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Yoga for Low-Income Older Adults: Silver Age Yoga

Erik J Groessl[1,2]*, Laura Schmalzl[1,2], Maria Mazzi[3] and Frank Iszak[3]

[1]University of California San Diego, California, USA
[2]VA San Diego Healthcare System, California, USA
[3]Silver Age Yoga Community Outreach, USA

Abstract

Objectives: Lower-income older adults are more likely to be sedentary and can benefit from interventions that increase mobility and physical function. Although many interventions may help sedentary older adults, yoga may be able to produce broader changes and impact multiple health outcomes simultaneously. Other features of yoga such as transportability, home practice, social interaction, and spirituality may increase its appeal to older adults.

Methods: Silver Age Yoga Community Outreach (SAYCO) provides free yoga programs to older adults who have limited resources and who reside at community senior centers. The yoga program consists of weekly 60-minute sessions that are specifically designed for inactive older adults. A gentle pace and props are used to make it accessible to all functional levels. Volunteer instructors are recruited to sustain the programs as long as possible. Participants at four new SAYCO programs were invited to complete questionnaires before their first class and again 3 month later. Questionnaires included measures of pain, functional status (HAQ), depression (CESD-10), fatigue, and health-related quality of life (EQ5D). Paired t-tests were used to compare baseline scores to those at the 10-week follow-up for the single group, pre-post design.

Results: Baseline and follow-up data were available for 31 participants who were 81% female, 23% Hispanic, 77% white, 48% had a college degree; median annual income was $20-39K and mean age was 69.1 years. Participants tended to be quite healthy, as assessed by baselines health status. (EQ5D=0.778) Despite the small sample size, significant decreases were found for depression (p=0.025) and pain frequency (p=0.040).

Conclusions: The data suggest that inactive older adults derive health benefits from free weekly yoga programs. However, the limitations of a small, unfunded, single-group study make conclusions tentative. A larger randomized, controlled trial of the yoga for older adults can answer these questions more definitively.

Keywords: Yoga; Older adults; Mobility

Introduction

In the next few decades, the proportion of Americans age 65 or older is expected to increase from 12% (36 million) to 20% (80 million) of the total US population [1]. As life expectancy increases, an even greater need arises for cost-effective interventions to improve function and quality of life among older adults [2-4]. All older adults face numerous health problems that can reduce or limit both the quality and quantity of life they will experience. Some of the main problems faced by older adults include reduced physical function and well-being, challenges with mental and emotional functioning and well-being, and more limited social functioning. Not surprisingly, these factors comprise the primary components of comprehensive health-related quality of life [5,6].

Physical mobility, defined as the ability to walk safely and independently [7], is one of the most important factors for maintaining functional independence [8]. Impaired mobility has been shown to predict subsequent broader disability involving activities of daily living activities (ADLs) [8,9], in addition to reduced quality of life (QOL) [10] and increased mortality [11,12]. Older adults that lead a sedentary lifestyle, walk more slowly, and have reduced strength and balance, but can still perform daily living activities are most at risk for developing disability and losing independence [13-16].

As the population of older adults expands in the US and globally, mental health disorders are expected to increase as well [17]. Thus a much large number of people will be facing a range of mental health issues including cognitive deficits, such as mild cognitive impairment and Alzheimer's disease [18], and lower-level emotional or mood problems such as depression and anxiety, in addition to more severe psychiatric disorders [17]. While limitations in both psychological and physical functioning can make it harder to function socially, an emphasis on maintaining social function is seen as important for successful aging and may provide resilience to physical and mental decline [19,20].

Older adults with low income or fewer economic resources are at an increased risk for health problems [21,22] and mortality [23]. Low-income older adults perform more health-risk behaviors [24] and fewer beneficial health behaviors [25,26] than older adults of higher income. Many healthy behaviors requires a financial investment (program cost, transportation cost), and people with limited resources will take care of more basic needs first, such as buying food to eat [27]. Other reasons that low-income older adults may not participate in health behavior programs include access issues [28], cultural norms, or misinformation about the program. Many programs have succeeded in overcoming barriers to participation in these health behavior programs [29,30].

***Corresponding author:** Erik J Groessl, PhD, Assistant Professor and Center Director, UCSD Health Services Research Center, Family and Preventive Medicine, 9500 Gilman Dr., #0994, La Jolla, CA 92093, USA, Tel: (858) 642-6347; Fax: (858) 552-4321; E-mail: egroessl@ucsd.edu

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Thus, programs that reduce barriers for low-income older adults to participate in beneficial health behaviors like mind-body interventions should be studied.

Yoga with Older Adults

There have been two recent reviews of yoga research with older adults [31,32]. A 2011 review by Roland et al. [32] provided a good background on Hatha yoga and included all studies of yoga with older adults that used physical fitness outcomes measures such as strength, flexibility, balance, etc. The review identified 10 relevant studies and concluded that despite methodological problems in many of the studies, there were trends toward improvement in strength, balance, gait and flexibility in older adults participating in yoga.

