A 12-Week Iyengar Yoga Program Improved Balance and Mobility in Older Community-Dwelling People: A Pilot Randomized Controlled Trial

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Background. Exercise that challenges balance can improve mobility and prevent falls in older adults. Yoga as a physical activity option for older adults is not well studied. This trial evaluated the feasibility and effect of a 12-week Iyengar yoga program on balance and mobility in older people.

Methods. We conducted a blinded, pilot randomized controlled trial with intention-to-treat analysis. Participants were 54 community dwellers (mean age 68 years, SD 7.1) not currently participating in yoga or tai chi. The intervention group (n = 27) participated in a 12-week, twice-weekly yoga program focused on standing postures and received a full prevention education booklet. The control group (n = 27) received the education booklet only. Primary outcome was standing balance component of the short physical performance battery with addition of one-legged stance time (standing balance). Secondary outcomes were the timed sit-to-stand test, timed 4-m walk, one-legged stand with eyes closed, and Short Falls Efficacy Scale-International. Feasibility was measured by recording class attendance and adverse events.

Results. Fifty-two participants completed follow-up assessments. The intervention group significantly improved compared with control group on standing balance (mean difference = 1.52 seconds, 95% CI 0.10–2.96, p = .04), sit-to-stand test (mean difference = −3.43 seconds, 95% CI −5.23 to −1.64, p < .001), 4-m walk (mean difference = −0.50 seconds, 95% CI −0.72 to −0.28, p < .001), and one-legged stand with eyes closed (mean difference = 1.93 seconds, 95% CI 0.40–3.46, p = .02). Average class attendance was 20 of 24 classes (83%). No serious adverse events occurred.

Conclusions. This trial demonstrates the balance and mobility-related benefits and feasibility of Iyengar yoga for older people. The fall prevention effect of Iyengar yoga warrants further investigation.

Key Words: Yoga—Aged—Balance—Accidental falls—Mobility.

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Despite the potential of yoga to prevent falls and the growing participation in yoga among people of all ages in many parts of the world, including Australia (7) and the United States (8), minimal research has been conducted into its effect on balance and mobility and reducing fall risk.

Hatha or physical yoga is the most common branch of yoga practiced in the western world. Iyengar yoga is a style of hatha yoga, focused on improving muscle strength and flexibility, and includes standing postures that challenge balance. It is an accessible form of yoga that can easily be modified to suit different ability levels with the use of props for support, such as straps, blocks, bolsters, pillows, and chairs.

Two published randomized controlled trials of Iyengar yoga among older people found improvements in single-leg stance ability (a balance measure) (9) and performance in the chair stand test (a lower limb strength measure) (10) after interventions of 6 months and 8 weeks duration, respectively. Both trials reported that the Iyengar yoga interventions were well tolerated and enjoyed by study participants.

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VER one third of people aged 65 years and older fall one or more times every year (1). Falls can result in disability, reduced independence, and poor quality of life. Measures of balance and mobility are known to predict fall risk (2).

Encouragingly, there is now evidence that exercise can prevent falls in older people. Exercise programs that challenge balance are most effective (3). Effective programs include tai chi (4) and the home-based Otago Exercise Programme (5). There is compelling evidence around the benefits of these types of programs to improve balance and prevent falls, yet uptake and adherence by older people has been low (6), indicating a need for greater fall prevention exercise choices and implementation strategies.

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Additionally, a recent systematic review that compared the benefits of yoga to other exercise interventions in older adults (11) provides preliminary evidence of improvements in strength, balance, aerobic fitness, and self-rated health after yoga practice. The review highlighted, however, the significant methodological weaknesses in existing studies and identified a need for further well-designed and implemented research to conclusively establish the balance and mobility-related benefits of yoga, in older people.

We conducted a pragmatic pilot randomized controlled trial to evaluate the effect of a 12-week Iyengar yoga program on balance and mobility in community-dwelling older people. We also documented intervention uptake, adherence, and enjoyment. This pilot trial was undertaken to test the feasibility of the methods to be used in a planned large trial of yoga for older people with falls as the outcome. We hypothesized that the intervention group would perform significantly better in tests of balance and mobility after the 12-week intervention compared with the control group.

**METHODS**

**Participants**

Between December 2011 and March 2012, community-based recruitment was undertaken via advertising in local newspapers, websites, and newsletters from local government and community organizations in Sydney, Australia. Participants were eligible if they were community dwelling, aged 59 years or older, were cognitively intact (defined as a score of ≥7 on the Short Portable Mental Status Questionnaire) (12), and were willing and able to attend 12 weeks of group-based yoga classes.

