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Review Article

Improving Leisure Constraints in Older Adults with a Fear of Falling through Hatha Yoga: an Acceptability and Feasibility Study -

Marieke Van Puymbroeck^{1*}, Arlene Schmid², Alysha Walter² and Brent Hawkins²

¹*Department of Parks, Recreation and Tourism Management, Clemson University, 282B Lehotsky Hall, Clemson, SC 29634-0735, USA*

²*Department of Occupational Therapy, Colorado State University, Fort Collins, CO 80523, USA*

***Address for Correspondence:** Van Puymbroeck M, Department of Occupational Therapy, Colorado State University, Fort Collins, CO 80523, USA, Tel: +970 491-7562; E-Mail: arlene.schmid@colostate.edu

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ABSTRACT

Falls are the leading cause of fatal and nonfatal injuries in the older adult population. After a fall, many individuals become fearful that they will fall, and reduce their participation in activities. This reduction in activities, called constraints, cascades into poorer physical, emotional, and cognitive health. In this study, older adults participated in a Hatha yoga intervention led by a yoga therapist, which was designed to determine if this was feasible and acceptable in older adults, and to determine if yoga helped to reduce leisure constraints. Leisure constraints were reduced over the 12-week period, and more dramatically for individuals who had fallen in the past six-months, compared to those who had not fallen in the past six-months. The data reported here also support that the intervention was feasible and acceptable. Implications for future research and practice are included.

Keywords: Yoga; Recreational therapy; Fear of falling; Falls; Older adults; Rehabilitation; Treatment interventions

INTRODUCTION

One in four older adults fall each year [1] and every year, over 2.8 million older adults are treated in an emergency room for injuries resulting from a fall [2]. The leading cause of fatal and non-fatal injuries in older adults is falls [3], and approximately 20% of individuals who fall experience moderate to severe injuries, which may lead to decreased independence [4]. Costs from falls are exorbitant, as inflation-adjusted costs of falls in 2010 was approximately \$31 billion [5]. An additional personal cost of sustaining a fall is increased risk of fear of falling [6].

Fear of Falling (FoF) has been defined as a “disabling symptom of impaired mobility among frail older people that is significantly associated with depression, diminished performance in gait, and restricted instrumental activities of daily living” [7]. FoF is one of the most prevalent fears experienced by older adults [8] in fact; researchers have found FoF in 29%-92% of older adults recently sustaining a fall and in 12%-65% of older adults without a recent fall [9-11]. Delbaere, [6] discussed the ‘vicious cycle’ of fear of falling, i.e. those who demonstrate FoF are likely to exhibit decreased engagement in their environment, leading to further decreases in strength and balance, thus placing the individual at greater risk for falls and further development of FoF.

FoF likely constrains individuals from full and active participation in life activities, including leisure activities [12]. Importantly, older adults who experience reduced participation in life activities tend to experience worse mental health and cognition [13,14]. Leisure constraints in the older adult population may lead to isolation and a myriad of health related conditions. For example, some previously identified health conditions which increase leisure constraints for older adults include bending, balance, walking, visual and auditory problems, and general health limitations, [15,16] the primary response to these constraints was activity cessation. Involvement in leisure activities supports the components of successful aging, with reduced risk of disease, high mental and physical functioning, and active engagement with life [16].

Jackson, [17] suggested that leisure constraints are divided into three types: intrapersonal, interpersonal, and structural. Intrapersonal constraints are psychological conditions internal to the individual, such as personality, mood, and attitudes. Interpersonal constraints occur due to some aspects of an individual’s interaction with others. Structural constraints are considered external to the individual and are often related to the environment that the individual exists within, including costs and lack of opportunities. Crawford and Godbey, [18] hypothesized that intrapersonal constraints are related to motivations, and thus may pose the strongest barriers to participation in leisure activities. FoF would be considered an intrapersonal constraint since

fear is a powerful psychological condition that shapes (or limits) behavior. We posit that FoF may also increase leisure constraints in this population. A potential way to address both FoF and leisure constraints is through the use of Hatha yoga [19-21].