A second review of yoga interventions with older adults focused only on randomized, controlled trials that compared yoga to another intervention, but did not limit the outcomes being studied [31]. They identified 18 studies representing 11 different cohorts, some with multiple outcomes reported in different manuscripts. The study identified 4 outcomes that were used in multiple studies and were suitable for meta-analysis. In summary, the review found evidence that yoga may result in greater improvements in SF-36 physical and mental scores, flexibility, and VO_{2max} than aerobic exercise interventions. The evidence was more mixed for depression, sleep, strength, and bone density.

The most relevant program of research in older adults has been conducted by Chen et al. who developed a yoga program (Silver Yoga) for institutionalized older adults in Taiwan and tested it in cluster randomized studies [33-36]. These studies found that yoga improved flexibility, walking speed, sleep quality, depression, and QOL among yoga participants. Although the generalizability of these data to non-institutionalized US older adults is unknown, these results are very promising.

In summary, there is increasing evidence that Hatha yoga can improve physical function among older adults, while the psychosocial benefits are promising but less clear. The population of older adults is growing rapidly and new intervention options are needed to address multiple aspects of health and well-being, especially among those of lower socioeconomic status. Features of yoga such as transportability, home practice, social interaction, and spirituality may increase its appeal to older adults, providing an additional low-cost intervention for older adults to choose from. People of lower socio-economic status tend to be underrepresented in randomized trials [37,38] and may have less access to yoga programs in the US. The purpose of our study was to examine the benefits of a Hatha yoga intervention for lower-income older adults attending senior centers in the community.

Methods

Study Design

This was an unfunded pilot study of an existing community yoga program that is described below. For the pilot study, yoga sessions were held at four new locations. New locations were identified for the initiation of the Silver Age Yoga Program in order to study only older adults that had not done yoga before. Recruitment flyers were posted at each of the new locations and the staff announced the new program to attendees. Due to lack of research funding, a pre-post study design with no control group was used. The goal of the study was to assess the feasibility of recruitment and assessment at new locations, and to gather preliminary data to include in a grant proposal for a larger, more rigorous, randomized controlled trial.

Silver Age Yoga

Silver Age Community Outreach (http://www.silverageyoga.org/) was started in 2003 as a non-profit organization. Primarily based on the principles of Iyengar yoga, a form of Hatha Yoga characterized by attention to detail and a focus on body alignment, the program was tailored specifically to the needs of inactive, older adults by working closely with physicians and other health professionals in the field of gerontology. The program currently provides free weekly yoga classes to over 500 older adults of diverse backgrounds at over 25+ senior center locations. The classes are located at sites primarily serving ethnic minorities and low-income seniors. The program relies upon funding and time contributions from charitable foundations, community donors, and volunteers. Communities have been encouraged to "adopt" individual programs by organizing future funding and sustainability after the first year of operations. The yoga instructors providing the program have all completed a certification course that combines geriatric science with yoga practices in a 30 hour workshop. After completing the workshop, instructors practice what they have learned by delivering yoga classes to older adults for a period of time as unpaid volunteers. To date, thousands of free classes have been offered and 200 yoga teachers have been specially trained to work with older adults.

Yoga Intervention

The yoga consisted of 1× weekly sessions lasting about 60 minutes each for 12 weeks. The first yoga class was longer, about 90-minutes in length, with the first 30 minutes being an overview and discussion of the principles of yoga as a holistic health practice that can produce comprehensive lifestyle change. In Silver Age Yoga, participants are encouraged to apply yoga principles to as many aspects of their life as they would like, choosing their own program and pace of transformation. The 60-minute formal yoga sessions begin with a brief meditation and breathing session led by the instructor (5 minutes). During this initial part of the class, students can either sit in chairs or lay on a yoga mat on the floor depending on their flexibility. The yoga instructor then leads students through a series of yoga poses at a gentle pace. The pace of the class often increases slightly as students become more familiar with the poses and more capable. The Silver Age Yoga System comprises a set of 73 poses including 35 chair poses, 18 standing poses and 20 floor poses, but not all postures are used each session. In a typical class, an initial set of chair poses (15-20 minutes) is followed by standing poses (10-15 minutes), and then floor poses (15 minutes), and lastly Savasana (Corpse) pose (10 minutes). Participants often used "props" such as blocks and straps, which allow students with limitations to enjoy the benefits of postures that they cannot otherwise perform. Participants are encouraged to gradually begin practicing very basic poses at home while emphasizing safety and caution.

Participants

Participants were older adults at three community centers in southern California and one community senior center in North Carolina. Silver Age Yoga was a new, free program at each of the senior centers. Senior center attendees who expressed interest in attending yoga were invited to participate at the first yoga session. Participants were not compensated for completing questionnaires. Participation in the yoga sessions and participation in completing research questionnaires were independent of each other and both were voluntary.