Exclusion criteria included having a medical condition that precludes exercise (13) (eg, unstable cardiac disease, uncontrolled hypertension, uncontrolled metabolic diseases, and large abdominal aortic aneurysm), minimal English language skills, hostel or nursing home resident, and/or current participation in yoga or tai chi. The presence or absence of these factors was determined by the research team during first telephone contact with prospective participants.

**Trial Design**

We conducted a parallel group randomized controlled trial with follow-up after 12-week intervention completion. An a priori sample size calculation determined that 54 participants were required (27 per group) to allow 80% power to detect as significant at the 5% level a 6-second between-group difference in standing balance, allowing 15% dropouts. The primary outcome was an adaptation of a continuously scored measure of standing balance (14). Because it had not been used previously in this format, we extrapolated an estimate of a clinically relevant change in performance using a similar outcome measure (15) to include in the sample size calculation.

Participants were initially screened by phone or e-mail for eligibility by the lead investigator (A.T.) and then completed the postal baseline questionnaire. Baseline physical assessments were conducted by the lead investigator (A.T.) or research assistant (S.O.) at the study site or participants’ home. After the 12-week intervention, all participants completed a follow-up postal questionnaire and the balance and mobility measures were reassessed by an assessor blind to group allocation (S.O.). Baseline assessments and the study questionnaire were completed after written informed consent was obtained from participants. To ensure allocation concealment, randomization to groups was undertaken by an investigator (C.S.) not involved in recruitment using a computer-generated random number schedule with randomly permuted blocks sizes of four and six. Randomization to study groups occurred after completion of baseline questionnaires and assessment. The research assistant (S.O.) who collected and entered study data remained blinded to group allocation throughout the study. The study design and procedures were approved by the Human Research Ethics Committee at the University of Sydney (protocol number 14265). The trial was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12612001265864).

**Intervention Group**

The intervention group received an education booklet produced by the Australian Commonwealth Department of Health and Ageing (16), which contained information about fall risk factors and prevention, and participated in a 12-week, twice-weekly group-based program of Iyengar-style yoga. Class sizes ranged from 12 to 15 people per class and the yoga sessions lasted for 1 hour each. The specific poses included are listed in Table 1. Participants were also instructed to practice the poses at home for 10–20 minutes on at least 2 days per week.

An experienced and Iyengar-certified yoga instructor (R.S.) conducted the classes, and in conjunction with the lead researcher (A.T.), developed the 12-week program of yoga postures to be practiced and adhered to. The balance challenge increased over time by gradually increasing the difficulty of the postures performed, commencing with low levels of challenge such as performing a half knee squat with feet side by side and arms extended above the head (known as “mountain pose”) and progressing the challenge over time to postures such as one-legged standing with arms extended above the head and the nonsupport foot placed on the thigh of the support leg (known as “tree pose”). Poses were modified to suit individual ability, with some participants initially requiring upper limb support (eg, leaning on a wall) to perform the most challenging postures. The ultimate goal, however, was that toward the end of the 12-week program, all participants would be performing the poses with minimal upper limb support.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poses included in the intervention group</td>
</tr>
<tr>
<td>1. Mountain pose</td>
</tr>
<tr>
<td>2. Tree pose</td>
</tr>
<tr>
<td>3. One-legged standing with arms extended above the head</td>
</tr>
<tr>
<td>4. Half knee squat with feet side by side and arms extended above the head</td>
</tr>
</tbody>
</table>
Table 1. The Yoga Protocol and Modifications to Poses to Account for Varying Physical Abilities

<table>
<thead>
<tr>
<th>Pose Description</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Tadasana in Urdhva Hastasana” Mountain</td>
<td>Pose performed with back to the wall for support where needed</td>
</tr>
<tr>
<td>Pose with Arms Stretch</td>
<td></td>
</tr>
<tr>
<td>“Utkatasana” Chair Pose</td>
<td>Pose performed next to a wall for support if needed</td>
</tr>
<tr>
<td>“Trikonasana” Triangle Pose</td>
<td>A block or chair is placed under the lower hand if required or</td>
</tr>
<tr>
<td></td>
<td>the pose can be performed with back to the wall for support where needed</td>
</tr>
<tr>
<td>“Virabhadrasana 1” Warrior 1</td>
<td></td>
</tr>
<tr>
<td>“Virabhadrasana 2” Warrior 2</td>
<td></td>
</tr>
<tr>
<td>“Virabhadrasana 3” Warrior 3</td>
<td></td>
</tr>
</tbody>
</table>

Control Group

Control group participants received the same fall prevention education booklet that intervention group participants received and were also instructed not to take part in any yoga classes or tai chi during the study period. They were offered 10 free yoga classes at the conclusion of the study after completing the reassessment.

