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Effects of table tennis participation on balance and postural control in older adults: a systematic literature review

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ABSTRACT

It is known that the ability to balance and the control of one's posture tend to worsen as we get older, and as a result, the likelihood of falling, becoming less mobile, and ultimately, losing one's independence increases. Exercise programs that combine physical and mental challenges are now being advised to encourage healthy aging. Table tennis, a sport with a racket but involving low movement, that demands quickness, reflexes, hand-eye coordination, and also a certain degree of balance, has been considered an activity suitable for the elderly; however, the results of its effects are still in pieces. This systematic review was conducted to determine how table tennis impacts balance and postural control as well as other functional outcomes in the elderly. A Scopus search in line with the PRISMA 2020 guidelines yielded 661 records. Screening of titles and abstracts led to the exclusion of 614 articles and after full-text assessment of 47 articles, 40 were excluded leaving seven studies for the eligibility criteria. Because of heterogeneous designs and outcome instruments, no meta-analysis was performed; evidence was combined through narrative thematic synthesis, and study quality was appraised using a design-appropriate risk-of-bias approach. The studies that were included in this review demonstrated that table tennis, whether as a separate practice, part of multicomponent or exergame programmes, or through the players accumulated playing experience, was associated with improvements in both static and dynamic balance, lessened postural sway, quicker reaction time, better single-leg stance performance, and greater functional mobility. Other advantages were improved sensorimotor connectivity, better quality of life, and increased antioxidant levels. Though the studies reviewed were small in number and diverse in methodology, the results show that table tennis is a highly effective, low-risk way of helping older adults maintain their balance and postural control.

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Introduction

One of the main demographic changes of this century is the ageing of the population, which has led to a focus on the physical abilities that enable older adults to stay independent and socially active. Out of these, the ability to keep balance and control body posture is fundamental, as it supports not only safe movement but also the execution of daily activities and the prevention of falls. As people get older, their balance and functional capacity gradually decline, which explains why falls become more common and the reason why

targeted exercise interventions can significantly decrease their occurrence (Yu et al., 2025; Ates & Kaki, 2025). Community organizations have reacted to this by increasing the availability of physical activities for the elderly, and studies conducted in senior welfare centers reveal that the demand for organized exercise programs, including racket sports like table tennis, is strong and the participants are very satisfied with them (Jung et al., 2023; Tayebi et al., 2025). Therefore, from a clinical and public-health perspective, knowing which one of these activities effectively contributes to balance is very important.

Maintaining balance/postural control is a process that combines the inputs from eyes, ears, and body senses with the execution of quick muscle movements. Getting older leads to the lessening of this working together of different senses, growing of body sway during posture maintenance, lengthening of reaction time, and lessening of the capacity of recovering from disturbance. Such changes end up in the higher chance of falling and, usually, a series of injury, fear of falling, and decrease in activity. Hence, exercises, which simultaneously put the sensory, cognitive, and motor parts of balance to the test, are very attractive because they modify the different systems contributing to postural decline with age instead of concentrating on one single system only. We can now increasingly map the age-related deteriorations of this multisensory integration to the alterations in the cortical control of posture and gait, including the changes in electroencephalography dynamics and slows down neural processing during the walking of elderly persons (Patelaki et al., 2023; Salminen et al., 2025; Devol et al., 2026), and there is also measurable worsening in the dynamic balance with advancing age (Ates & Kaki, 2025).

Table tennis has been catching the eye of researchers as a potential intervention. The fact that players do not have to move around the environment greatly reduces the risk related to the locomotor aspects. Besides that, the sport requires agility, quickness of reaction, the hand, eye coordination, and constant postural adjustments (Deprá et al., 2022). Besides that, the wider reviews of the sport point out that its advantages are multidimensional; they cover the physical, emotional, and social aspects, which, among other things, makes it an excellent vehicle for healthy ageing programmes that aim at getting adherence as well as physiological gains (Aparicio-Chueca & Muñoz-Vila, 2025). All these features make table tennis a possible activity for maintaining balance and postural control in old age.

A large number of mechanistic studies have investigated the neurocognitive demands of table tennis. Electrophysiological studies reveal that during continuous play, processing in frontal brain areas is engaged (Visser et al., 2022), whereas wholebrain functional near-infrared spectroscopy work reveals different patterns of cortical activation during motor adaptation and skill execution, including variations between novices and experts (Carius et al., 2023; Carius et al., 2025; Studnicki et al., 2023). The game also results in measurable dual-task costs and accesses perceptual-cognitive resources that are dependent on the level of task difficulty (Schaefer & Amico, 2022; Amico & Schaefer, 2022; Taghi et al., 2025); more generally, involvement in racket and other ball sports is related to better executive function throughout the lifespan (Wang et al., 2025). In sum, these data indicate that table tennis affects the sensorimotor and attentional systems that are involved in postural control, thus offering a biological rationale for the positive effects of balance in older adults.

However, despite this reasoning, most of the table tennis research base is focused on young, skilled, or competitive players rather than old adults. Research on stability and stroke mechanics usually select athletes, for example, studies on abdominal-core training and stability control in players (Meng & Bu, 2023) or on eye, hand coordination and stroke mastery (Haryanto & Becerra-Patiño, 2023); the transfer of such eye, hand coordination training to balance and motor-skill gains has similarly been proven mainly with younger cohorts (Selvakumar et al., 2025). Although such studies are very useful in describing the sport's motor demands, it would be wrong to assume that they apply to ageing populations who possess very different baseline capacities, training goals, and safety considerations. This indeed constitutes a first gap: the relative lack of evidence from older people, even though sport-based and complex motor interventions are increasingly being proposed to maintain cognition, mobility, and fall-resisting balance in this group (Contreras-Osorio et al., 2022; Huang et al., 2022).