Procedures

Participants were asked to arrive 30 minutes prior to their first yoga session to complete the informed consent process and complete initial research questionnaires. Participants then completed a follow-up assessment 3 months after the first assessment after a designated yoga session. They were reminded of this assessment in the weeks prior to the assessment, but personal contact information was not available to schedule assessments outside of the yoga sessions. Assessments took approximately 20-30 minutes to complete. Data were de-identified to protect the confidentiality of research participants.

Measures

A brief sociodemographics questionnaire was used to collect data on age, gender, income, education, race/ethnicity, marital status, and comorbid disorders. Yoga attendance was not available at all sites. The best proxy available for attendance was completion of the follow-up assessment.

Depression: was assessed using the Center for Epidemiologic Studies Short Depression Scale (CES-D 10) [39]. The measure is widely used in research studies and is derived from the full CES-D [40]. The frequency of mood symptoms were assessed by 10 items, rated on a 4-point Likert scale ranging from 0 (Never) to 3 (All of the Time), a number of which are typically reverse-scored. Retest correlations for the CESD-10 were comparable to those in other studies (r=.71). The 10–item measure had high predictive accuracy for scores on full-length CES-D (kappa=.97, P<.001). The CESD-10 was negatively correlated with positive affect (r=-.63) and positively correlated with other scores of poor health. (r=.37) [39]. Scores can range from 0-30, and a score of 10 or greater is generally considered depressed. Normative data on people with assorted chronic illnesses are available [41].

Fatigue/Energy: were measured using items adapted from the Medical Outcomes Study [42], for use with chronic illness populations by Lorig et al. [41]. The total score is calculated by taking the mean of the 5 questions and ranges from 0-5. Evaluation of the psychometric properties indicated an internal consistency for the measure of 0.89 and test-retest reliability of 0.85. Validity has also been established [43].

Pain: was measured using a single visual numeric scale (range 0-10) and 5 additional questions on severity/interference. The visual pain scale is a modified version of the visual analog scale and was adapted by Ritter et al. [44]. The single item was found to have alternate form reliability of 0.79 and correlated r=0.85 with the 5-question scale [43]. The 5-question severity scale (range 0-100) is a modified version of the Medical Outcomes Study pain severity scale, which was changed to omit the skip pattern and add "physical discomfort" to the item stems for the Chronic Disease Self-Management study [43]. This scale was further modified by substituting a 0-10 visual numeric scale for the original 0-20 numeric scale in items 1 and 2. The scale was shown to have an internal consistency of 0.88 and 10-day test-retest reliability of 0.91. Concurrent validity has also been established [43].

Health-related quality of life: was measured with the EuroQol 5D (EQ-5D), a generic preference-based measure of health-related quality of life that consists of 5 questions used to rate the severity of common symptoms and functional limitations [45]. The measure is quick and is available for use in the public domain. The measure produces a single score on a scale from 0–1.0, representing global well-being. The measure also includes a 0-100 visual analog rating of global self-rated health, which is analyzed independently.

Statistical Analyses

Outcome variables were examined for departure from the normal distribution using the Shapiro-Wilks test. Variables for which either the baseline or follow-up score were non-normal (depression, pain-discomfort, pain-duration, pain-frequency, HAQ disability, EQ5D, - quality of life, and self-rated health) were compared pre-post using a non-parametric comparison of means (Wilcoxon signed-rank test). Paired sample *t*-tests were used to compare baseline scores of participants to their scores at the 3-month follow-up for normally distributed variables. Standardized effects sizes (Cohen's "d") were calculated by dividing the change in means between baseline and follow-up by the standard deviation of the mean. Spearman's rank correlation was used to examine whether changes in depression were associated with changes in pain. Attrition-related factors were explored using independent samples t-tests to examine differences on socio-demographic and health outcomes variables at baseline.

Results

Fifty-three patients were initially enrolled in the study. Baseline and follow-up data were available for 31 participants. The mean age of participants was 69 years (range 56-85). Participant characteristics are shown in table 1. The mean number of co-morbid conditions endorsed by each participant was 2.5 (sd=1.9).

Statistically significant improvements were found for pain frequency ($t(29)=2.15$, $p=0.040$) and depression ($t(23)=2.40$, $p=0.025$). Scores on all other measures improved but the changes were not statistically significant. These data are presented in table 2, along with effect size calculations.

