



Yoga's effect on falls in rural, older adults



Irene Hamrick^a, Paul Mross^{b,*}, Nate Christopher^{b,c}, Paul D. Smith^a

^a Department of Family and Community Medicine, University of Wisconsin-Madison, 1100 Delaplaine Ct. Mailcode 326, Madison, WI 53715, United States

^b Upland Hills Health, 800 Compassion Way, PO Box 800, Dodgeville, WI 53533, United States

^c Southwest Health, 1400 East side Road, Platteville, WI, 53818, United States

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ABSTRACT

Background: Unintentional falls affect 30% of people over age 65 years. Yoga has been shown to improve balance. We designed this study to examine if yoga reduces falls.

Methods: We conducted 16 sessions of Hatha yoga over 8 weeks. Participants were randomly assigned to practice 10 min of yoga daily at home in addition to 5-min relaxation exercises or relaxation exercises only (control group).

Results: Of the 38 participants completing the intervention, 15 participants reported a total of 27 falls in the 6-months before the study, compared to 13 participants sustaining 14 falls in the 6 months from the start of the study ($p < 0.047$), without difference between yoga home-exercise and home relaxation-only groups.

Compared to baseline scores, all participants improved on the Berg Balance Scale (53–54 out of 56, $p = 0.002$), the Functional Gait Assessment (22.9–25.8 out of 30 points, $p < 0.001$), and the Dynamic Gait Index (20.6–22.4 out of 24 points, $p < 0.001$). Right leg stand time improved from a mean of 13.3 s to 17.1 s ($p = 0.020$) and standing forward reach distance from 26.0 cm to 29.6 cm ($p < 0.001$). Without difference between groups.

Confidence, with the Activities-specific Balance Confidence Scale, increased in the yoga home-exercise group (88%–93%, $p = 0.037$) compared to 90% unchanged from pre-intervention in the home relaxation-only group.

Conclusion: Yoga classes reduce self-reported falls and improve balance measures. The addition of home yoga exercises did not enhance benefit over relaxation exercise only.

1. Background

Unintentional falls are a common occurrence among older adults, affecting approximately 30% of persons over 65 years of age and 50% of those over 80 years annually.¹ Falls are the leading cause of injury death in adults over the age of 65 years and the most common cause of nonfatal injuries and hospital admissions for trauma.² In 2010, 2.3 million nonfatal fall injuries among older adults were treated in emergency departments and more than 662,000 of these patients were hospitalized.³ In the same year, the direct medical costs of falls, adjusted for inflation, were \$30 billion.³ As the demographics of the US population shift to an increased number of elders, this problem is likely to get bigger and more expensive.

Yoga has been shown to have a wide variety of health benefits including: 1) lowered blood glucose for people with type 2 diabetes; 2) improved symptoms of depression and anxiety; 3) decreased pain; 4) improved sleep disturbance; and 5) improved quality of life.⁴ A systematic review and meta-analysis of yoga in 6 trials of 307 participants

60 years and older showed improved balance and mobility, and called for further research to determine whether yoga prevents falls.⁵ A study of older adults showed yoga to be as effective as Tai Chi in improving postural stability.⁶ The most recent Cochrane and Centers for Disease Control (CDC) reviews reported a variety of exercise programs that reduce the risk of falls,^{7,8} including fairly strong evidence of a reduction in rate of falls with Tai Chi (RR 0.72, 95% CI 0.52–1.00) based on 5 randomized trials with 1563 participants. However, a diligent search of the literature only found one very small randomized trial of a yoga program that reported a non-significant fall reduction.⁹

Only 2 recent studies addressed yoga practice in rural areas. One was our prior feasibility study,¹⁰ and one yoga therapy workforce survey found that yoga therapists were less likely to work in rural settings, possibly contributing to the underutilization of yoga in underserved populations.¹¹ We conducted a needs assessment survey to assess the interest and acceptance for yoga in rural areas and consulted with community members for advice. We then conducted a pilot study of a yoga program for falls prevention in rural older adults to assess the

* Corresponding author.

E-mail addresses: Irene.Hamrick@fammed.wisc.edu (I. Hamrick), mr_oss@hotmail.com (P. Mross), nate34christopher@hotmail.com (N. Christopher), Paul.Smith@fammed.wisc.edu (P.D. Smith).

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impact of yoga on falls frequency or fall rates. We report the results of this project in this article.

2. Methods

2.1. Needs assessment survey

We conducted a needs assessment with a convenience sample of adults age 18 and older living in the communities surrounding the yoga class sites from August to September, 2014. We used a 16-item questionnaire designed to assess basic demographics, prior yoga experience, interest in and feasibility of conducting yoga classes in rural areas and number of falls. Interest was assessed using Likert-type questions with responses ranging from 1: not very likely to 10: very likely. The survey was distributed and collected at a variety of public events (e.g., Kiwanis Club) and was available as a link on a website for the Aging and Disability Resource Centers (ADRCs) that serve residents of the 4-county area involved in this study.¹²

2.2. Community advisory board

We convened a 10-member advisory board to guide us in the development and design of the intervention. Three individuals were selected because of their previous experience with yoga, 3 represented the ADRCs and 4 were community members interested in advancing a yoga research project. The advisory board reviewed the needs assessment results and some members were participants in the first set of yoga classes to provide feedback on the process of the study. Feedback from the advisory board and survey showed that a twice-weekly yoga class was preferred over a once weekly class.