A second gap is related to the methodological diversity and outcome fragmentation. With the inclusion of older adults, table tennis is shown in different forms in the studies; for example, as stand-alone training, as one component of multicomponent or exergame programmes, or as accumulated lifetime experience, and the outcomes include posturographic sway and single-leg stance to functional-mobility tests, quality of life, and even serum biomarkers. This variety, together with small samples and different study designs, makes direct comparison difficult and has so far blocked any clear, consolidated interpretation of whether and in what way table tennis may have positive effects on balance and postural control amongst older adults.

Because of these differences, there is a need for a thorough review. Combining the existing data will not only tell us the way and regularity of the results, but will also reveal methodological problems that future experiments should overcome, and give a clear picture leading to practice changes for people planning falls prevention and active ageing programmes. In this review, balance/postural control is operationalised as performance on validated static and dynamic assessments - including force-platform posturography (centre-of-pressure sway), single-leg stance time, the Timed Up-and-Go test, and clinical balance/functional-fitness batteries as reported by the included studies. This paper sets out to do this by a clear and open approach, PRISMA-directed, of the defined Scopus database, and is structured according to three research questions: (1) RQ1: What effects does table tennis participation have on balance performance in older adults? Addressing this question establishes the central empirical claim of the review and its strength of support; (2) RQ2: How does table tennis participation influence postural control and postural stability among older adults? This question examines the specific postural mechanisms-sway, single-leg stance, and underlying sensorimotor control-through which any benefits are expressed; (3) RQ3: Which characteristics of table tennis interventions (frequency, duration, intensity, and training format) are associated with improvements in balance and postural control in older adults? Answering this question contributes practical dosage guidance and constitutes the review's novel synthesis of an otherwise fragmented literature.

Method

Research design and framework

A systematic literature review method was carried out to discover, evaluate, and combine the empirical evidence on table tennis and balance in older adults (Tranfield et al., 2003). The review was organised following the PRISMA 2020 reporting framework (Page et al., 2021) that directed the identification, screening, eligibility, and inclusion phases and the building of the flow diagram, with the explanatory conventions of Liberati et al. (2009) informing the eligibility reporting. Among the various types of reviews, a systematic one was selected as it provides a transparent and reproducible method for collecting and assessing a clearly defined body of evidence, in contrast to a narrative review.

Search Strategy

The evidence base was assembled from a Scopus query targeting the intersection of the sport, the population, and the outcomes of interest. The conceptual search logic was as follows:

> *TITLE-ABS-KEY (("table tennis" OR "ping pong") AND ("balance" OR "postural control" OR "postural stability" OR "physical fitness" OR "motor control") AND ("older adult*" OR "elderly" OR "aging" OR "ageing"))*

Field codes were applied to title, abstract, and keywords (TITLE-ABS-KEY), and truncation (*) was used to capture morphological variants. The export was restricted to journal articles.

Database and Information Sources

We have used only one source of information and that is Scopus. Through a thorough search of titles, abstracts, and keywords, we have discovered 661 records that form the evidence base in our review. Since no other databases were used nor hand-searching done, all the important bibliographic information, abstracts, and cited primary studies in this review come from that source only. Standard methodological references (e.g., the PRISMA 2020 statement) are cited as a declared exception to support transparent reporting. Where a data point was not recorded in the source, it is reported as not stated rather than inferred. Scopus was used as the single, pre-defined source because of its broad multidisciplinary indexing and consistent metadata export, which maximises reproducibility; reliance on a single database is acknowledged as a limitation.

Study selection process

Selection proceeded in stages and is depicted in Figure 2. The 661 identified records contained no duplicates, so none were removed at deduplication. Title and abstract screening excluded 614 records: 454 did not address table tennis, 120 did not concern older adults, and 40 were not original articles. The remaining 47 records underwent full-text assessment, after which 40 were excluded-32 were not related to balance or postural outcomes, 5 were non-English, and 3 had unavailable full text or insufficient data-yielding seven studies for synthesis.

Eligibility criteria

Eligibility criteria are summarised in Table 1. Studies were included when they examined table tennis (as intervention, programme component, or exposure) in older-adult samples and reported balance, postural, or functional-fitness outcomes.

Table 1 <Inclusion and Exclusion Criteria>

Criterion	Inclusion	Exclusion
Population	Older adults / middle-aged-to-older samples	Children, adolescents, young adults, or competitive athletes only
Exposure	Table tennis as the sport (intervention, component, or experience)	Non-sport uses of the term (e.g., badminton, football, tennis etc)
Outcome	Balance, postural control/stability, or functional fitness	No relevant outcome (e.g., satisfaction only)
Design	Empirical study with outcome data	Protocol or review without primary outcome data
Document type	Journal article	Other document types
Language	English	Non-English
Period	Published within the last five years (2022–2026)	Before 2022
Article access type	Open access	Closed access

PRISMA 2020 Flow Diagram

PRISMA 2020 flow of Study Identification, Screening, Eligibility, And Inclusion. All Counts Derive from the Scopus Search and Screening Record