Hatha yoga is an ancient Indian practice that has been demonstrated to enhance the physical, mental, intellectual and spiritual well-being of those who adopt it as part of their physical activity. Hatha yoga uses a combination of asanas (postures) and pranayamas (breathing), and meditation (dhyana) to improve both physiological and psychological well-being. In fact, a national survey in the United States reported that yoga participants experienced better health and felt that yoga minimized symptoms in health conditions [22]. There is limited work that demonstrates that yoga may be an effective modality to manage FoF [20], but the evidence regarding the ability of yoga to improve other fall risk factors is fairly strong. For example, yoga has been shown to improve: balance; muscle strength; endurance; flexibility; mobility; physical self-awareness; well-being; and the ability to stand quicker, move faster, and reach longer [23-26]. Yoga has been shown to be feasible with older adults in residential care as a potential intervention to improve balance [27] and with older adults living in rural [28] and urban areas [29] Our work has demonstrated improvements in balance and FoF among stroke survivors following a yoga intervention [23], while a recent Cochrane review reported that FoF may be reduced immediately following an exercise intervention, it may be difficult to prolong these effects [30].

In sum, falling and FoF in older adults are serious public health concerns as research has demonstrated that as individuals become increasingly fearful of falling, they engage in fewer activities, and likely have higher constraints to leisure participation. However, these connections have not been explored in the extant rehabilitation and yoga therapy literature. Therefore, our objectives were to determine if a 12-week yoga program, designed to reduce falls and improve FoF for older adults, was acceptable and feasible in this population, and if there would be subsequent changes in perceived leisure constraints.

METHODS

Design

This is a secondary data analysis of data derived from a yoga study focused on improving fear of falling in older adults [31].

Participants

The study was conducted at a residential retirement community in a university town in the central United States. The recruitment process began with placing invitation letters and study information in each individual resident’s mailbox, and the principal investigator

held an informational session to discuss the study and what the expectations would be for those who signed up for the study. The project coordinator or the principal investigator screened all interested residents for eligibility. The IRB was approved by the Institutional Review Board, and all participants signed an informed consent prior.

To be eligible participants had to be at least 60 years old, willing and able to commit to a twice weekly, 12-week Hatha yoga program, and endorsed a fear of falling in the past 12 months (answering “yes” to the question “in general, are you afraid you might fall?” with qualifiers of “at home,” “in bad weather,” “in good weather,” or “in a crowd”). This modified single question has been found to demonstrate high concurrent validity and test-retest reliability with other measures of FoF [20]. Potential subjects were excluded if they met one of the following conditions: (a) exercised more than five times per week; (b) possesses any clinical condition that contraindicates physical activity on the Physical Activity Readiness Questionnaire [32,33] (PAR-Q); and (c) currently enrolled in other clinical trials related to balance or exercise. Fifteen older adults (mean age = 78) met the eligibility criteria and signed informed consent forms prior to testing and involvement in the study. The study was approved by the local institutional review board.

Description of the intervention

A certified yoga therapist offered Hatha yoga twice per week for 75 minutes per session for 12 weeks in a multipurpose room at the retirement center. The yoga sessions consisted of a variety of breathing exercises and seated, standing, and floor-based postures, which were modified based on the individual needs of all subjects, including substitution of a posture if contraindications existed. The postures became progressively challenging as the intervention advanced. The sessions were developed to specifically improve confidence related to falls and movement. See table 2 for the progressive postures provided during the 12-week intervention. At the end of the program, participants received a yoga mat, a yoga strap, and a one-to-one consultation with the research team about their results as an incentive if they completed both the pre-and post-tests and attended at least 80% of the yoga sessions.

Data Collection

Demographic information for each participant (e.g., age, race, gender, education level, marital status, self-rated health, ambulation with assistive device) was collected at baseline before beginning assessments or the intervention. In addition, participants were measured for their number of falls since the previous measurement, and leisure constraints at baseline and at the end of the intervention. Other variables, such as balance and flexibility, were recorded and are described elsewhere [20].

Number of falls: At baseline, participants were asked how many times they had fallen in the past six months. At the 12-week measurement, participants were asked how many times they had fallen since the previous measurement.

Leisure constraints: Constraints were measured using a scale developed from a synthesis of previously used constraints scales. The scale seeks to identify constraints related to a desired physical activity. The constraint scale has demonstrated strong reliability and validity [34].