Study Measures

Balance and mobility.—The primary outcome measure was the standing balance component of the short physical performance battery (17) with the addition of one-legged stance time (18) (standing balance). The three standing balance positions of the short physical performance battery include standing for 10 seconds each with feet side by side, feet in semi-tandem and in tandem positions. The sum of time able to stand in the four positions (with addition of one-legged stance), up to a maximum of 40 seconds, was the final measure. This test has been used extensively as a measure of function and mobility in older people. Secondary outcome measures were the timed sit-to-stand test with five repetitions, timed 4-m walk at fast pace (17), one-legged stand with eyes closed (18), and falls self-efficacy or concern about falling, as measured with the Short Falls Efficacy Scale-International (Short FES-I) (19). The sit-to-stand test (2), a similar gait speed test timed for 6 m (2), and the Short FES-I (20) have all been shown to predict falls.

Study questionnaire.—All participants completed a baseline questionnaire about medical conditions, medications, fall history, the need for assistance with activities of daily
living, and general health, as measured by the SF12v2 Health Survey (21). Participant perceptions of the benefits and barriers to exercise participation were measured at baseline with the Exercise Benefits and Barriers Scale (22). This 43-item questionnaire consists of statements that relate to ideas about exercise, such as “I enjoy exercise” and “It costs too much to exercise,” which are rated on a 4-point agreement scale. Physical activity participation was also measured with the Incidental and Planned Exercise Questionnaire (23) and the total physical activity (h/wk) recorded.

Adverse events, adherence, and ongoing participation.— Class attendance was recorded by the yoga instructor at each session. Adverse events associated with yoga participation were recorded in the follow-up questionnaire after intervention completion. To measure the sustainability and long-term uptake of the program, 4 months after completion of the yoga classes, all participants were surveyed to determine ongoing yoga class participation.

Data Analysis
All analyses used an intention-to-treat approach. Data were analyzed using SPSS and Stata statistical software. Because the data for some variables (standing balance and Short FES-I) were not normally distributed, we evaluated the difference between study groups using the change scores from baseline to follow-up for the continuously scored primary and secondary outcome measures. Analyses used the linear regression approach to analysis of covariance with group as the independent variable, change score on the outcome measures as the dependent variable, baseline score on the outcome measure as a covariate, and statistical significance set at \( p < .05 \).

Results
Figure 1 shows the flow of participants through the study. The sample consisted of 54 participants (11 men and 43 women) aged 59–87 years, mean age 68 years (SD 7.1). The participants in the two groups had similar baseline characteristics (included in Table 2).
reported minor musculoskeletal pains including low back pain and pain in the shoulder, wrist, knee, and Achilles tendon, which resolved after a short time and did not interfere with ongoing yoga participation. An additional participant experienced an exacerbation of existing low back pain and ceased participation in the yoga program after completing six classes.

Effect of Intervention on Outcome Measures

The mean time between baseline and follow-up assessments was similar between the intervention and control groups: 116.2 (SD 14.6) versus 116.2 (17.4) days. Table 3 shows the baseline and follow-up scores for the outcome measures. A significant improvement in the intervention group compared with the control group was found for the primary outcome—standing balance (mean difference = 1.52 seconds, 95% CI 0.10–2.96, \( p = .04 \)). Significant improvements were also found for the secondary outcome measures, where at follow-up the intervention group performed significantly faster in the sit-to-stand test (−3.43 seconds, 95% CI −5.23 to −1.64, \( p < .001 \)) and timed 4-m walk (−0.50 seconds, 95% CI −0.72 to −0.28, \( p < .001 \)) and could complete the one-legged stand with eyes closed for longer (1.93 seconds, 95% CI 0.40–3.46, \( p = .02 \)). There were no between-group differences at follow-up in falls self-efficacy, measured by the Short FES-I (\( p = .67 \)).

Intervention Enjoyment/Satisfaction

At the follow-up assessment, intervention participants rated their enjoyment and satisfaction with the yoga intervention. Twenty-two (81%) people reported enjoying the program and 19 people (70%) felt confident they would continue to take part in yoga classes after study conclusion. The most commonly cited potential barriers to continued participation in the yoga classes were lack of time (six responses), cost (four responses), and lack of motivation (two responses).