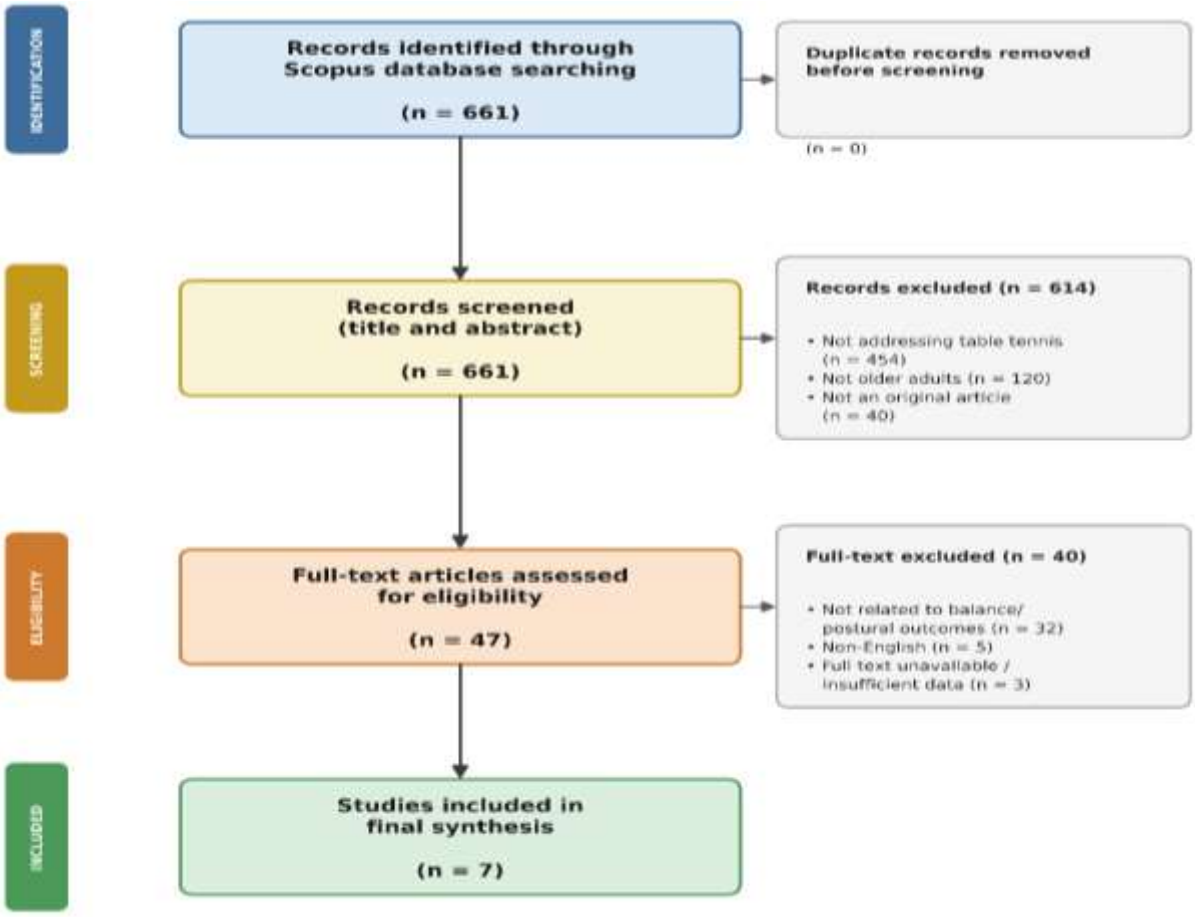

Figure 2 <PRISMA 2020 Flow Diagram of Study Selection>

Quality assessment - FICO framework
Included studies were appraised using the FICO framework (Focus, Information, Context, Outcome): whether the study Focus addressed table tennis and balance in older adults; whether Information on design, sample, and dosage was reported; whether the Context (setting and population) was relevant to ageing; and whether Outcomes were measured with recognised tests. Studies meeting all four dimensions were retained; those with an irrelevant focus, ineligible context, or absent outcome data were excluded at the full-text stage.

Data extraction procedure
For each included study, the following were extracted from the source record: authors, year, journal, country (where stated), study design, sample, the form of table tennis exposure, outcome measures, and key findings. Extracted items populate Tables 1 and 2.

Network and bibliometric analysis
Descriptive information for the included studies-publication year and outcome focus-was tabulated to characterise the synthesised evidence (Figure 1). Formal co-authorship or co-citation network analysis was not performed, as the small number of on-topic studies would not support stable network structures.

Data analysis and synthesis
A thematic synthesis was used, following the approach of Thomas and Harden (2008). Findings from each study were coded against the three research questions and grouped into themes-balance and functional performance, postural control and sensorimotor mechanisms, and intervention characteristics-allowing convergent and divergent results to be compared narratively across heterogeneous designs and outcomes.

Reporting and documentation
Reporting followed the PRISMA 2020 structure for identification, screening, eligibility, and inclusion (Page et al., 2021). The synthesised evidence is drawn from the Scopus source, while standard methodological references are included as a declared exception so that the reporting and appraisal procedures are fully traceable, in line with the requirements of high-impact journals

Results and Discussions

Study selection results
The Scopus search identified 661 records. No duplicates were detected. Title and abstract screening removed 614 records: 454 did not address table tennis, 120 did not concern older adults, and 40 were not original articles. Of the 47 full texts subsequently assessed, 40 were excluded-because their full text was not related to balance or postural outcomes (n = 32), was non-English (n = 5), or was unavailable or contained insufficient data (n = 3). Seven studies met all criteria and were carried into the synthesis (Figure 2).

Descriptive characteristics
The seven included studies were published between 2022 and 2026; their year distribution is shown in Figure 1. The studies are summarised in Table 1, and their thematic and methodological classification appears in Table 2.The purpose of the Results and Discussion is to state your findings and make a interpretations and/or opinions, explain the implications of your findings, and make suggestions for future research. Its main function is to answer the questions posed in the Introduction, explain how the results support the answers and, how the answers fit in with existing knowledge on the topic. The Discussion is considered the heart of the paper and usually requires several writing attempts.

