certain medical conditions (stroke, osteoporosis, heart problems, Parkinson's disease, fractures, and other disease conditions that may interfere with the study
Intervention	Nintendo Wii Fit/Wii Fit Plus	virtual reality other than Wii Fit (Virtual Kayak Paddling Exercise, Xbox 360 Kinect, SensBalance Fitness Board, Dance Dance Revolution, Xavix Measured Step System[XMSS])
Comparison	any comparator (conventional balance training, combined exercise)	–
Outcomes	balance and fall risk	–
Study design	randomised controlled trial, pilot study, experimental study, case report	meta-analysis, review of reviews
Year range	January 2011 to August 2023 (12 years)	before January 2011

improve balance. After reviewing the titles and abstracts, the sources were reviewed in their complete form. A list of approved sources was manually retrieved. Relevant sources were not identified in the initial strategy as appropriate to the question; thus, we proceeded to a full review. Exclusion criteria were developed by reviewing titles, abstracts, and the entire content, based on inclusion criteria, and were agreed upon independently by the researcher. Some additional criteria were also attached. Exclusion was required when the article did not answer the study question.

Data extraction and synthesis

Articles were compiled in Microsoft Excel, and data were extracted, including author, title, study type (all study types that used primary data testing), publication year, country, study sample (elderly > 60 years old), and findings (whether or not Wii Fit improved balance or reduced the risk of falls, types of Wii Fit games and doses that may affect balance improvement in the elderly).

To assess the quality of each article, researchers used assessment tools that have been recognised as appropriate for assessing certain types of methodologies, namely the Joanna Brigs Institute (JBI) checklist for quasi-experimental studies, Case Report Guidelines (CARE) for case reports, and Physiotherapy Evidence Database (PEDro) for randomised controlled trials (RCTs).

Data synthesis for each article used the TIDIer checklist to collect various information related to the provision of Wii Fit interventions and their effects on balance and the risk of falling. Articles were eliminated if there was duplication. A researcher conducted screening by reading the title and abstract, reading the text thoroughly, and filtering based on the inclusion criteria shown in Table 2.

Results

The preliminary search yielded 1,170,131 items, and after eliminating 1,169,873 duplicate entries, 258 research publications were examined (see Figure 2). Upon conducting a thorough examination of the articles by carefully scrutinising the complete text, 215 articles were deemed irrelevant, and 21 satisfactorily fulfilled the inclusion criteria.

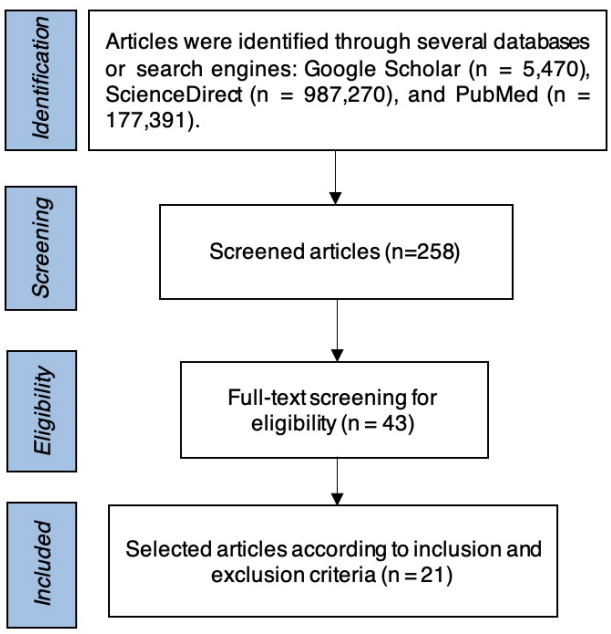

Figure 2. PRISMA study selection flow diagram (here)

Table 2 presents a comprehensive overview of the attributes of the examined studies. Most publications consisted of RCTs and repeated measures studies involving within-group and between-group comparisons of elderly individuals who were in good health and resided in retirement communities. Table 3 provides a detailed summary of the research included.