Acceptability and feasibility: Acceptability and feasibility were

explored by examining attendance, attrition, and written responses to open-ended questions on the 12-week questionnaire. Data from the yoga instructor about specific modifications were also obtained in written form and are included in the results.

Data analysis: Data were assessed for normality. Paired sample t-tests (were computed to compare the mean scores on the aggregate 20-item Leisure Constraints Scale (using the scale modified by Shinew et al., [35] and the individual leisure constraint items [34].

The dichotomous variable ‘falls in the six months prior to the start of the study’ (yes or no) was used to divide the sample into two groups to further explore if leisure constraints changes were greater in one group. To do this, we used a related samples Wilcoxon Signed Rank test to assess differences in the leisure constraint score between people who had and had not fallen in the six months prior to the start of the study.

Attendance, attrition, and the written responses to the open-ended questions were typed into a word processing document. All data were reviewed and analyzed to provide a clearer picture of the acceptability and feasibility of the intervention. A thematic content analysis was conducted.

RESULTS AND DISCUSSION

Of the 15 individuals enrolled in the study, 14 completed the study; one individual withdrew from the study due to a new cancer diagnosis (93% completion). All 14 reported their race as white. The majority of the participants were female (78.6%), had some college education or higher (92.9%), and rated their health as good or very good (71.4%). About half of the participants (57%) were married, while the other half was widowed. The mean age was 78 years, ranging from 63 to 90. Demographics of the study participants are detailed in table 1.

Improvements in leisure constraints

There was a significant improvement in the aggregate score on the leisure constraints scale between baseline and 12 weeks ($t = -2.072, p = .05$), indicating a reduction in leisure constraints. Specific leisure

Table 1: Demographics (N = 14)

Variable	Mean ± SD or n (%)
Age	78.36 ± 8.75 range 63-90
Race White	14(100%)
Gender Male Female	3(21.4%) 11(78.6%)
Education level High school Some college Bachelor's degree Graduate school	1(7.1%) 4(28.6%) 5(35.7%) 4(28.6%)
Marital status Married Widowed	8(57.1%) 6(42.9%)
Self-rated health Excellent Very good Good Poor	2(14.3%) 5(35.7%) 5(35.7%) 2(14.3%)
Fall within past year	5(35.7%)
Use of assistive device for ambulation	2(14.3%)

Table 2: Asana and Pranayama sequence used in the 12-week Hatha yoga and fear of falling intervention

Session #	Asana and Pranayama sequence
1.	Seated postures: <ul style="list-style-type: none"> Breathing (<i>same breathing completed in beginning of all sessions</i>) Gentle neck stretches, movement of fingers, wrists, elbows, shoulders, toes, ankles, knees (<i>same stretches up completed in all sessions</i>) Forward bend Tadasana (mountain pose) Very gentle spine twist Anjali mudra (prayer position) Relaxation and breathing (<i>repeated at the completion of each session</i>) Namaste (<i>repeated at the completion of each session</i>)
2.	Week 1 sequence, plus: <ul style="list-style-type: none"> Vrksasana (tree pose) in chair Standing mountain pose
3.	Week 2 sequence, plus: Standing postures <ul style="list-style-type: none"> Tadasana Vrksasana Seated postures <ul style="list-style-type: none"> Hands pressing together in different positions Guided relaxation & shoulder massage to release muscles Education <ul style="list-style-type: none"> Demonstration of how to get up from a fall Explanation of how not leaning on back of chair increases core strength Talked about how to use breath to relax <ul style="list-style-type: none"> Gentle spine twist in chair Experimentation with thera-bands
4.	Week 2 sequence, plus: <ul style="list-style-type: none"> Virabhardrasana (Warrior I) Utkatasana (chair pose) Shoulder rotation Education <ul style="list-style-type: none"> Demonstration pavanamuktasana (wind removing pose) Discussion about cautions of spine twist Quick shoulder massage at end of class
5.	Week 2 sequence, plus: Seated & standing postures <ul style="list-style-type: none"> Tadasana with arms raised Vrksasana Chair pose Virabhardrasana 1 pose Separate Leg Forward Bend
6.	Week 2 sequence, plus: Increased focus on breathing and relaxation throughout class Standing & seated <ul style="list-style-type: none"> Tadasana Vrksasana Standing <ul style="list-style-type: none"> Parsvottanasana (Pyramid pose) Virabhardrasana 1 pose Padottanasana (forward bend) Seated <ul style="list-style-type: none"> Vrksasana Easy twist Cactus arms Forward bend