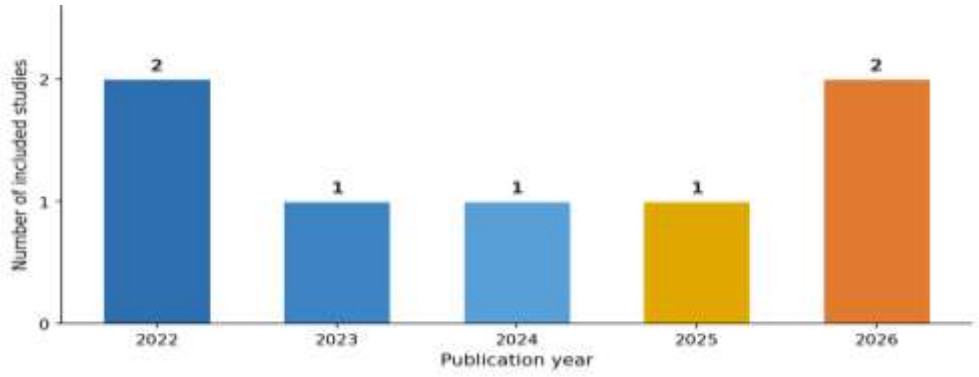

Figure 2 <Year of publication of the included studies (n = 7)>

Table 2 <Summary of included studies (n = 7)>

Author(s) (Year)	Country	Design & sample	Key findings
Deprá et al. (2022)	Brazil	Quasi-experimental, parallel controlled; n = 16 (8 EG / 8 CG); 16-week TT, 2×/week	EG improved agility and reduced postural sway in tandem stance (area, antero-posterior amplitude, medio-lateral speed); supports balance benefit of low-to-moderate-intensity TT.
Wei et al. (2024)	Not stated*	Cross-sectional comparative (TT-experienced vs fit-aerobics vs none); TMS connectivity	TT-experienced older adults showed better motor control and more efficient sensorimotor (pre-SMA–M1, DLPFC–M1) connectivity, a neural basis for postural-motor benefits.
To-aj et al. (2025)	Thailand	RCT; adults 40–70; competitive vs recreational TT; WHOQOL-BREF	Structured competitive TT improved physical, psychological, and social quality-of-life domains versus control; physical-health gains relevant to active ageing.
Lin et al. (2026)	Not stated*	RCT; adults 55–65 (TT n = 36 / control n = 34); 12-week TT	TT improved single-leg stance, reaction time, and hand-grip strength (notably in women), maintained body composition, and raised antioxidant capacity.
Hernández-Martínez et al. (2022)	Not stated*	RCT (block design); older females n = 25; 8-week exergames incl. TT, 3×/week	Exergames including table tennis improved walking speed, static balance, timed-up-and-go, and sit-to-stand performance.
Shirazi et al. (2023)	Iran	Clinical trial; nursing-home elders with balance impairment, n = 60; Kinect vs routine (walking + TT)	Technology-based exercise improved fitness and daily-living function in balance-impaired elders; TT featured within the comparison programme.
Schumacher et al. (2026)	Not stated*	Non-randomised controlled; inactive adults 60+, n = 161 (+32 control); 24-week multicomponent incl. TT	Multicomponent programme incorporating recreational table tennis improved motor performance with moderate effects and supported longer-term adherence.

Note. EG = experimental group; CG = control group; TT = table tennis; TMS = transcranial magnetic stimulation. * Country not explicitly recorded in the source export; authorship/affiliation suggests an origin but is not asserted here.

Table 3 <Classification of Included Studies by Theme and Method>

Author(s) (Year)	Research Design	Table Tennis Exposure	Primary Outcome Domain
Deprá et al. (2022)	Quasi-experimental	Standalone TT practice	Balance (posturography) & agility
Wei et al. (2024)	Cross-sectional comparative	Lifetime TT experience	Motor control & cortical connectivity
To-aj et al. (2025)	Randomised controlled trial	Competitive vs recreational TT	Quality of life (physical/psych/social)
Lin et al. (2026)	Randomised controlled trial	Standalone TT training	Functional fitness & antioxidant status
Hernández-Martínez et al. (2022)	Randomised controlled trial	TT within exergame set	Functional balance & mobility
Shirazi et al. (2023)	Clinical trial	TT within routine programme	Fitness & activities of daily living
Schumacher et al. (2026)	Non-randomised controlled	TT within multicomponent sport	Motor performance & adherence

Findings for RQ1 - Effects on balance performance
Deprá et al. (2022) provide the clearest proof. A 16-week table tennis programme delivered at the low- to-moderate intensity twice a week produced significant improvements in agility within the group and, more importantly, reductions in postural-sway parameters in tandem stance with eyes open. Since these gains were in the experimental group and not in the control group, they fairly specifically support a balance benefit of table tennis rather than of general activity.

Convergent, though less isolated, evidence appears in programmes where table tennis is combined with other activities. Hernández-Martínez et al. (2022) showed that eight-week exergame including a table tennis exergame improved balance, walking speed, sit-to-stand and timed-up-and-go performance of older women. Besides, Lin et al. (2026) indicated that the twelve weeks of table tennis training improved single-leg stance and reaction time, which are two of the measures to assess balance, especially among the female participants. Shirazi et al. (2023) and Schumacher et al. (2026) similarly found that table tennis psychosocial function and motor performance benefits resulted from their programmes that included table tennis, thereby strengthening the case even where the sport was one of several components.

However, the combined results of this research show a clear trend: not a single study among those included found a balance effect that was either null or negative. However, the level of the evidence varies; it is highest when table tennis alone was considered (Deprá et al., 2022; Lin et al., 2026) and lower when it was combined with other activities (Hernández-Martínez et al., 2022; Shirazi et al., 2023; Schumacher et al., 2026).In fact, table tennis seems to be an effective way to exercise the balance in elderly people is the main implication of RQ1, and there has been an ongoing increase in the support for this.

Findings for RQ2 - Postural control and postural stability
Deprá et al. (2022) sent the strongest message in terms of postural mechanisms: a lesser sway area, antero-posterior amplitude, and medio-lateral velocity during a challenging tandem posture reflect a better management of the body's centre of pressure, that is essentially the physical basis of postural stability. Lin et al. (2026) supported this even more with their finding of a longer single-leg stance time, which is a very popular static-balance and fall-risk indicator.