Quality of evidence

The overall quality of the studies using an RCT design was rated greater than seven by PEDro, while the JBI rated quasi-experimental studies higher than seven, and CARE scored case series studies higher than nine, indicating that the studies were high quality and reliable (Table 3).

Discussion

The selected studies included 1,761 elderly participants, with an average sample size of 83.8. Although not all papers provided complete and consistent information regarding the age of participants, the mean age exceeded 60 years. Despite most individuals involved in the research being able to walk without assistance and live freely, 11 studies specifically examined older persons with mild to severe balance impairment. The study participants resided in a community, senior living facility, or retirement centre, though several trials included a hospital environment [30]. All investigations shared the same sample characteristics, with all participants free of cognitive impairment, as the capacity to comprehend instructions for using the device was necessary [40, 41].

The intervention groups of 21 publications employed exercises, mostly Wii Fit, for the purpose of balance training and fall prevention. The sessions were conducted bi-weekly for a duration of more than four weeks, with each session lasting between 15 and 60 min. The frequency varied between two and five times per week, and the total duration ranged from three to 10 weeks. However, one study failed to specify the length of time that Wii Fit was used, though it did note that participants engaged in three sessions per week for four weeks [34].

Most research regularly used balancing and exercise activities, such as soccer heading, table tilt, penguin slides, ski jumping, and ski slalom, as exercise applications for balance training and fall risk intervention. Soccer heading is a game that specifically targets improvements in static balance, quick motor reaction, attention, and coordination, as well as visual and aural feedback [38]. Users position themselves on the Wii Fit balancing board and adjust their centre of gravity to strike a simulated ball approaching them from the television screen. Points can be earned by heading the soccer ball, but points will be deducted if the ball is struck by cleats or pandas. Table tilt is a Wii Fit game designed to enhance balance [37] in which the player places their weight on the balancing board and manipulates their body movements to send the ball into a hole on a platform that is in motion. Penguin slide focuses on enhancing dynamic postural balance [30, 36], with players using their balance board by shifting their weight laterally so that a penguin can successfully capture a fish.

Several studies have indicated that Wii Fit has improved balance in elderly individuals, although Montero-Alia et al. [32] observed no significant change in their study due to an unequal distribution of samples. Specifically, the intervention group had a large sample size (n = 977) and a higher number of older women who were more likely to experience falls. This might have influenced the results in a biased manner.