2.3. Intervention study

2.3.1. Intervention design

To assess the impact of yoga on falls frequency or fall rates, we conducted a pilot and feasibility study with a convenience sample of community dwelling older adults between October 2014 and October 2015. To assess the value of additional yoga home poses, we randomized the participants into a yoga home exercise plus relaxation group (hereafter called the “home exercise group”) and a home relaxation-only group (hereafter called the “home relaxation-only group”).

2.3.2. Theoretical basis for yoga program

A thorough search of the literature for available evidence related to strengthening and improving balance for fall prevention as it relates to yoga was done for a prior feasibility study.¹³ Reduced lower extremity strength in general¹⁴ and specifically ankle dorsiflexion and hip extensor forces have been associated with increased frequency of falls.¹⁴ Gluteus medius muscles seem to be especially important for the maintenance and recovery of balance during a balance perturbation (e.g., slip, trip, bumping into an object).^{15–17} Several researchers have suggested that hip abductors should be targeted for strengthening in falls reduction exercise programs.^{18–20} Based on this evidence, we chose Chair (Utkatasana), Tree (Vrksasana) and High or Crescent Lunge (Alanasana) because of the strengthening effect on ankle dorsiflexion in addition to psoas, gastrocnemius, tibialis anterior and soleus muscles.²¹ Chair and Tree can strengthen hip abductors, including gluteus medius.²² Chair, Tree and High or Crescent Lunge were the core of the twice weekly classes and these 3 poses were chosen for the home exercise group. The remaining poses included in the intervention (see Table 1) were chosen because of their challenge to core, strength and flexibility.

The basic structure of the intervention included traditional yoga elements of a typical class, including physical postures (*asana*), body awareness, breath techniques (*pranayama*) and relaxation (meditation). Because of participant concern with getting up from the floor and

Table 1
Complete list of poses (*Asanas*).

Yoga Poses (<i>Asanas</i>) both sides if required
Seated:
1. Foot openers (<i>Mulabandhasana</i>)
2. Arms over head (<i>Urdhva Hastasana</i>)
3. Crescent side stretch (<i>Indudalasana</i>)
4. Seated Cat/Cow (<i>Marjaryasana, Bitilasana</i>)
5. Knee to Chest (<i>pawanmuktasana</i>) w/ankle rotation
6. Leg Stretch (<i>Utthita Hasta Padangusthasana</i>)
7. Stand/Sit transition (<i>Chair (Utkatasana) as guide</i>)
8. Child's (<i>Balāsana</i>)
Standing:
9. Mountain and Equal Standing (<i>Tadasana, Samasthiti</i>)
10. Arms over head (<i>Urdhva Hastasana</i>)
11. Forward Fold (<i>Uttanasana</i>)
12. Down Dog with Chair (<i>Adho Mukha Svanasana</i>)
13. Crescent side stretch (<i>Indudalasana</i>)
14. Standing twist (<i>Katichakrasana variation</i>)
15. Chair (<i>Utkatasana</i>)
16. Cat Cow (<i>Marjaryasana, Bitilasana</i>)
17. Eagle Arms (<i>Garundasana</i>)
18. Balancing Knee lift (<i>Utthita Hasta Padangusthasana variation</i>)
19. High Lunge (<i>Alanasana</i>)
20. Tree Variations (<i>Vrksasana</i>)
21. Knee dancer sequence- Balancing Knee lift to Dancer (<i>Natarajasana</i>) to High lunge (<i>Alanasana</i>)
22. High lunge (<i>Alanasana</i>) alternating between straight and bent knee
23. Tandem walk
24. Warrior II (<i>Virabhadrasana II</i>)
25. Triangle (<i>Utthita Trikonasana</i>)
26. Reverse Warrior (<i>Viparita Virabhadrasana</i>)
27. Wide Leg Forward Fold with chair (<i>Prasarita Padottanasana</i>)

unwillingness to participate if floor poses were included, we chose to only include chair and standing poses. Participants were monitored for safety and ability to advance to more challenging poses by the yoga instructors and by researchers conducting the fidelity checks. To address the physical plateau effect in specific poses, individuals deemed able (by the yoga instructors and researchers) were encouraged to incorporate more challenging modifications of specific poses in both the classroom and for the home-exercise group.

2.3.3. Intervention and evaluation development

Intervention and evaluation methods were based on a previous development project¹³ and modified based on the experience and findings from that project. Input about the proposed revised intervention and evaluation was solicited from the Advisory Committee prior to the classes starting. The 10 committee members (3 had prior yoga experience) who participated in the first set of classes suggested minor modifications including increasing the amount of time for the home practice, wording of the questionnaires and future recruitment ideas.

2.3.4. Study setting and population

We partnered with ADRCs of 4 rural counties (total population 130,078) in Southwest Wisconsin in 2014 to recruit community-living older adults for the study. Recruitment methods included a printed flyer, poster, ADRC electronic and printed newsletters, and verbal announcements at public events.

2.3.4.1. Inclusion criteria. Age 60 years and older, able to walk 150 feet without assistive devices such as a cane or walker. This is a commonly used definition of an “independent ambulator” according to the Functional Independence Measure.²³ Cognitively intact as evidenced by correct answers to the Memory Impairment Screen.²⁴ Able to provide informed consent.

2.3.4.2. Exclusion criteria. Pelvic or lower extremity injury in the previous 6 months that required temporary use of an assistive device,

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