The mechanistic aspect of postural control is made clearer by Wei et al. (2024) who demonstrated that senior individuals with table tennis experience have better motor control and a more efficient connectivity between supplementary and dorsolateral prefrontal regions and the primary motor cortex. While this experiment observed neural regulation rather than postural sway, it offers a potential mechanism through which table tennis could promote quick, anticipatory motor adjustments to balance-maintenance-relying on cortical-activation patterns in the sport (Carius et al., 2023; Carius et al., 2025; Visser et al., 2022).

After integrating these studies, it is concluded that the advantages of table tennis on postural control are manifested both in the performance level (less body sway, longer duration of single-leg stance) and in the level of brain (sensorimotor system becoming more efficient). In respond to RQ2, the activity of table tennis seems to affect postural control mainly as a result of better center of pressure regulation and possibly, to a greater extent, through more effective cortical control of movement. However, the neural data is based on a single cross-sectional study and is not sufficient to determine causality.

Findings for RQ3 - Intervention characteristics associated with improvement
The included trials consistently point to a familiar dosage. Well-being effects appeared after work-from-home programmes of roughly eight to twenty-four weeks: eight weeks of three times/week exergames (Hernández-Martínez et al., 2022), twelve weeks of table tennis training (Lin et al., 2026), sixteen weeks of twice/week practice (Deprá et al., 2022), and twenty-four weeks of multicomponent sessions (Schumacher et al., 2026). Interestingly, Deprá et al. (2022) got sway reductions with just two low-to-moderate-intensity sessions a week, which means that high intensity is not necessary for balance improvements.

It also seems that the format of training can influence the results. To-aj et al. (2025) reported that structured and competitive table tennis led to wider quality-of-life improvements compared with just playing table tennis leisurely without any structure. Their results showed that benefits can be enhanced by some level of structure and a progressive challenge. Meanwhile, a few studies showed improvements when table tennis was used as a part of multicomponent or exergame formats (Hernández-Martínez et al., 2022; Shirazi et al., 2023; Schumacher et al., 2026), which means that the sport can be easily a part of an active-ageing program. Schumacher et al. (2026) went a step further to associate these types of formats with continuous commitment, which is a vital prerequisite for any long-term balance advantage.

For RQ3, the findings indicate that training programs lasting between eight and sixteen weeks, done two to three times a week at low-to-moderate levels of intensity, which include a few structured or progressive elements, are linked to the enhancements in balance and postural control. Since no research has comprehensively changing dosage, these parameters are descriptive regularities rather than established thresholds.

Comparative and critical analysis

Methodologically, the included papers cover a quasi-experiment (Deprá et al., 2022), three randomised controlled trials (Hernández-Martínez et al., 2022; To-aj et al., 2025; Lin et al., 2026), a non-randomised controlled study (Schumacher et al., 2026), a clinical trial (Shirazi et al., 2023), and a cross-sectional neural-connectivity comparison (Wei et al., 2024). This variety is a benefit as different studies using different methods come to the same conclusion. However, it is also a disadvantage as the samples are very small and, usually, participants ranging from 16 to about 193 have been used in the studies. In addition, outcome instruments differ substantially, from force-platform posturography to single-leg-stance timing, the senior fitness test battery, and quality-of-life questionnaires. Being so diverse, they cannot be meta-analytically pooled and the accuracy of any effect estimate is compromised. Pooling was not undertaken because designs and outcome instruments were clinically and methodologically heterogeneous; findings were therefore integrated by direction-of-effect (vote counting) within a narrative synthesis.

Another analytical issue is exposure isolation. Only Deprá et al. (2022) and Lin et al. (2026) focused on table tennis primarily; in other cases, the sports were just one among several of the activities involved, so the balance improvements observed could not be solely attributed to it. The study that offers the most mechanistic insights (Wei et al., 2024) is a cross-sectional one, and as such, it can be influenced by self-selection, because physically active older adults who usually play table tennis might also have better motor control at the baseline. These aspects challenge the extent to which causal arguments can be strongly made.

Overall, the data suggest that table tennis is connected with significant enhancements in balance, postural control, and functional fitness in the elderly, and that these physical improvements are likely reflected in brain changes. The combination of results from posturographic, functional, and connectivity measures gives a strength to the conclusion that no one study can achieve.

Theoretically, the findings can be used to justify the perspective that postural control can be developed by engaging in actions that simultaneously challenge the sensory, cognitive, and motor systems. Playing table tennis can be one such example of an action, and the results of the brain connectivity study from Wei et al. (2024), along with the works on brain activity (Carius et al., 2023; Carius et al., 2025; Visser et al., 2022; Schaefer & Amico, 2022; Amico & Schaefer, 2022; Studnicki et al., 2023), help in changing the balance-benefit concept from one focusing only on the musculoskeletal system to one centered on sensorimotor efficiency. In fact, this theory is in line with research using mobile-brain imaging that has shown how the brain's control of posture and walking changes with aging (Patelaki et al., 2023; Salminen et al., 2025; Devol et al., 2026), as well as studies that have demonstrated the cortical responses to perturbations as good indicators of balance performance throughout the adult lifespan (Mirdamadi et al., 2025).

In practice, the results provide useful orientation for future actions. Table tennis has limited locomotor displacement, i.e. players hardly move around the table, which makes it a low fall risk activity suitable for implementation in the community and senior centres where it is already very popular and enjoyed by a lot of people (Jung et al., 2023). For professionals and lawmakers who build fall-prevention programs, table tennis is a viable, attractive, and cheap option that can be enhanced with some organization (To-aj et al., 2025) and continued for a few weeks at least. If there are only few places to play or no other players available, the same perceptual-motor challenges can be recreated more and more through exergames and virtual reality, which have been shown to be physically possible, acceptable, and mentally stimulating for old people (Kershner et al., 2024; Müller et al., 2025) and are able to systematically challenge postural control (Abayasiri et al., 2026; Hidayat et al., 2025).