Table 3. Study characteristics

Authors	Study design	Sample(s)	Intervention	Wii Fit procedure	Outcome measures	Conclusion
Fakhro et al., 2019 [20]	randomised controlled trial	64 elderly; age ≥ 65 years old (mean: 79.5); TUG >14s, MoCa ≥ 23; good vision; institutionalised; no vestibular disorders	Wii Fit	40-min session, three times a week for eight weeks, starting with "soccer heading" for the first four weeks, followed by "table tilt" for the remaining four weeks	Timed TUG test, Nintendo Wii Balance Board	Wii fit balance training is a valid method for improving both dynamic and static balance among older adults.
Khushnood et al., 2021 [21]	double-blind randomised controlled trial	90 elderly; ≥ 60 years old; no serious systemic disease; physical independence	Wii Fit	basic step, basic run, soccer heading, table tilt, balance bubble, and lotus focus	ABC, TUG, Fukuda, and EQ-5D	Wii Fit shows promise in boosting balance confidence, enhancing quality of life, and lowering fall risk in older adults.
Toulotte et al., 2012 [6]	randomised controlled study	36 elderly; ≥ 60 years old; healthy elderly living in independent community dwellings	Wii Fit training vs. adapted physical activities	soccer heading, ski jumping, yoga, downhill skiing, ball games, and tightrope walking	The Tinetti test, uni pedal tests, and the Wii Fit test	Wii Fit only improves activities on static balance in bipedal conditions.
Franco et al., 2012 [22]	randomised controlled trial	32 elderly; 63 to 90 years old (mean 79.8); living independently; able to see the television clearly from 8 to 10 feet away; able to ambulate independently with or without an assistive device	Wii Fit vs. matter of balance	soccer heading, ski jumping, Wii tightrope game, table tilt, balance bubble	BBS, Tinneti gait, balance assessment, Wii fit enjoyment questionnaire	The Wii Fit exercise programme proved feasible and enjoyable by a group of community-dwelling elders.
Park et al., 2015 [23]	randomised controlled trial	30 elderly; ≥ 65 years old; no fall experience within the most recent year; no disease that could affect performance during the experiment	Wii Fit vs. ball exercise	30-min three times a week for eight weeks; 10 min each game of soccer heading, snowboard slalom, and table tilt	TUG and 30-sec sway length and average sway speed with open eyes and gazing to the front on the top	Wii Fit exercise game may improve the balance and gait of elderly individuals in communities.
Kim et al., 2022 [24]	randomised controlled trial	36 elderly; ≥ 65 years old; intact vestibular function and vision; capable of daily life and independent walking; no disease that could affect performance during the experiment; isolation for at least three months	Wii Fit vs. motor imagery training	six weeks, three times a week, included balance ski, table tile, jogging, rhythm step	TFES, Gaitview AFA-50 system	Wii Fit is an effective intervention for improving physical function in isolated older people and preventing falls.
Cho et al., 2014 [25]	randomised controlled trial	32 healthy elderly; ≥ 65 years old; Score < 23 on the Korean MMSE	Wii Fit	eight weeks (three/week) of programmes; ski slalom, table tile, and balance bubble	Romberg test on a Bio-rescue; Korean MMSE	Wii Fit training is effective at improving the balance of the healthy elderly.
Lee et al., 2017 [26]	randomised controlled trial	44 healthy community-dwelling older adult; ≥ 65 years; ability to communicate	Wii Fit	six weeks (two/week); jogging for gait, swordplay, ski jump, tennis, and step dance (6–8 min each game)	Sit-to-stand test and Good Balance System (Metitur Ltd., Jyväskylä, Finland)	Wii Fit might be beneficial for reducing falls in community-dwelling older adults.
Jorgensen et al., 2013 [27]	randomised controlled trial	58 healthy community-dwelling older adults ≥ 65 years old; self-reported balance of poor to average; capable of understanding verbal instructions	Wii Fit	ten weeks: table tilt, slalom ski, perfect 10, tight rope tension, penguin slide (45 min)	TUG test, Short-form Falls Efficacy Scale- International, 30-second repeated Chair Stand Test, Center of Pressure velocity moment	Wii Fit training improved overall functional performance in the elderly, but static bilateral postural balance remained unaffected.
Padala et al., 2017 [28]	randomised controlled pilot trial	30 older veterans; ≥ 60 years old; scored BBS ≤ 52 and MMSE ≥ 24	Wii Fit	eight weeks; lateral weight shifting (Ski Slalom, Penguin Slide, and Tight Rope Walking); multi-directional balance (Table Tilt, Balance Bubble)	BBS, ABC	The Wiii-Fit exercise regimen is safe and viable for older adults living independently with mild-to-moderate balance issues.
Fu et al., 2015 [29]	randomised controlled clinical trial	60 elderly; ≥ 65 years old; lived in a nursing home; functional ambulatory category score 2 or 3	Wii Fit	each participant received Wii Fit for six weeks (60 min); soccer heading, table tilt, and balance bubble	PPA and incidence of falls	PPA scores and fall incidence improved significantly in the Wii Fit training group.
Laver et al., 2012 [30]	randomised controlled pilot study	44 hospitalised older adults; mean age of 85 years (*SD* 4.5); MMSE score of ≥ 21/30; weighing less than 150 kg; able to perform sit-to-stand transfers independently; good vision	Wii Fit	two weeks (five/week) of Wii Fit programmes (25-min); penguin slides, sustained squats/single leg extension, and aerobic tasks; stepping on and off the balance board or walking on the spot	SPPB, MBBS, ABC	The use of an interactive gaming programme by physiotherapists with hospitalised older people appeared to be safe and resulted in improvements in balance and mobility.