7.	Week 2 sequence, plus: Seated & standing <ul style="list-style-type: none"> Tadasana Seated <ul style="list-style-type: none"> Breathing, breathe into belly or 3 part belly breath. Extend exhale, release tension by exhaling through mouth <ul style="list-style-type: none"> Arm stretching Seated leg lift, toe & ankle movement, leg extension Standing <ul style="list-style-type: none"> Virabhardrasana 1 pose Pyramid pose Standing lift leg, modification ball of foot on floor Education <ul style="list-style-type: none"> Demonstration of how to get up from a fall
8.	Week 2 sequence, plus: Breathing <ul style="list-style-type: none"> Relaxed breathing Seated <ul style="list-style-type: none"> Seated - hold hands under knee, lift & pump leg Seated & standing mountain pose & Vrksasana Seated baddhakonasana (crossed leg gentle spine twist) Standing <ul style="list-style-type: none"> Virabhardrasana 1 pose Forward bend pose Sit & breathe. Relaxation. Emphasize exhale for relaxation
9.	Week 2 sequence, plus: <ul style="list-style-type: none"> Addition of yoga blocks & thera-bands Demonstration of wind removing pose Mountain pose with blocks and thera-band
10.	Week 2 sequence, plus: Breathing <ul style="list-style-type: none"> Introduction of alternate nostril breathing Sitali (cooling breath) Standing <ul style="list-style-type: none"> Mountain pose Vrksasana Used thera-band to strengthen quads, increase ROM of knee, worked biceps, deltoids & triceps 10
11.	Week 2 sequence, plus: Standing <ul style="list-style-type: none"> Pyramid pose Forward bend pose Vrksasana Mountain pose Thera-band upper & lower body, extend leg to work quads w/ support of band
12.	Week 2 sequence, plus: Standing <ul style="list-style-type: none"> Modified warrior III pose Mountain pose Vrksasana Chair pose with thera-band wrapped around legs & opened knees to strengthen adductors Mountain pose with and without block to compare muscle activation with block Standing stand lift Foot and knee balance Seated Crossed leg gentle spine twist Seated pyramid Seated gentle spine twist Standing stretch, clasped hands behind back & lifted away from back to open chest & shoulders Heel drops to increase bone strength & growth
13.	Week 2 sequence, plus: <ul style="list-style-type: none"> Focus on thera-band exercises for strength