Relative to previous research on sport, which highlights its multidimensional health benefits generally (Aparicio-Chueca and Muñoz-Vila, 2025), the current review zooms in on balance and posture outcomes in ageing and uncovers the emerging evidence to be supportive yet immature. None of the included studies rejected the general direction of effect; the main conflict in the literature is not between positive and negative results but between the reliability of the signal and the rather low quality of the designs.

The pattern observed here also reflects a large body of evidence on the training of balance in ageing. Systematic and meta-analytic researches indisputably show that regular exercise consistently improves

balance function and reduces the number of falls in older adults (Yu et al., 2025), and other low-impact, coordination-rich modalities also bring about the same benefit: rhythmic dances like Cha-cha (Li et al., 2022), traditional Tai Chi which helps in increasing lower-limb loading and controlling obstacle-crossing (Huang et al., 2022; Li et al., 2023), cooperation, opposition games which maintain dynamic balance compared to inactive controls (Béraud-Peigné et al., 2022). Similar improvements in functional fitness and single-leg stance have even been observed after a few structured sessions in older women (Chen et al., 2022), whereas physical education curriculum enhances postural-stability indices in younger samples (Mocanu, 2022). Against such comparators, table tennis stands out as balancing such balance demands with continuous perceptual, cognitive engagement, the very combination that facilitates automatised postural control under dual-task load (Pineda et al., 2022). This confluence of factors makes the balance gains from table tennis most probably real rather than merely artefactual, although the sport-specific evidence base is not as substantial as that for these better-studied modalities.

There are several gaps in this regard. Firstly, isolating table tennis from other co-administered activities is a rare feature of studies, which means its independent contribution remains unclear. Secondly, posturographic outcomes are rarely reported directly and instead, many studies rely on functional proxies. Thirdly, mechanistic evidence is cross-sectional, so the chain of causality from play to neural changes to improvements in posture remains untested longitudinally. This review also suffers from its own limitations. It is based on just one database (Scopus), hence studies indexed in other databases are missing, and the small seven-study evidence base. Synthesised evidence is taken from the Scopus source; standard methodological references were added as a declared exception to transparent reporting, but no additional contextual literature beyond the source was included. Lastly, no formal risk-of-bias instrument or meta-analysis was undertaken given the heterogeneity and number of studies.

Future research ought to focus on sufficiently large randomised controlled trials that separately study table tennis, use standardised force-platform posturography along with clinical balance tests, and have a long enough follow-up to observe fall outcomes. Longitudinal neuroimaging studies may be able to examine if the connectivity benefits observed by Wei et al. (2024) are the cause or effect of playing, and dose-response studies could change the purely descriptive dosage regularities found here into evidence-based prescriptions. Nonetheless, some gaps exist. Firstly, few studies manage to isolate table tennis from other co-administered activities, making its independent effect uncertain. Secondly, posturographic outcomes are reported inconsistently, with many studies just using functional proxies instead of direct centre-of-pressure measurements. Thirdly, mechanistic evidence is cross-sectional, so the causal chain from playing to neural change to postural improvement has not yet been tested longitudinally.

Our review also has several limitations. It relies on one database (Scopus) only, so articles indexed elsewhere are not included, and the seven-study corpus is rather small. The components of the synthesised evidence are from the Scopus source; standard methodological references were added as a declared exception to ensure transparent reporting, but no additional contextual literature beyond the source was incorporated. Lastly, no formal risk-of-bias tool or (meta-)analysis was used, due to the heterogeneity and number of studies. In summary, and in direct answer to the research questions: table tennis participation appears to improve balance performance in older adults (RQ1); it does so through better centre-of-pressure regulation and plausibly through more efficient sensorimotor cortical control (RQ2); and benefits are most consistently associated with structured programmes of roughly eight to sixteen weeks performed two to three times weekly at low-to-moderate intensity (RQ3).

Conclusions

This systematic review took seven studies from a specific Scopus database to identify the influence of table tennis in improving balance and postural control in seniors. The results show that playing table tennis is frequently linked to better balance performance as seen in decreased postural sway and longer single-leg stance, and also with improvement in other areas like agility, reaction time, functional mobility, and quality of life. Besides, one paper made a connection between table tennis activity and enhanced sensorimotor cortical connectivity, hinting at a possible brain effect of these kinds of physical activities. Such gains were primarily seen in well-organized courses of about eight to sixteen weeks, held two to three times weekly at low-to-moderate intensity level, whether the sport was done alone or in combination with other physical activities and exergames. The main value of this paper lies in bringing together previously disjointed publications to form a consistent rest-of-picture and then turning that into actual very useful advice: since table tennis is a low-impact, fun, and inexpensive game, it can be a very strong contender for fall-prevention

and active-aging programmes in the community. Evidence was synthesised narratively by direction of effect (vote counting); meta-analysis was deemed inappropriate due to heterogeneity.

References

Abayasiri, A. M., Padilha Lanari Bo, A., Baghaei, N., & Dick, T. J. M. (2026). Virtual reality illusions systematically perturb balance in young and older adults. Gait & Posture, 128, Article 110172. https://doi.org/10.1016/j.gaitpost.2026.110172

Amico, G., & Schaefer, S. (2022). Tennis expertise reduces costs in cognition but not in motor skills in a cognitive-motor dual-task condition. Acta Psychologica, 223, Article 103503. https://doi.org/10.1016/j.actpsy.2022.103503

Aparicio-Chueca, P., & Muñoz-Vila, N. (2025). Table tennis for health: A multidimensional perspective on its physical, emotional, and social advantages. Healthcare, 13(18), Article 2352. https://doi.org/10.3390/healthcare13182352

Ates, B., & Kaki, B. (2025). Age, sex and BMI in dynamic balance control: A cross-sectional study. Polish Journal of Sport and Tourism, 32(2), 19–24. https://doi.org/10.2478/pjst-2025-0009