Authors	Study design	Sample(s)	Intervention	Wii Fit procedure	Outcome measures	Conclusion
Whyatt et al., 2015 [31]	randomised controlled trial	84 healthy elderly; ≥ 65 years old; ⩾ 54 BBS score; ≥ 24 on the MMSE	Wii Fit	five weeks, 2×/week, Wii Fit programmes (30 min): bubble pop, avoid the shark, and smart shrimp	Activities-Specific Balance Confidence Scale, BBS	Balance game training had a significant effect on levels of functional balance and balance confidence.
Montero-Alia et al., 2019 [32]	quasi-randomised clinical trial	1,016 elderly patients 70 years or older who could walk independently (with or without walking aids) attending one of five primary care centres	Wii Fit	three months, two/week, 30 min, Nintendo Wii Fit game (30-min); (balance bubble, soccer heading, ski jump, table tilt, ski slalom, penguin slide, snowboard slalom, tightrope walk)	Tinetti balance test, Unipedal stance test, Balance Wii test, Short-FES-I	No effect of balance training using the Nintendo Wii on balance or falls in older community-dwelling patients.
Roopchand et al., 2015 [33]	single group pretest/ posttest design	33 healthy elderly; noninstitutionalised; not involved in any form of regular exercise for at least eight weeks before the start of the intervention	Wii Fit	participants underwent six weeks of Wii Fit training twice a week for 30 min each session, starting with games like obstacle course and penguin slide, progressing to include tilt table, yoga single tree pose, and skate board	BBS, Multi-Directional Reach Test, Modified Clinical Test for Sensory Interaction in Balance, Star Excursion Balance Test	Balance games on the Nintendo Wii Fit Plus can be used for balance training in community-dwelling persons 60 years and older.
Bateni et al., 2012 [34]	preliminary study	17 elderly aged 53 to 91 years (mean 73 years, standard deviation [*SD*] 13.7); included if they had fallen two or more times during the previous year	Wii Fit	four weeks, three/week, no specific duration, Wii Fit game (ski slalom, ski jump, and table tilt)	BBS (all groups) and Bubble Test (PW and WI groups) scores	Wii Fit training enhances balance, yet combining it with physical therapy further improves balance compared to Wii Fit training alone.
Orsega-Smith, et al., 2012 [35]	exploratory study	The study included 30 elderly participants aged between 55 and 86 years (mean age 71.60 ± 7.79 years), with the majority rating their health as either 'very good' (44 %) or 'good' (44 %)	Wii Fit	four and eight weeks, two/week for 30-min; penguin slide, table tilt, ski slalom, and balance bubble), light aerobics (hula hoop), and yoga exercises (deep breathing, half-moon, palm tree), snowboard slalom, ski jumping	eight-foot TUG, 30-second chair stands, and BBS, ABC Scale, FSES	Wii Fit playing may be a vehicle for physical activity participation in the older adult population.
Nicholson et al., 2015 [36]	two-group pre-post design	41 elderly; ≥ 65 years old; not involved in balance or resistance type training in the previous three months; able to independently ambulate; able to see characters on a television screen from three metres; and free of chronic medical conditions	Wii Fit	six weeks, three/week, Wii Fit balance training games (30-min); participants choose at least three from a list of soccer heading, penguin slide, ski slalom, ski jump, table tilt, snowball fight, perfect 10, and tightrope walking	TUG, functional reach, lateral reach, single-leg balance, 30-s chair stand, usual gait speed, and 10-item Iconographical, FES	Six weeks of unsupervised Wii balance training is an effective modality for improving balance in independent older adults.
Chao et al., 2013 [37]	single-group pre-post de-sign.	seven elderly; ≥ 65 years old; able to ambulate with or without an assistive device; able to speak and read English; able to understand instructions and follow commands (1:1); medically stable	Wii Fit	eight weeks, two/week; weeks 1-3 (30-min), penguin slide, table tilt; weeks 4-6 (30-min), penguin slide, table tilt; weeks 7–8 (30- min), penguin slide, table tilt	TUG, 6MWT, FES, SEE	Using Wii exergames was an acceptable, safe, and potentially effective approach to promote physical activity in older adults.
Agmon et al., 2011 [38]	quasi-experimental single-group pre-post design	seven elderly; ≥ 65 years old; < 52 on BBS; able to walk four metres without human support or assistive device; approval from the participant's health care provider; a working television set in their home; adequate vision and hearing	Wii Fit	three months, three/week, Wii Fit balance training games (30-min); basic step, soccer heading, ski slalom, table tilt	BBS, Timed 4-Metre Walk Test	Using Wii Fit for limited supervised balance training in the home was safe and feasible for a selected sample of older adults.
Afridi et al., 2018 [39]	case series	16 elderly; ≥ 65 years old; MMSE tool, less than 23 points	Wii Fit Plus	six weeks, four/week, Wii Fit balance training games (10 min each); soccer heading game, yoga tree pose, ski slalom, table tilt	BBS, TUG, functional reach	Wii-fit plus training was effective in improving dynamic balance and mobility in older adults.