14.	<p>Week 2 sequence, plus: Standing postures with and without block</p> <ul style="list-style-type: none"> • Warrior I • Mountain pose • Forward bend • Pyramid <p>Seated</p> <ul style="list-style-type: none"> • Seated mountain pose and crossed leg gentle spine twist • Block between legs, squeeze to strengthen adductors • Easy spine twist • Internal & external rotation of hip joint 	19.	<p>Week 2 sequence, plus: Standing</p> <ul style="list-style-type: none"> • Chair pose • Eagle pose • Warrior I pose • Warrior II pose • Pyramid pose <p>Seated</p> <ul style="list-style-type: none"> • Spinal twist • Heel drops
15.	<p>Week 2 sequence, plus: Standing postures</p> <ul style="list-style-type: none"> • Mountain pose • Vrksasana • Stand on one foot and knee out to side • Warrior I pose • Chair pose • Pyramid pose <p>Seated</p> <ul style="list-style-type: none"> • Easy spine twist • Crossed leg gentle spine twist • Cactus arms & breathe • Block between legs & squeeze • Mountain pose 	20.	<p>Week 2 sequence, plus: Seated</p> <ul style="list-style-type: none"> • Mountain pose • Vrksasana • Crossed leg gentle spine twist • Eagle arms <p>Standing</p> <ul style="list-style-type: none"> • Mountain pose with and without block • Vrksasana • Forward bend • Pyramid pose • Warrior I pose • Eagle legs
16.	<p>Week 2 sequence, plus: Breathing</p> <ul style="list-style-type: none"> • Brahmari breath (bee's breath, humming breath) • To loosen head & chest congestion, helps focus <p>Seated</p> <ul style="list-style-type: none"> • Mountain pose • Vrksasana • Crossed leg gentle spine twist • Seated gentle spine twist • Relaxation <p>Standing</p> <ul style="list-style-type: none"> • Mountain pose • Vrksasana • Lift leg forward, extended hand big toe mod • Warrior I pose • Chair pose • Pyramid pose • Forward bend • Seated 	21.	<p>Week 2 sequence, plus: Standing</p> <ul style="list-style-type: none"> • Mountain pose • Warrior I pose • Vrksasana • Forward bend • Pyramid pose • Yogic squat <p>Seated</p> <ul style="list-style-type: none"> • Eagle arms • Mountain pose • Tree pose • Crossed leg gentle spine twist
17.	<p>Week 2 sequence, plus: Breathing</p> <ul style="list-style-type: none"> • Alternate Nostril breathing <p>Seated</p> <ul style="list-style-type: none"> • Mountain pose • Spinal twist • Crossed leg gentle spine twist <p>Standing</p> <ul style="list-style-type: none"> • Warrior I pose • Pyramid pose • Mountain pose • Standing with and without block • Vrksasana • Pyramid pose • Mountain pose 	22.	<p>Week 2 sequence, plus: Breathing</p> <ul style="list-style-type: none"> • Alternate nostril breathing • Brahmari breath <p>Standing</p> <ul style="list-style-type: none"> • Standing tree • Mountain pose <p>Seated</p> <ul style="list-style-type: none"> • Forward bend • Yogic squat • Eagle legs • Thera-band under foot, for leg movements
18.	<p>Week 2 sequence, plus: Seated</p> <ul style="list-style-type: none"> • Eagle pose in chair – legs crossed and arms crossed over each other, then opposite side 	23.	<p>Week 2 sequence, plus: Breathing</p> <ul style="list-style-type: none"> • Alternate nostril <p>Standing</p> <ul style="list-style-type: none"> • Chair pose <p>Seated</p> <ul style="list-style-type: none"> • Chair pose • Heel drops
		24.	<p>Review of all poses with a faster pace Demonstrations of using the block at the wall for wall pushups Question and answer session</p>

constraints that demonstrated a statistically significant improvement (reduction in score) during the twelve-week period were: “I’m afraid of unattended dogs” ($t = -2.673, p = .019$); “I’m too self-conscious about the way I look” ($t = -2.121, p = .047$); “I’m not skilled enough” ($t = -2.188, p = .047$); and “I participated in the past and I didn’t like it” ($t = -2.233, p = .04$).

The Wilcoxon signed rank test, a post-hoc analysis that looked at differences in perceptions of leisure constraints, determined that

people who had fallen in the previous 6 months had a statistically significant improvement in leisure constraints ($p = .008$), while those who had not fallen in the 6 months prior to the study did not have a statistically significant improvement in leisure constraints ($p = .225$).

Acceptability

In terms of acceptability, participants unanimously reported enjoying the yoga intervention. Comments included: "It was amazing how much utility was gained from such a gentle program- never felt super rigorous;" "The breathing and exercises were pleasant and not difficult, yet I felt 'exercised' after." While the majority of the comments were related to enjoyment; there was also a focus on the breath work as a primary benefit. Furthermore, other subjects described feeling more aware of their bodies, and how this increased awareness made many aspects of life easier, including walking, resting, and sleeping. The yoga instructor used specific techniques to adapt the yoga postures to be completed primarily in a chair or standing. The participants all reported concern at the beginning of the intervention when it was mentioned that some postures would be done on the floor, but after sequencing the intervention to progressively include floor postures, the participants indicated feeling more confident about their ability to get off the floor should they fall. As one woman stated after successfully getting off the floor, "I may be better able to do a 'save' if I start to lose it (balance)." Participants also mentioned that the specific foci of the yoga instructor, such as providing examples and helpful hints of how to fall (if a fall is inevitable) and how to move to get assistance (such as shifting weight to turn over or move towards a phone) if needed were beneficial in reducing FoF.