Béraud-Peigné, N., Maillot, P., & Perrot, A. (2022). The impact of a cooperation and opposition physical activity program on cognitive function among older adults. NPG Neurologie - Psychiatrie - Gériatrie, 22(129), 149–157. https://doi.org/10.1016/j.npg.2021.08.002

Carius, D., Herold, F., Clauß, M., Kaminski, E., Wagemann, F., & Ragert, P. (2023). Increased cortical activity in novices compared to experts during table tennis: A whole-brain fNIRS study using threshold-free cluster enhancement analysis. Brain Topography, 36. https://doi.org/10.1007/s10548-023-00963-y

Carius, D., Kaminski, E., Clauß, M., & Ragert, P. (2025). Dynamic alterations in cortical activation during motor adaptation in table tennis using whole-brain fNIRS. Scientific Reports, 15. https://doi.org/10.1038/s41598-025-94699-3

Chen, C.-H., Hsu, C.-H., Chu, L.-P., Chiu, C.-H., Yang, W.-C., Yu, K.-W., & Ye, X. (2022). Acute effects of static stretching combined with vibration and nonvibration foam rolling on the cardiovascular responses and functional fitness of older women with prehypertension. Biology, 11(7), Article 1025. https://doi.org/10.3390/biology11071025

Contreras-Osorio, F., Ramirez-Campillo, R., Cerda-Vega, E., Campos-Jara, R., Martínez-Salazar, C., Arellano-Roco, C., & Campos-Jara, C. (2022). Effects of sport-based interventions on executive function in older adults: A systematic review and meta-analysis protocol. Brain Sciences, 12(9), Article 1142. https://doi.org/10.3390/brainsci12091142

Deprá, P. P., Lopes, W. A., de Oliveira, G. H., Costa, C. E., & da Silva, V. O. (2022). Effects of table tennis practice on balance and physical fitness in the elderly. Journal of Physical Education (Maringá), 33(1), Article e3360. https://doi.org/10.4025/jphyseduc.v33i1.3360

Devol, C. R., Liu, C., Salminen, J., Pliner, E. M., Roy, A., Hass, C. J., Clark, D. J., Manini, T. M., Seidler, R. D., & Ferris, D. P. (2026). Mobility function and aperiodic electrocortical activity in younger and older adults. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 34, 2516–2529. https://doi.org/10.1109/TNSRE.2026.3693634

Haryanto, J., & Becerra-Patiño, B. (2023). Exploring the impact of eye-hand coordination on backhand drive stroke mastery in table tennis regarding gender, height, and weight of athletes. Journal of Physical Education and Sport, 23(10). https://doi.org/10.7752/jpes.2023.10310

Hernández-Martínez, J., Ramírez-Campillo, R., Álvarez, C., Valdés-Badilla, P., Moran, J., & Izquierdo, M. (2022). Effects of active exergames training on physical functional performance in older females. Cultura, Ciencia y Deporte, 17(51), Article 1658. https://doi.org/10.12800/ccd.v17i51.1658

Hidayat, Y., Kusamawati, M., Basri, H., Ridho, A. F., Tumijan, W., Pa, W. A. M. W., Mutaqin, D. I., & Subagyo, B. (2025). Can virtual reality training effectively improve physical condition and back-row attack in volleyball? Journal of Coaching and Sports Science, 4(1), 100–111. https://doi.org/10.58524/jcss.v4i1.728

Huang, H.-P., Kuo, C.-C., Lu, S.-H., Chen, S.-C., Ho, T.-J., & Lu, T.-W. (2022). Synergistic multi-joint kinematic strategies to reduce tripping risks during obstacle-crossing in older long-term Tai-Chi Chuan practitioners. Frontiers in Aging Neuroscience, 14, Article 961515. https://doi.org/10.3389/fnagi.2022.961515

Jung, Y.-H., Park, J.-B., Kang, A., & Cho, K.-C. (2023). The elderly's satisfaction with physical activity programs in senior welfare centers. Frontiers in Public Health, 11, Article 1170612. https://doi.org/10.3389/fpubh.2023.1170612

Kershner, K., Morton, D., Robison, J., N'dah, K. W., & Fanning, J. (2024). Assessing the feasibility and acceptability of virtual reality for remote group-mediated physical activity in older adults: Pilot randomized controlled trial. JMIR Formative Research, 8, Article e53156. https://doi.org/10.2196/53156

Li, H., Peng, F., Lyu, S., Ji, Z., Li, X., & Liu, M. (2023). Newly compiled Tai Chi (Bafa Wubu) promotes lower extremity exercise: A preliminary cross-sectional study. PeerJ, 11, Article e15036. https://doi.org/10.7717/peerj.15036

Li, H., Qiu, X., Yang, Z., Zhang, Z., Wang, G., Kim, Y., & Kim, S. (2022). Effects of Cha-Cha dance training on the balance ability of the healthy elderly. International Journal of Environmental Research and Public Health, 19(20), Article 13535. https://doi.org/10.3390/ijerph192013535

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. PLoS Medicine, 6(7), Article e1000100. https://doi.org/10.1371/journal.pmed.1000100

Lin, Y., Zhang, Y., Wu, Z., Mao, W., & Yan, L. (2026). Effects of a 12-week table tennis training on physical fitness and serum antioxidant parameters for older adults. Scientific Reports, 16(1). https://doi.org/10.1038/s41598-025-31098-8

Meng, Y., & Bu, Y. (2023). Influence of abdominal core training on stability control in table tennis players. Revista Brasileira de Medicina do Esporte, 29, Article e2022_0357. https://doi.org/10.1590/1517-8692202329012022_0357