ABC Scale – Activities-Specific Balance Confidence Scale
BBS – Berg Balance Scale
EQ-5D – European Quality of Life-5 Dimensions tools
FSES – Falls Self-Efficacy Scale
MBBS – Modified Berg Balance Scale
MMSE – Mini Mental-Status Exam
PPA – Psychological Profile Assessment
SEE – Self-Efficacy for Exercise Scale
Short-FES-I – Fear of Falling
SPPB – Short Physical Performance Battery
6MWT – Six-Minute Walk Test
TUG – Timed Up and Go Test

Of the 21 studies examined, four used a single-group pre-post design, meaning they did not have a control group. Out of the remaining 14 studies employing a control group, 10 included older individuals who did not receive any intervention or just engaged in routine activities as the control group. Seven trials employed traditional exercise or other therapies as a control. Most studies (19 of 21) indicated that the exercise intervention group demonstrated notable enhancements in static and dynamic balance following the intervention period.

Meanwhile, a study involving three groups found that the Wii Fit group only improved static balance [6]. Contrary to this, combining Wii Fit with conventional intervention enhanced static and dynamic balance. However, another study noted insignificant improvement post-Wii Fit due to a short three-week intervention period [22]. Moreover, older adults engaging in Wii Fit for at least one hour twice a week for 6–8 weeks showed moderate to strong balance improvements [21, 24, 28, 29, 36]. Increasing task complexity enhances functional upper-body stretching, lower-body and trunk posture control, and weight transfer. Moreover, heightened complexity boosts movement speed and shifts the body's centre of gravity beyond the base of support, enhancing joint proprioception and balance maintenance capacity [42].

Balance was measured using the Timed Up and Go test (TUG) and Berg Balance Scale (BBS). TUG correlated positively with walking speed ($r = 0.75$) and negatively with postural sway ($r = –0.48$), step length ($r = –0.74$), Barthel Index ($r = –0.79$), and step frequency ($r = –0.59$). BBS showed strong predictive validity in the elderly, correlating highly with the Dynamic Gait Index ($r = 0.67$) [43]. The TUG instrument demonstrates exceptional test-retest reliability, as indicated by an intraclass correlation coefficient (ICC) ranging from 0.92 to 0.99 [43], while the BBS shows high test-retest reliability among community-dwelling seniors (ICC = 0.98) and elderly individuals in institutions (ICC = 0.97) [43].

