



Development of a falls reduction yoga program for older adults—A pilot study



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ABSTRACT

Objectives: Work with local rural organizations to develop an evidence-based hatha yoga program intended to improve core strength and balance to reduce falls risk. Feasibility determined by successful recruiting, intervention and evaluation of participants and acceptable frequency of adverse events.

Design: Single-arm pilot study.

Setting: Rural Wisconsin town of 4200 people.

Intervention: Eight week yoga program with weekly group classes and home yoga practice three times per week.

Main outcome measures: The primary outcomes were (1) ability to enroll at least 20 participants, (2) participant completion of intervention and post-intervention evaluation, and (3) adverse event description and frequency.

Results: A convenience sample of 20 adults over age 59 was enrolled and started the program with one drop out. Participants attended a mean of 7.1 (SD 1.47) of the 8 classes and a total of 141 out of 160 (88.1%) classes. Nineteen (95%) completed follow up evaluation. Participants reported 4 falls in the month before the intervention and 1 fall the month before the post-intervention evaluation ($p=0.34$). No other serious adverse events occurred.

Conclusions: This project suggests an evidence-based yoga program designed to improve core strength and balance is feasible and acceptable to participants. Future research will include a randomized trial to assess impact on falls risk.

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1. Introduction

Unintentional falls are common for older adults, affecting up to 1 in 3 adults over age 65 each year.^{1,2} Falls are the leading cause of injury death in adults over the age of 64 and the most common cause of nonfatal injuries and hospital admissions for trauma.³ 2.8 million nonfatal fall injuries among older adults were treated in emergency departments in 2014 and more than 800,000 of these patients were hospitalized.³ Also in 2013, the direct medical costs of falls, adjusted for inflation, was \$31 billion.³ As the demographics of the US population shifts to an increase in the number of older adults, this problem is likely to get bigger and more expensive.

Yoga is often translated as “to yoke or to join”, thus can be defined as the effort to restore harmony within the mind-body complex.⁴ For this project, we are referring to yoga as a practice

that includes physical postures (*asana*), regulation of the breath (*pranayama*) and relaxation (meditation). Yoga has been shown to have a wide variety of health benefits including (1) lowering blood glucose for people with type 2 diabetes,⁵ (2) improving symptoms of depression and anxiety,^{6,7} (3) decreasing pain,⁸ and (4) improving sleep disturbance.⁸ The most recent Cochrane review, “Interventions for Preventing Falls in Older People Living in the Community”⁹ reports a variety of exercise programs that reduce falls risk. T'ai Chi has good evidence showing a reduction in rate of falls (RR 0.72, 95% CI 0.52–1.00) in 5 randomized trials with 1563 participants. There is a growing body of evidence that yoga can improve balance and gait^{10–15} suggesting it may decrease falls risk, although a recent survey of women aged 59–64 found no association between the practice of yoga and meditation, and falls frequency.¹⁶ Yet, with a diligent search of the literature, we found only one very small randomized trial of a yoga program that reported a non-significant reduction in falls.¹⁷

We conducted a pilot and feasibility project to develop a well-defined, evidence-based hatha yoga program including a classroom

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and home practice that would be acceptable to older adults living in a rural community. Yoga poses were chosen specifically to increase core strength and balance in an effort to ultimately reduce the frequency of falls. Our pre-defined objectives were to (1) develop working relationships with community organizations to assist with recruiting and execution of the project, (2) recruit at least 20 participants, (3) develop a yoga program that was acceptable to participants measured by drop-out rates, (4) develop and test the feasibility of evaluation methods measured by evaluation completion rates, and (5) assess safety of the intervention with careful tracking of adverse events.

1.1. Theoretical basis for yoga program

We did a thorough search of the literature for available evidence related to strengthening and improving balance for falls risk reduction as it relates to yoga. Reduced lower extremity strength in general¹⁸ and specifically ankle dorsiflexion and hip extensor forces have been associated with increased frequency of falls.¹⁹ 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).^{20–22} Several researchers have suggested that hip abductors should be targeted for strengthening in falls risk reduction exercise programs.^{23–25} 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.²⁶ Chair and tree can strengthen hip abductors including gluteus medius.²⁷ Chair, tree and high or crescent lunge were the focus of weekly classes and the 3 poses used for the home yoga practice (Table 1 and Photos 1–3).

Yoga fundamentals such as awareness (*manomaya kosha* or *mind*) and breathing (*pranamaya kosha* or energy) may also play a role in falls risk, however the evidence is limited. Brown et al., suggest that complementary and alternative therapies (such as yoga) that include a mindfulness element are more therapeutic than traditional exercise.^{28,29} The mind-body awareness may also increase proprioception, which influences falls risk.^{30,31} Awareness not only has postural benefits, but promotes a mindfulness that brings about a state of calm and focus.

2. Methods

This single-arm pilot and feasibility study, with a convenience sample of community dwelling older adults, was conducted between October 2013–May 2014 at a 25-bed community hospital in a rural Wisconsin town of 4200 people. The hospital provides administrative support and space for a variety of community programs such as child birth classes, Narcotics Anonymous and bingo for older adults. All participant visits and yoga classes occurred in various meeting rooms at the hospital.

We developed working relationships with key staff at the hospital and the Aging and Disability Resource Center of Iowa County with initial face-to-face meetings followed by regular telephone and email contact. Community partners provided consultation about (1) recruitment plan development, (2) evaluation methods likely to be acceptable to participants, and (3) project logistics such as time and location of yoga classes.

2.1. Participants

Participants were recruited using a combination of printed flyers or posters, Facebook posting, presentations and information booths at public events and personal invitations. One author (PM) worked with local community organizations and hospital staff to advertise the yoga program and invite potential participants to contact the



Photo 1. Chair pose.

researchers by telephone or email. Participants that met eligibility criteria were invited to attend informational meetings.

Inclusion criteria included (1) over age 59, (2) able to walk 150 feet without assistive devices such as a cane or walker (defined as an “independent ambulator” according to the Functional Independence Measure)³²; (3) able to provide informed consent based on a negative Mini-Cog dementia screen, and (4) anticipated attendance at all 8 classes. Exclusion criteria included (1) pelvic or lower extremity injury in the previous 6 months that required temporary use of an assistive device, including crutches, for more than 7 days, (2) pelvic or lower extremity orthopedic surgery in the previous 12 months, (3) cardiac or other medical condition with previous physician instructions to avoid low intensity exercise, (4) neurologic condition that impaired strength or balance including herniated lumbar disc with nerve root compression, previous stroke with residual lower extremity weakness, Parkinson’s Disease, Multiple Sclerosis and muscular dystrophy, (5) terminal condition with rapid progression of disease and not expected to live 6 months or more, (6) inability to provide informed consent, and (7) practiced any form of yoga at home or in a classroom setting in the previous 6 months.

Research was approved by the University of Wisconsin Health Sciences Institutional Review Board. Written informed consent was obtained from all participants. Enrollment occurred at group

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