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Briefing Summary

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The Older People and Frailty Policy Research Unit were requested by DHSC to examine whether dance-based interventions are effective in preventing falls, reducing risk of falls, or preventing fear of falls in older adults, and to provide an overview of the evidence for cost-effectiveness of dance-based interventions for falls prevention amongst older people. This evidence could then be used to indicate whether the NHS and social/leisure care services should be advised to invest in dance-based interventions rather than traditional strength and balance interventions.

To answer these questions we undertook a systematic scoping review of the literature in late 2022/ early 2023. We focused on primary studies of people aged ≥50 years that investigated dance interventions aimed at fall prevention, and/or reduction of risk of falls. We also considered evidence from previous reviews in this topic area.

A fall is defined as "an event which results in a person coming to rest inadvertently on the ground or floor or other lower level". Some 30% of older adults aged 65 years and over fall each year. The recent *NHS England 'Going further for winter: community-based falls response*' highlights the importance of falls prevention for the NHS following the COVID-19 pandemic.

To set the scene there is a strong evidence base that strength and balance exercise programmes are effective at reducing falls. There have been a number of different systematic reviews and the most recent Cochrane review of randomised controlled trials (RCTs) investigating exercise interventions for falls prevention reports falls reduction of 23% to 31% depending in part on who delivers the strength and balance programme[1]. This review includes only one RCT of a dance programme, and found that dance may increase falls, comparing poorly to the strength and balance interventions reviewed.

Nonetheless dance has been put forward as an alternative approach to falls prevention. It is argued that dance is an enjoyable and sociable form of exercise in comparison to more formal exercise, thus enhancing both uptake and adherence. However, it should be noted that strength and balance programmes are often delivered so as to provide sociable and enjoyable session which engage the older people participating.

A number of systematic reviews report physical and mental health benefits of different forms of dance, but such dance programmes do not usually focus on the types of exercises known to prevent falls, nor do they focus on falls as the primary outcome. Previous reviews normally focus on proxy outcome measures such as balance and lower limb strength. However, from the literature generally it is clear that proxy markers of fall risk may improve without actual fall rate or number of fallers being reduced. Thus reviews which suggest there are positive effects of dance on such proxy measure, whilst indicative of the promise of dance interventions, do not directly address the question of whether dance interventions reduce falls incidence.

In order to address the issue we conducted a rapid systematic review of the literature on dance interventions and falls prevention. Our initial search identified 397 potential papers, but after removal of duplicates, abstract/title and full text screening of papers to assess eligibility against our criteria we were left with 48 primary studies. Our 48 primary studies included 23 randomised controlled trials (RCTs), and 25 non-randomised studies (NRSs). We identified one study reporting on cost-effectiveness. As with previous reviews the majority of the papers focus on proxy outcomes, but a small minority of the papers do report falls outcomes. We categorised the different types of dances as: Ballroom and Latin (15

[1] Sherrington C, et al. Exercise for preventing falls in older people living in the community. Cochrane Database Syst Rev. 2019;40

studies), cultural (folk dances) (8 studies), dance-based exercises (11 studies), dance-based therapy (2 studies), dance-based exergames (7 studies), low impact dances. (5 studies). We tabulate the characteristics of studies and summarise main findings in the full report.

Ballroom and Latin dances: All fourteen studies looked at balance as a key outcome, of which ten showed positive associations between participation and balance. In only one study were there significantly fewer falls in the dance group after ballroom dancing. Thus, results are inconclusive since only one RCT showed positive changes and it is not possible to estimate the effect size from the data presented.

Dance-based exercises: Nine of the eleven studies reported positive outcomes on balance, strength, and quality of life. Only four of these are RCTs. Only one non-randomised study reported reduced fear-of-falling following intervention.

Cultural dances: All eight studies on folk dances showed positive significant outcomes on balance, and one found significant improvements both in balance and strength. Only one study explicitly examined the effect on risk of falls, reporting a reduced risk of falls (measured by Morse Fall Scale). None of the studies examined number of falls as a primary outcome.

Dance-based therapy: Both studies were quasi-experimental. Dance-based therapy was found to improve leg strength of older adults. One study compared dance-based therapy with a multifactorial exercise programme and reported the participants in dance-based therapy had poorer outcomes.

Dance-based exergames: All studies, except for one, examined fear-of-falling as primary outcome, but only two demonstrated a positive effect. In terms of number of falls, one study reported a reduction in fall rate by 77% in healthy, community-dwelling older adults. However, and perhaps worryingly, results from another study suggest a slight increase in falls in the dance group.