One of the principal challenges in reviewing the articles was the heterogeneity in the outcome measures, while differences in the measurement methods used between the studies made direct comparisons difficult. Seven articles used TUG, nine used BBS, two used the Falls Efficacy Scale (FES), one used the Tinetti fall efficacy test, and two employed the Romberg test. The Wii Fit games used also varied between studies. Such variability not only complicates the analysis process but may also affect the validity and reliability of the conclusions that can be drawn from this review.

After reviewing the research, it was determined that the optimal amount of Wii Fit training sessions required to enhance balance in the elderly is around 18, with an average duration of 39 min each session for 6–8 weeks. The findings of this research indicate that administering a certain amount of Wii Fit can have a substantial positive impact on the balance of older individuals. Indeed, regular Wii Fit training, with an average total usage of 702 min, can have a beneficial impact on balance. In a separate study using median Wii Fit dosage data, it was shown that a Wii Fit intervention consisting of 12 30-minute sessions would be more effective with a total intervention duration of 485 min [44]. These results may be used as a reference to effectively develop the appropriate dosage of Wii Fit for improving balance in senior individuals in the future.

Considerations for the preparation of exercise programmes based on Wii Fit/VR, in addition to being based on functional improvement targets, must pay attention to the conditions and treatment methods the patient is undergoing so that physiotherapists can modify exercise activities and assess their feasibility. The 2023 Takashi study reported that VR exercise cannot be performed to ideal standards in dialysis patients since they are required to rest on a bed all day and cannot use the supporting facilities needed, such as ergometers and treadmills. However, VR exercise modifications can be made to involve a bed-based activity that can be carried out for 5–10 min, depending on patient tolerance [45]. Therefore, exercise programmes can personalised to obtain effective target outcomes for patients/clients.

Limitations

The predetermined criteria assessed the evidence in this study as high-quality. Nevertheless, the investigations were subject to some methodological restrictions, which increases the likelihood of bias. The diverse range of Wii Fit games leads to less uniform data, making it difficult to precisely establish which specific games had the most significant impact on balance. While the study findings revealed differences in the efficacy of Wii Fit exercise programmes, it is important to acknowledge other constraints in this review. Specifically, the generalisability of the results should be taken into account because the studies were solely published in English and exclusively recruited adults aged ≥ 60 years who possessed the ability to transfer and walk without assistance. Hence, the conclusions drawn from this analysis may not apply to different groups. Additionally, a limitation of this study was its potential bias towards including only articles that show improvements in balance through VR, neglecting studies that reported a lack of improvement or mixed results. By narrowing the search criteria to only positive outcomes, the review may not have fully captured the nuanced effects of VR on balance in the elderly. Future research should consider including studies that also address non-significant or adverse effects to provide a more comprehensive understanding of VRs impact on balance in older adults.

Conclusions

Wii Fit is a game-based exercise with a VR approach that focuses on balance. Wii Fit offers an innovative solution that can help reduce the risk of falls and improve coordination in the elderly population. This review demonstrated the importance of regular engagement in Wii Fit exercise for improving balance in older adults, and the findings provide a solid basis for the development of focused and structured Wii Fit exercise programmes to improve balance and overall quality of life in older adults.

Integrating Wii Fit into elderly healthcare programmes could be a positive step towards injury prevention and improving the quality of life. Future research could focus on optimal implementation strategies and the long-term effects of exergaming interventions in various clinical settings. In addition, exploring the feasibility and effectiveness of integrating exergaming into community-based fall prevention programmes is crucial. By utilising exergaming technology, healthcare providers and community organisations have the potential to deliver innovative and accessible interventions aimed at reducing fall risk and improving overall health among the elderly. Therefore, fostering collaboration between researchers, clinicians, and community stakeholders is crucial to furthering our understanding of the role of exergaming in rehabilitation and fall prevention efforts, which will ultimately improve outcomes and quality of life for the elderly.

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Ethical approval

The conducted research was not related to either human or animal use.

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Conflict of interest

The authors state no conflict of interest.

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