Dance Programs and Fall-Related Costs in Older Adults: A Literature Review
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Abstract

Falls among older adults impose substantial health and economic burdens in Canada, contributing to injury-related hospital care, reduced mobility, fear of movement, and increased long-term care needs. This literature review examines the effectiveness of dance-based interventions in reducing fall risk and, in turn, fall-related costs. A focused search strategy prioritized peer-reviewed studies, theses, and public health reports that linked dance interventions to fall outcomes, fall risk factors (e.g., balance, gait speed, strength, confidence), or economic measures; 12 sources met this inclusion criterion. Across studies, dance interventions were associated with improvements in postural control, functional balance, gait speed, and lower-limb functional capacity, outcomes closely tied to fall risk. However, evidence on falls incidence is mixed, with large-scale "social dance" formats failing to consistently reduce falls, suggesting that enjoyment alone is insufficient without adequate balance challenge and progression. Economic evidence is limited in Canada, but evaluations from England (e.g., Dance to Health) indicate structured dance-based falls prevention as cost-effective and potentially cost-saving over multiple years. Overall, this paper indicates that dance interventions can improve fall-risk factors and may yield meaningful cost savings.

Introduction

Falls in later life create major health loss and high public costs worldwide. Canada also faces a heavy burden from seniors' fall injuries each year. (Parachute, 2021, p. 1). Parachute reports about $5.6 billion in yearly injury costs from seniors' falls. It also reports about 1.1 million injuries, 166,000 hospitalisations, and 7,000 deaths yearly. (Parachute, 2021, p. 1). Those totals show why fall prevention is an economic issue, not only a clinical one. Based on those figures, about one in seven reported injuries involved hospital care. Exercise is a core prevention tool because it targets balance, strength, and gait control. Dance is a form of exercise that may improve these risks while supporting steady attendance. This review synthesises evidence on outcomes and costs, with Canada used for savings scenarios.

Search Strategy and Selection Criteria

A focused search and selection process was used to choose sources. The goal was to include studies that link dance to fall risk factors, falls, or costs. The final set included 12 sources.

Search approach. Sources were identified using the four recommended items and added searches for: "older adults," "dance," "falls prevention," "balance," "gait speed," "cost," and "cost-effectiveness." Priority was given to peer-reviewed studies, theses with clear methods, and public health reports with national data. The search also screened reference lists in key papers to find linked trials.

Inclusion criteria. Sources were included if they:
1. studied adults aged 60 or older, or a clearly "older adult" sample;
2. tested a dance-based program or reviewed dance-based programs;

3. measured at least one fall outcome (falls, injuries) or fall risk factor (balance, gait, strength, confidence);
4. provided economic outcomes (costs, cost-effectiveness) or supported economic framing with burden data;
5. were accessible as full text.

   Exclusion criteria. Sources were excluded if they:
   1. focused only on younger groups;
   2. studied dance only as art therapy with no physical outcomes;
   3. lacked usable outcome reporting;
   4. were inaccessible in full text.

This process produced a set that supports both effectiveness and economic discussion. The Canadian context was added using national surveillance and cost summaries. The selection also included international studies to support a global perspective while keeping the economic framing centred on Canada (Goldsmith & Kokolakakis, 2021, p. 3; Merom et al., 2016, p. 1). Most included studies used pre-post designs, which limit firm cause-and-effect claims across samples.

Economic Burden of Falls in Canada
Falls in older age often lead to emergency care, hospital stays, and long recovery periods. These events also raise long-term care use and reduce independence, which adds indirect costs. Falls also increase fear of movement, which can reduce daily activity levels. This pattern can create a cycle where lower activity weakens balance and strength over time. In Canada, Parachute reports seniors' falls cost about $5.6 billion per year. (Parachute, 2021, p. 1). Cost size matters for economics because small risk changes can create large savings. If prevention reduces injuries, savings can exceed programme delivery costs in many settings. This link between high injury costs and low programme costs supports prevention investment. (Parachute, 2021, p. 1).

Dance Programs in Reducing Fall Risk
Dance can reduce fall risk through several linked pathways. Falls are rarely caused by one factor. Balance, gait, strength, reaction speed, and confidence all matter. Dance training often targets many of these at once. Dance may also train quick stepping responses that help recovery after a trip. This is relevant because many falls occur during turning, stepping over obstacles, or changing speed. Dance sessions can combine strength work and balance challenge within the same routine. This matters because fall risk often rises when several small deficits occur together.