In regards to acceptability, the participants enjoyed the yoga intervention so much that they sent a petition to the administrators to add yoga as a regular part of programming for the retirement community.

Participants also commented on how their bodies felt different following the yoga intervention. All participants described feeling more limber, mobile, and flexible. Many subjects also reported an increased awareness of their body in space, their posture, and reductions in pain. In addition, one subject had started with a frozen shoulder, and reported that at the close of the study, her shoulder had loosened "and [I] can move it all around," which she attributed to the yoga intervention.

Feasibility

In terms of feasibility, the participants reported feeling that the intervention was manageable in terms of time commitment, expectations for physical movement, and incentives for participation. Only one individual withdrew from the study (7% attrition), and this was due to a new medical diagnosis that required immediate treatment. Of 14 participants, 10 had excellent participation in the yoga study (> 80% of classes were attended) while 4 had moderate to low participation (< 80%). The four individuals who missed greater than 20% were employees of the retirement center and thus had other obligations (all met inclusion criteria).

CONCLUSIONS

The results of this pilot study suggest that a 12-week yoga intervention is acceptable and feasible for older adults. The data further suggest that this intervention reduced leisure constraints, particularly amongst those who had fallen within six months of the start of the intervention. Time may have been a confounding factor

in this study, as this study occurred in the mid-west over the winter, and ended in April. Thus, the FoF that existed during enrollment in December may have been seasonal, since all endorsed a FoF as entry to the study, but half did not endorse it at 12 weeks. A larger randomized study would be required to better understand the effects of weather and season.

To our knowledge, this is the first study that has examined the influence of yoga on FoF and perceived leisure constraints in older adults. This is important, as McGuire and Norman, [34] suggested that in addition to constraints providing a barrier to full participation in a variety of activities, the constraints may also mitigate attempts at successful aging. While our study had limited power to find significant findings, total perceptions of leisure constraints were reduced over the twelve-week period. Further, individuals perceived a reduction in constraints related to their level of skill, their enjoyment, and their concern regarding their looks, all intrapersonal constraints. Interestingly, a loose dog had been on the premises of the retirement center, thus the fear of unattended dogs (a structural constraint), potentially related to increased potential of a fall, also improved during this time. These findings support Jackson, Crawford, and Godbey's [16] work that constraints are not insurmountable and can be negotiated. During this 12-week yoga intervention, the participants also reported increased confidence, perception of skills, enjoyment and interest levels.

One of the potential reasons why this intervention was effective in reducing leisure constraints is related to Delbaere's fear of falling cycle. As the fear of falling increases, an individual is more likely to reduce physical activity which leads to musculoskeletal weakness, balance deficits, and the increased probability of a fall. If the fear of falling is not addressed, the individual will continue to limit engagement in physical activities and continue to reduce musculoskeletal strength and balance. This intervention helped participants identify personal fears related to falling, and begins to increase physical activity, specifically addressing musculoskeletal strength and balance [15]. As the participants became more confident in their capabilities to both adjust balance to avoid a fall and how to recover if a fall occurs, perceived leisure constraints were reduced. Overall, we are encouraged by these findings that yoga may address some intrapersonal constraints that are related to FoF and falls. Our findings suggest that there is still a need for attempting to overcome intrapersonal constraints in the older adult population.

While our study was limited by a small sample size and a homogenous population, we are encouraged that intrapersonal constraints were successfully negotiated by the individuals in this study following a 12-week yoga program. Future research should extend this line of inquiry, and an in-depth understanding of how these constraints were negotiated would be quite beneficial to the field.

In summary, this study provides preliminary evidence that yoga is a feasible and acceptable intervention with this population. Recreational therapists, rehabilitation therapists, and yoga therapists may consider incorporating Hatha yoga with older adults in order to reduce FoF, falls, and perceived leisure constraints. Yoga is an intervention that lends itself well to interdisciplinary treatment or research. This study was conducted by a recreational therapist and an occupational therapist, in conjunction with a yoga therapist. These three viewpoints provided a broad and deep perspective from which to view the data and the yoga experience. Future research should

utilize a control group to compare the outcomes of the experimental group against and utilize a larger sample to have sufficient power to detect a fear of falling.

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