The study participants were surveyed about ongoing yoga participation 4 months after intervention completion. Forty-four of the 54 participants (81%) reported intending to continue to take part in yoga classes after study conclusion. The most commonly cited barriers to ongoing participation included lack of time (seven responses), health problems (seven responses), and inconvenience of class times (five responses).

**Discussion**

A 12-week program of twice-weekly Iyengar yoga significantly improved balance and mobility in community-dwelling older people. These results are in accordance with previous research that found Iyengar yoga significantly improved balance (9) and silver yoga significantly improved gait speed and sit-to-stand ability (24) in older

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**Table 2. Baseline Characteristics of Participants in Intervention and Control Groups**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention (n = 27)</th>
<th>Control (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>67.7 (7.2)</td>
<td>67.3 (6.1)</td>
</tr>
<tr>
<td>Female gender: n (%)</td>
<td>22 (82)</td>
<td>21 (78)</td>
</tr>
<tr>
<td>English spoken at home: n (%)</td>
<td>23 (85)</td>
<td>23 (85)</td>
</tr>
<tr>
<td>Accommodation type: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>House</td>
<td>18 (67)</td>
<td>22 (82)</td>
</tr>
<tr>
<td>Unit/independent living unit</td>
<td>9 (33)</td>
<td>5 (19)</td>
</tr>
<tr>
<td>Lives alone: n (%)</td>
<td>8 (30)</td>
<td>13 (48)</td>
</tr>
<tr>
<td>Short portable mental status</td>
<td>9.5/10 (0.8)</td>
<td>9.7/10 (0.5)</td>
</tr>
<tr>
<td>Fallen in the past 12 mo: n (%)</td>
<td>10 (37)</td>
<td>8 (30)</td>
</tr>
<tr>
<td>Total medications</td>
<td>4.2 (2.1)</td>
<td>4.0 (2.5)</td>
</tr>
<tr>
<td>Medical conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>2 (7)</td>
<td>3 (11)</td>
</tr>
<tr>
<td>Stroke</td>
<td>2 (7)</td>
<td>0</td>
</tr>
<tr>
<td>Hypertension</td>
<td>7 (26)</td>
<td>7 (26)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>13 (48)</td>
<td>12 (44)</td>
</tr>
<tr>
<td>SF12v2: physical composite score</td>
<td>50.8 (6.3)</td>
<td>48.5 (6.8)</td>
</tr>
<tr>
<td>SF12v2: mental composite score</td>
<td>51.7 (8.6)</td>
<td>51.1 (6.2)</td>
</tr>
<tr>
<td>IPEQ total physical activity (h/wk)</td>
<td>34.8 (16.1)</td>
<td>33.5 (20.2)</td>
</tr>
<tr>
<td>Self-rated balance fair/poor: n (%)</td>
<td>7 (26)</td>
<td>11 (41)</td>
</tr>
<tr>
<td>Self-rated fear of falling ≥ moderate:</td>
<td>12 (44)</td>
<td>13 (48)</td>
</tr>
<tr>
<td>Exercise benefits/barriers scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived barriers subscale</td>
<td>27.3 (5.7)</td>
<td>27.8 (7.2)</td>
</tr>
<tr>
<td>Perceived benefits subscale</td>
<td>95.7 (12.7)</td>
<td>94.7 (12.2)</td>
</tr>
</tbody>
</table>

*Notes: Means (SD) unless stated otherwise. IPEQ = Incidental and Planned Exercise Questionnaire.*

Eighteen of the 54 participants (33%) had experienced at least one fall in the past year, 18 out of 54 (33%) rated their balance as fair or poor, and 23 out of 54 (43%) rated their general health as very good or excellent.

**Intervention Adherence and Participant Retention**

The number of classes attended ranged from 6 to 24 with a mean class attendance of 20 out of 24 classes offered (SD 6.32, 83% mean attendance). Nineteen people (70%) attended at least 20 of the classes. Eight people (30%) attended all 24 classes. The reasons given for nonattendance included going away on holidays (n = 4), illness (n = 3) and exacerbation of a medical problem related to yoga participation (n = 2), lack of time (n = 1), and finding the yoga too difficult (n = 1).

Two participants were unable to attend for the follow-up physical assessment (both from the control group) and one of these people also did not complete the follow-up questionnaire. This resulted in completion rates of 100% for the intervention group and 93% and 96% for the control group in the physical measures and questionnaire, respectively. The reasons given for noncompletion are included in Figure 1.