1. **Balance and postural control**
Balance outcomes are central because balance loss is a strong fall predictor. In Chen's pilot trial, postural sway improved in the dance groups after training. For example, anteroposterior displacement fell from 0.42 to 0.34 in one group. (Chen, 2023, p. 57). The drop from 0.42 to 0.34 equals about a 19% reduction in sway. Other sway measures also improved, although group sizes were small in this pilot. (Chen, 2023, p. 57). Chen's study also tracked

feasibility outcomes, such as session completion and participant retention. Feasibility data matter because programmes that cannot retain participants will not reduce costs.

Dance may also improve balance because it forces weight shifts in many directions. Steps often require a single-leg stance, turning, and controlled lean. These movements resemble daily balance demands, but in a safer and planned setting. The repeated exposure can improve motor control and reduce "stiff" movement patterns that raise fall risk.

2. Mobility and gait speed

Mobility matters because slower gait speed predicts higher fall and disability risk. In a 12-week online dance study, gait speed rose from 1.57 to 1.68 m/s. (Hansen et al., 2024, p. 1). The gain from 1.57 to 1.68 m/s is about 0.11 m/s over twelve weeks. The reported effect size was moderate to large for this pre-post change. (Hansen et al., 2024, p. 1).

Dance training can also support dual-task skills. Many dance routines require listening, timing, and step choice while moving. This resembles real walking in busy spaces, where attention is split. Since many falls happen under divided attention, dual-task improvements are relevant.

3. Strength and functional capacity

Strength supports balance recovery after trips and helps with safe transfers. In Chen's pilot trial, chair-stand repetitions rose from 16.0 to 19.8 in one group. (Chen, 2023, p. 58). Chair-stand performance increased by 3.8 repetitions, which is about a 24% rise. Calf raises also increased, such as 19.8 to 29.2 in one group. (Chen, 2023, p. 58).

Adherence affects benefit because exercise effects depend on repeated weekly doses. Chen reported a mean attendance of 80.4% across sessions in that programme. (Chen, 2023, p. 3). In a large social dance trial, mean class attendance was 51%, which may limit the effect. (Merom et al., 2016, para. 8) Attendance differed by 29.4 percentage points, which may affect outcomes and cost value. This contrast suggests programme structure and attendance tracking are economic priorities.

Evidence on Dance and Falls Outcomes

Dance research includes mixed designs. Some studies focus on balance outcomes, while fewer measure falls directly. However, the falls prevention case for dance is strengthened when programs are built as structured falls prevention, not only as a social activity.

A recent review included 41 studies and 2,451 participants across dance formats. (Lazo Green et al., 2024, p. 1). Meta-analysis was only possible for some functional outcomes, not consistent fall outcomes. (Lazo Green et al., 2024, p. 1). Across pooled results, effects were not statistically clear and certainty was very low. (Lazo Green et al., 2024, p. 1). The review's low certainty rating reflects wide differences in dance style, dose, and outcome tools. This makes local pilot testing important before scaling a dance programme across regions.

Large trials show that dance design affects outcomes and must be checked carefully. One cluster trial reported 444 falls and no fall-rate reduction overall in the main analysis. (Merom et al., 2016, para. 8). The cluster trial result also suggests that offering classes alone does not guarantee a sufficient training dose. The authors noted low attendance and suggested adding clearer training elements. (Merom et al., 2016, para. 15).

More structured dance formats may align better with known fall-prevention principles. A tango programme reported improved functional balance and confidence after training. (McKinley

et al., 2008, pp. 446–449). This supports the idea that dance works best when it challenges balance with progression. (Lazo Green et al., 2024, p. 3).

These findings support a key theme across the literature: dance works best when it functions as structured balance training, with skilled instruction and progression.

Cost and Cost-Effectiveness Evidence for Dance

Economic outcomes depend on two main inputs: program cost and the size of benefit. For dance programs, cost includes instructor time, space, training, and coordination. Benefits include reduced falls, reduced injury care, and quality-of-life gains.

Cost findings for dance-based programmes come mainly from settings outside Canada. These findings still matter because falls prevention uses similar inputs across countries, such as staff time, space, and participant reach. However, unit costs, care pathways, and funding rules differ across systems, so results need careful adaptation before Canadian planning decisions (Goldsmith & Kokolakakis, 2021, p. 3).