Low impact dances: Only two of the five studies were RCTs, and none recorded number of falls as primary outcome. One study reported significant improvement in fear of falling, one reported non-significant changes in fear of falling. Two studies reported improved balance in participants.

We assessed the quality of the evidence using Cochrane risk of bias tools as appropriate; the RoB-1 tool for randomised trials and the ROBINS-I for non-randomised studies. Of the 23 RCT only four were rated as at consistently low risk of bias; 11 were at high risk of bias, and 8 had unclear risk of bias, of which all but one was at high risk of bias in at least one key domain. Of the 25 NRSs none were assessed as being at low risk of bias; the majority of studies were assessed to be at critical (7) or serious (8) risk of bias and only 10 were assessed as at moderate risk of bias overall. Considerable caution must therefore be taken when drawing conclusions on the basis of these studies, especially when considering evidence based on the poorer quality studies.

None of the four high quality RCTs demonstrate any effect on falls rates. However, only one actually reports falls data, and the other three RCTS all report significant improvements in proxies or fall risk factors (Timed-Up-and-Go, Sit-to-Stand, muscle power and balance). The evidence from the other lower quality studies was variable, and although inconsistent could be interpreted to suggest general physical and mental health benefits of dance. However from these studies it cannot be concluded that any of the dance interventions prevent falls. We found no robust evidence that dance interventions are cost-effective.

Cost-effectiveness is only assessed in one study. Considerable caution must be used in interpreting the cost-effectiveness of the Dance to Health intervention as reported, since the study is rated as being at critical risk of bias overall and thus it would not be justified to draw strong conclusions based on the one existing study.

Conclusions

Echoing the results of previous reviews, this study finds that there is inconclusive evidence on the effectiveness of dance interventions in falls prevention. Effectiveness of falls prevention programmes is best assessed when a RCT design is used, numbers of falls are assessed before and after the intervention and in comparison to a control, and outcome is based on number of falls or fallers, or rate of falls rather than the use of risk of falls proxy indicators. Out of the 48 studies examined in this review, only eight studies examined the number of falls after participation in dance. Only four of them claimed positive effect of dance on the number of fallers or falls after the intervention. Most importantly the one RCT that measured falls as an outcome and that was assessed as being of high quality (i.e. low risk of bias) reported no effect on falls outcomes.

Existing evidence shows that dance-based interventions may reduce the risk of falling through modification of risk factors and improvements in physical activity as well as psychological health. In this review, however, there are inconsistent results. Reduced fear of falling, for example, was only statistically significant in three studies, two of which are dance-based exergames. Most of the studies that recorded balance and strength have shown positive significant associations with low impact dance, cultural dance and ballroom and Latin dance. However, we must be cautious in interpreting that these dances are effective at actually reducing falls rates or number of fallers. Given that the types of dances found in this review vary, it is difficult to pinpoint which type of dance is likely to be the most effective.

The other aim of this review was to find out whether dance-based initiatives are cost effective or not. We know from previous studies that traditional balance and strength-based exercises, e.g., Otago, FaME, Tai Chi, have strong evidence on cost effectiveness. In this rapid review, we found no robust evidence that dance interventions are cost-effective.

Implications for policy and practice: Dance may provide benefits to older people who take part, but at present there is insufficient evidence to recommend any form of dance as an alternative to strength and balance training, if the aim is to prevent falls. There is no robust evidence on the cost-effectiveness of dance interventions for the prevention of falls. The World Guidelines for Falls Prevention and Management[2] recommend risk stratification of older adults. Older adults at low falls risk should be offered education about falls prevention and exercise for general health and/or fall prevention if interested; those at intermediate risk, in addition should be offered targeted exercise or a physiotherapist referral in order to improve balance and muscle strength, and reduce fall risk; older adults at high risk for falls should be offered a multifactorial falls risk assessment to inform individualised tailored interventions. The World Guidelines conclude that the evidence for effectiveness of dance for falls prevention is of very low quality using GRADE. There is therefore no evidence upon which to prioritise dance over exercise programmes with known effectiveness for falls prevention for any of the three risk groups. Nonetheless it may be that older people at low falls risk could benefit from dance as part of a general health regimen, in which case it

[2] Montero-Odasso M, et al. World Guidelines for Falls Prevention and Management for Older Adults: A Global Initiative. *Age and Ageing* 2022, 51 (9), afac205.

should be part of a structured progressive programme delivered by appropriately qualified professionals.

Further research is nonetheless warranted in this area, especially in terms of RCTs putting dance interventions head to head with interventions known to be effective in preventing falls such as FaME or Otago exercises.

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