Mirdamadi, J. L., Poorman, A., Munter, G., Jones, K., Ting, L. H., Borich, M. R., & Payne, A. M. (2025). Excellent test-retest reliability of perturbation-evoked cortical responses supports feasibility of the balance N1 as a clinical biomarker. Journal of Neurophysiology, 133(3), 987–1001. https://doi.org/10.1152/jn.00583.2024

Mocanu, G.-D. (2022). The influence of curricular physical activities on the values of body balance indices in university students. Balneo and PRM Research Journal, 13(1), Article 478. https://doi.org/10.12680/balneo.2022.478

Müller, H., Büchel, D., Skjaeret-Maroni, N., Vereijken, B., & Baumeister, J. (2025). Monitoring cognitive load while playing exergames in a four-week intervention for older adults: An explorative EEG study. Scientific Reports, 15(1), Article 32490. https://doi.org/10.1038/s41598-025-19183-4

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, Article n71. https://doi.org/10.1136/bmj.n71

Patelaki, E., Foxe, J. J., Mantel, E. P., Kassis, G., & Freedman, E. G. (2023). Paradoxical improvement of cognitive control in older adults under dual-task walking conditions is associated with more flexible reallocation of neural resources: A Mobile Brain-Body Imaging (MoBI) study. NeuroImage, 273, Article 120098. https://doi.org/10.1016/j.neuroimage.2023.120098

Pineda, R. C., Krampe, R. T., Vanlandewijck, Y., & Van Biesen, D. (2022). Cognitive–motor multitasking in athletes with and without intellectual impairment. Scandinavian Journal of Medicine & Science in Sports, 32(2), 424–434. https://doi.org/10.1111/sms.14088

Salminen, J., Liu, C., Pliner, E. M., Tenerowicz, M., Roy, A., Richer, N., Hwang, J., Hass, C. J., Clark, D. J., Seidler, R. D., Manini, T. M., Cruz-Almeida, Y., & Ferris, D. P. (2025). Gait speed-related changes in electrocortical activity in younger and older adults. Journal of Neurophysiology, 133(6), 1761–1794. https://doi.org/10.1152/jn.00544.2024

Schaefer, S., & Amico, G. (2022). Table tennis expertise influences dual-task costs in timed and self-initiated tasks. Acta Psychologica, 223, Article 103501. https://doi.org/10.1016/j.actpsy.2022.103501

Schumacher, A., Krumpolt, M., Sannemann, L., & Witte, K. (2026). Influence of a sport-oriented exercise concept on motor performance and sustainability in healthy but sporting inactive older adults aged 60+. Frontiers in Sports and Active Living, 8, Article 1702331. https://doi.org/10.3389/fspor.2026.1702331

Selvakumar, K., Xin, E. T. W., & Vasu, D. T. (2025). Bridging the gap: Enhancing motor skills and balance through eye-hand coordination training in university students. Caspian Journal of Neurological Sciences, 11(4), 329–337. https://doi.org/10.32598/CJNS.11.43.575.1

Shirazi, F., Jaberi, A., & Nasab, N. Z. (2023). Effect of a technology-based exercise program on physical fitness and activities of daily living in the elderly with balance impairment: A clinical trial. Iranian Journal of Ageing, 18(2). https://doi.org/10.32598/sija.2023.3448.1

Studnicki, A., Seidler, R. D., & Ferris, D. P. (2023). A table tennis serve versus rally hit elicits differential hemispheric electrocortical power fluctuations. Journal of Neurophysiology, 130(6), 1444–1456. https://doi.org/10.1152/jn.00091.2023

Taghi, M. M., Aghdaei, M., Farsi, A., Badicu, G., & de Sousa Fernandes, M. S. (2025). The effect of task cognitive difficulty on perceptual-cognitive indicators: Evidence on the relationship between the Challenge Point Framework and cognitive development in table tennis beginners. Journal of Multidisciplinary Healthcare, 18. https://doi.org/10.2147/JMDH.S472671

Tayebi, S. M., Ghaziani, F. G., & Suryo Putro, W. A. (2025). Technological innovation in increasing sport access and participation for people with disabilities and inactivity—A report on 1st Conference USCI (University Sport Consortium International). Annals of Applied Sport Science, 13(Special Issue), Article e1485. https://doi.org/10.61186/aassjournal.1485

Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Medical Research Methodology, 8, Article 45. https://doi.org/10.1186/1471-2288-8-45

To-aj, O., Bumrungpanictarworn, A., & Liauw, F. (2025). Comparing competitive and recreational table tennis training: Impacts on quality of life in older adults - A randomized controlled trial. F1000Research, 14. https://doi.org/10.12688/f1000research.160396.2

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. British Journal of Management, 14(3), 207–222. https://doi.org/10.1111/1467-8551.00375

Visser, A., Büchel, D., Lehmann, T., & Baumeister, J. (2022). Continuous table tennis is associated with processing in frontal brain areas: An EEG approach. Experimental Brain Research, 240. https://doi.org/10.1007/s00221-022-06366-y

Wang, Y., Luo, Z., Zhang, T., Zhang, M., Kapilevich, L., & Wang, J. (2025). Sport-specific impacts of ball games on adolescent brain function: A network meta-analysis of executive cognitive tasks. BMC Sports Science, Medicine and Rehabilitation, 17(1), Article 215. https://doi.org/10.1186/s13102-025-01268-2

Wei, J.-N., Zhang, M.-K., Wang, Z., Liu, Y., & Zhang, J. (2024). Table tennis experience enhances motor control in older adults: Insights into sensorimotor-related cortical connectivity. International Journal of Clinical and Health Psychology, 24(2), Article 100464. https://doi.org/10.1016/j.ijchp.2024.100464

Yu, H., Zhong, J., Li, M., & Chen, S. (2025). Effects of exercise intervention on falls and balance function in older adults: A systematic review and meta-analysis. PeerJ, 13, Article e20190. https://doi.org/10.7717/peerj.20190