Dance to Health is a structured programme that blends dance with falls-prevention exercise aims. The evaluation reported a 58% reduction in the number of falls in its modelled scenario. (Goldsmith & Kokolakakis, 2021, p. 3). It also reported potential cost savings over £196 million across two years in that scenario. (Goldsmith & Kokolakakis, 2021, p. 3). In the modelled scenario, £196 million over two years averages about £98 million per year.

Economic value also depends on reach. Group programs can spread fixed costs across many participants. They also build social connection, which can support attendance and reduce dropout. Lower dropout increases "value for money" because benefits depend on dose and time in the program.

Goldsmith and Kokolakakis also reported a positive net monetary benefit per person. The table shows £1,615.93 net monetary benefit per person at £30,000 per QALY. (Goldsmith & Kokolakakis, 2021, p. 11). This supports a cost case when delivery is efficient and reach is high. (Goldsmith & Kokolakakis, 2021, p. 11). Net monetary benefit is sensitive to both effect size and delivery cost per participant. Group size, venue pricing, and staff training are practical levers that can shift this balance.

Comparison With Other Falls Prevention Options

a) **Otago Exercise Programme as a comparator**

The Otago Exercise Programme is one of the best-known falls prevention exercise programs. A Canadian cost-effectiveness study compared Otago outcomes by sex in an older adult sample. The study reported that the program's cost and benefits differed by subgroup, with some groups showing cost savings and others showing small added costs (Davis et al., 2022, pp. 2-4). This highlights that program economics depends on who participates, baseline risk, and adherence.

Dance programs can be compared to Otago on key dimensions. Otago is home-based and strength-focused. Dance is often group-based and includes rhythm and stepping skills. Dance may have an adherence advantage in some settings because it feels social and enjoyable. That advantage can matter as much as the exercise type, since low adherence reduces benefits for any program.

b) **Digital and online delivery**

Online delivery has become more common. Chen's work supports the idea that online dance can be safe and feasible, with measurable balance gains and strong attendance (Chen, 2023, p. 2). Online delivery can reduce travel barriers and can reach rural areas. This matters in Canada, where distance is a common access barrier. It also changes costs, since space needs fall but technological accessibility poses a barrier.

c) Public health guidance context

Global guidance on falls prevention emphasizes exercise and risk reduction as core strategies (World Health Organization [WHO], 2007, pp. 15-16). Dance acts as an exercise-based prevention, but also adds a cultural and social dimension. Those dimensions can facilitate real-world uptake, especially when older adults prefer group activity over formal exercise sessions.

Canadian Savings Scenarios From Dance-Based Fall Prevention

A Canada-focused estimate should be presented as a scenario, not a forecast. Savings depend on reach, targeting, and the real fall reduction achieved in practice. The cost base is large, so even small changes can matter for public budgets. These scenario savings depend on participation rates, because most benefits require regular weekly attendance.

Parachute reports $5.6 billion per year in injury costs from seniors' falls in Canada. (Parachute, 2021, p. 1). A 1% reduction in fall injury costs implies about $56 million in yearly savings. A 5% reduction implies about $280 million, and 10% implies about $560 million. (Parachute, 2021, p. 1).

Programme evidence suggests effects can vary by format, dose, and participant risk level. Structured models that add balance, challenge, and progression may be more cost-relevant. Economic models also stress that targeting higher-risk groups can improve value. (Kwon et al., 2022, pp. 3-4).

Limits and Gaps in the Evidence

The evidence base has clear gaps. Dance studies vary in style, dose, and outcome choice. Many studies also have small samples. Reviews note heterogeneity and limits in certainty (Lazo Green et al., 2024, pp. 3-5). Some large trials also show that not all dance reduces falls, especially when the program is mainly social and not designed as progressive balance training (Merom et al., 2016, p. 1).

Economic evidence is also limited. Few studies report full cost-effectiveness for dance in North America. Cost-effectiveness results from England can inform thinking, but must be adapted to Canadian costs, care pathways, and delivery structures. More Canadian trials with economic evaluation are needed, especially in provincial health systems.

Conclusion

Overall, the literature supports dance as a practical exercise option for fall-risk factors. Evidence is strongest for balance, gait, and function outcomes, not consistent fall counts. (Lazo Green et al., 2024, p. 1). Programme design appears to matter, especially dose, progression, and balance challenge. (Merom et al., 2016, para. 15).

The economic case is strongest where fall injury costs are high and delivery is efficient. In Canada, seniors' falls are linked to about $5.6 billion in yearly injury costs. (Parachute, 2021, p.

1). Scenario savings can be large even with modest reductions, supporting careful pilot scale-up.

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