**Adverse Events**

There were no serious adverse events reported during the conduct of the classes; however, five participants reported minor musculoskeletal pains including low back pain and pain in the shoulder, wrist, knee, and Achilles tendon, which resolved after a short time and did not interfere with ongoing yoga participation. An additional participant experienced an exacerbation of existing low back pain and ceased participation in the yoga program after completing six classes.
Table 3. Mean (SD) of Groups at Baseline and Follow-up, Mean (SD, 95% CI) Difference Within Each Group, and Mean (95% CI) Difference Between Groups

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention (n = 27)</th>
<th>Control (n = 27)</th>
<th>Follow-up Intervention (n = 27)</th>
<th>Control (n = 25)</th>
<th>Difference Within Groups (follow-up minus baseline)</th>
<th>Difference Between Groups* (follow-up minus baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing balance (s)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>0.86 (2.67, −0.20 to 1.91)</td>
<td>−0.67 (2.44, −1.68 to 0.33)</td>
</tr>
<tr>
<td>Sit to stand (s)</td>
<td>39.9 ± 2.8</td>
<td>38.9 ± 3.1</td>
<td>39.7 ± 0.99</td>
<td>38.2 ± 5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-meter walk time (s)</td>
<td>10.1 ± 3.8</td>
<td>11.9 ± 5.2</td>
<td>8.8 ± 2.6</td>
<td>13.6 ± 6.1</td>
<td>−1.37 (2.59, −2.40 to −0.35)</td>
<td>1.62 (3.95, −0.01 to 3.25)</td>
</tr>
<tr>
<td>Single-leg stance eyes closed (s)</td>
<td>2.6 ± 0.6</td>
<td>2.5 ± 0.6</td>
<td>2.4 ± 0.4</td>
<td>2.8 ± 0.6</td>
<td>−0.24 (0.38, −0.39 to −0.10)</td>
<td>0.31 (0.49, 0.11 to 0.51)</td>
</tr>
<tr>
<td>Short FES-total score (out of 28)</td>
<td>9.4 ± 2.3</td>
<td>10.0 ± 3.3</td>
<td>9.8 ± 1.4</td>
<td>10.9 ± 3.2</td>
<td>0.37 (4.58, −1.44 to 2.18)</td>
<td>1.57 (2.83, −0.72 to 1.57)</td>
</tr>
</tbody>
</table>

Note: Short FES-I = Short Falls Efficacy Scale-International.
*Baseline score included as a covariate.

The most significant improvements in test performance were seen for the timed 4-m walk and sit-to-stand test, which were similar to previous study results (26). For example, the critical level of performance for discriminating between multiple fallers (two or more falls during 1 year) and nonmultiple fallers (one or no falls during 1 year) and nonmultiple fallers was set at 8.8 seconds. People unable to achieve this test speed had twice the risk of multiple falls in the following year than those who were able to achieve this performance (Relative Risk = 2.0, 95% CI 1.3–3.0). In the present study, the control group mean was slower than this cutoff (9.6 seconds, SD 2.6). Furthermore, the proportion of people able to complete the sit-to-stand test was lower in the yoga group compared with the control group (96% vs 95%, respectively, p = .001). The improvement in sit-to-stand ability indicates improved functional balance and lower limb strength after the yoga intervention with a clinically important effect size (0.5) for the primary outcome measure.

The results of this study provide preliminary evidence of the possible benefit of this yoga program for reducing the risk of falls in older people. Nonetheless, the results of this study provide encouraging preliminary evidence of the possible benefit of this yoga program for reducing the risk of falls in older people. Although regression to the mean could have been a factor in the improvement in balance and mobility, the improvement in intervention group performance was associated with small between-group differences reported in this study (12, 25). The small between-group differences in intervention group performance and control group performance were likely to be clinically important. Larger effect sizes during the intervention and shorter follow-up periods are needed to detect larger between-group differences, because 19 out of 25 (76%) control participants and 24 out of 27 (89%) yoga group participants attained the highest score possible on the balance measure, indicating that the standing balance measure may not be challenging enough for people unable to achieve this level of performance.

The sizes of these effects ranging from small (0.5) for the primary outcome measure to large (1.0) for the sit-to-stand test, which were similar to previous study results (26). For example, the critical level of performance for discriminating between multiple fallers (two or more falls during 1 year) and nonmultiple fallers (one or no falls during 1 year) and nonmultiple fallers was set at 8.8 seconds. People unable to achieve this test speed had twice the risk of multiple falls in the following year than those who were able to achieve this performance (Relative Risk = 2.0, 95% CI 1.3–3.0). In the present study, the control group mean was slower than this cutoff (9.6 seconds, SD 2.6). Furthermore, the proportion of people able to complete the sit-to-stand test was lower in the yoga group compared with the control group (96% vs 95%, respectively, p = .001). The improvement in sit-to-stand ability indicates improved functional balance and lower limb strength after the yoga intervention with a clinically important effect size (0.5) for the primary outcome measure.

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The smallest between-group differences in intervention group performance and control group performance were likely to be clinically important. Larger effect sizes during the intervention and shorter follow-up periods are needed to detect larger between-group differences, because 19 out of 25 (76%) control participants and 24 out of 27 (89%) yoga group participants attained the highest score possible on the balance measure, indicating that the standing balance measure may not be challenging enough for people unable to achieve this level of performance.
The yoga program used in this study focused on standing balance postures that were adapted to suit the needs and limitations of older people. These results support the feasibility of yoga for improving balance and mobility in community-dwelling older people. Although there were minor, short-term musculoskeletal pains experienced by a small number of people, the benefits of the program appear to outweigh the risks.

The feasibility of the yoga program was also demonstrated by the ease of recruitment in a short period of time from a small geographical area and very good attendance at the classes, with participants attending an average of 83% of available classes. This demonstrates that the yoga program was appropriate to the abilities of the older participants and also enjoyable, with participants reporting perceived benefits as a result of their attendance. Adherence was promoted by cohesive group dynamics, gradual increases in program intensity, and strong instructor leadership. The feasibility and enjoyment of yoga among older people should not be underestimated. Poor rates of uptake and adherence to exercise for fall prevention among older people clearly demonstrate the need for evidence-based programs that are also popular choices among older people. Much greater participation is required to have a substantial public health impact.

In addition to its low risk of bias, a key strength of this study is its written protocol that could easily be implemented elsewhere by an Iyengar-certified instructor. The yoga program used in this study is likely to be easily implemented into “real world” conditions as it was utilized by a trained yoga teacher within an established yoga studio. Furthermore, the participants were drawn from a general community setting and varied in previous exercise history, and falls and medical histories, demonstrating the ability of yoga program modification to suit the needs of older people with a range of abilities and comorbidities. Additionally, the outcome measures included are validated measures of fall risk that are commonly used to assess balance and mobility in older people. They were purposefully chosen to understand the potential of yoga to reduce fall risk by addressing associated measures of risk.

We acknowledge that this study has several limitations. Firstly, the small sample size makes it difficult to draw conclusions about wider implications of the results. However, this was designed to be a pilot trial to assess the feasibility of the yoga program for older people and to assess the effect on balance and mobility in preparation for a planned large trial of yoga with rate of falls as the primary outcome. The study has achieved these aims.

The use of a social-contact control group may have reduced the uncertainty about observed balance and mobility improvements simply being the result of general increases in physical activity, resulting from travel to and from the yoga classes each week. We believe this explanation for the observed improvements in balance and mobility to be unlikely in light of evidence around the importance of specific exercise that challenges balance rather than general increased physical activity for significantly improving balance and reducing fall risk (3).

The study participants were required to provide their own transport to the study site, which may have excluded participation by less mobile older people, therefore translation of the results to frailter older people is uncertain. Furthermore, because the yoga classes were offered to study participants free of charge, the high rates of adherence may have been biased by the free nature of the classes, because cost is a commonly cited barrier to exercise participation (27).

Because Iyengar-style yoga is generally taught by certified instructors, accessibility to this type of program may be limited in some areas and we would recommend that it is taught by instructors experienced with the provision of yoga to older people. Finally, the intervention was limited to only 12 weeks of yoga, which we acknowledge to be less than the recommended 50 or more hours of balance challenging exercise that is recommended in clinical guidelines (3) and which is likely to reduce the risk of falls in older people. Future studies should include a longer duration intervention.

**Conclusion**

These results demonstrate the beneficial effects of Iyengar yoga on balance and mobility in older people. High rates of intervention adherence also demonstrate the feasibility and participant enjoyment of the yoga program. Further research is planned to evaluate the effect of yoga on falls in older people. If shown to be effective in preventing falls, Iyengar yoga could be promoted alongside other exercise-based fall prevention strategies and would increase the exercise choices available to older adults. Iyengar yoga shows promise as a fall prevention intervention for older people.

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**Conflict of Interest**

The authors declare that there are no competing interests.

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