To further examine the change depression, we examined whether the magnitude of change in depression was larger in participants who were considered "depressed" as defined by a score of 10 or higher on the CESD at baseline. At baseline, 14 participants had a score of 10 or higher on the CESD. Eight of these participants completed the follow-up assessment, the best indication of program participation and attendance. The mean change in depression among these 8 participants decreased from 14.00 to 12.25, or a mean decrease of 1.75, exactly matching the overall decrease in depression scores for the whole sample. The 43% (6/14) attrition rate among depressed patients was very similar to that of 42% (22/53) of the overall sample. The correlation between changes in depression and changes pain-frequency was Spearman's rho=0.008, (p=0.972) was non-significant.

Because attrition from the follow-up assessment was high, we analyzed baseline differences between those who completed the 3-month follow-up (n=31) and those who did not (n=22). Although no significant differences were found ($p<0.05$) a number of trends ($p<0.1$) were of interest. (See table 3) People who went on to complete the follow-up assessment had higher mean scores on a variety of pain variables, indicating greater pain at baseline. In addition, 58% of Hispanics initially enrolled in the study did not complete the follow-up assessment while only 31% of non-Hispanic Whites did not complete the 3-month assessment.

The 31 participants who completed both the pre- and post-assessment came from different cohorts of yoga sessions at four locations. Thus, the results obtained at each site may be partially influenced by cohort or location factors such as the instructor, transportation, culture of participants, etc. To explore this possibility, we examined Spearman's rank order correlation for an association between the site, and the significant changes in depression and pain

	Mean (sd) or # (%)
Variable (n = 31)	
Age	69.1 (7.9)
Gender	
Female	25 (81%)
Education	
High School or GED	5 (17%)
Some college	10 (32%)
College degree	5 (16%)
Post-grad studies	10 (32%)
missing	1 (3%)
Ethnicity	
African-American	0 (0%)
Non-Hispanic White	24 (77%)
Hispanic	7 (23%)
Other	0 (0%)
Income	
0-$20K	7 (23%)
$20K-$40K	10 (32%)
$40K-$60K	5 (16%)
$60K-$99K	7 (23%)
$100K+	1 (3%)
missing	1 (3%)
Marital status	
Never Married	1 (3%)
Married/partner	21 (68%)
Divorced	6 (19%)
Widowed	2 (7%)
missing	1 (3%)
Comorbid Disorders	
Anxiety	7 (23%)
Arthritis	20 (65%)
Asthma	6 (19%)
Cancer	4 (13%)
Depression	8 (26%)
Diabetes	4 (13%)
Heart problems	5 (16%)
Hypertension	6 (19%)
Memory problems	1 (3%)
Rash/Skin	6 (19%)
Reflux/Heartburn	8 (26%)

Table 1: Participant characteristics

found above. Neither the decrease in depression nor the decrease in pain frequency was significantly correlated with study site (depression - r =.20, p=0.35; pain frequency r= .22, p=0.24). Although not statistically significant, it is interesting to note that the decrease in depression at one site was double that of the other three cohorts. Similarly, the sites varied in the size of decrease in pain frequency.

Discussion

Our results indicate that significant improvements in health outcomes occurred in a group of lower-income older adults who did yoga once per week at a community senior center. Significant improvements were found for pain frequency and CES-D depression scores. The effects sizes for the improvements in pain frequency and depression were "medium" in size [46] while there was inadequate power to detect statistical differences for the small effects found for other variables.

Our results coincide with the conclusions of a recent review of yoga interventions for older adults [31] which found that yoga improved depression scores in older adults across a number of research studies. Although data from individual studies found that yoga improved flexibility, walking speed, sleep quality, and QOL among older adults, measures were not used across multiple studies, limiting meta-analytic conclusions.

Efforts to explore the results were interesting, suggesting that reductions in depression scores were very similar among participants who were above or below the cutoff for depression at baseline. In addition, the changes in pain and depression appeared to be quite unrelated in this sample. This suggests that these benefits may be distinct and independent effects of yoga in older adults. This finding is not completely unexpected because we know that yoga is multi-dimensional. There are theorized benefits of increased strength, flexibility, and some level cardiovascular fitness resulting from performance of yoga asanas in connection with deep breathing [47]. There may be independent relaxation and stress reduction benefits resulting from the deep breathing alone [48]. Finally, concentration, mindfulness, meditation, and other cognitive activities that are present in most types of Hatha yoga may have other independent effects on the mind and body [49]. However, research on the various mechanisms by which yoga produces its possibly interwoven effects is ongoing and incomplete.

One of the main contributions of this pilot study is that it presents evidence of promising results for low-income seniors. Hatha yoga has been found to produce health benefits for many populations and conditions in recent years [50-53]. However, most yoga is practiced in studios that charge a monthly fee or fee per session. Although more options for free or low-cost yoga are becoming available, access to yoga for low-income older adults has often been limited in the US.

Like many of the previous studies of yoga with older adults that have been conducted, our study had a number of limitations. The study was unfunded and contained a single-group pre-post design. Without a control group, we cannot rule out the possibility of expectation effects or other factors that may have contributed to improved health in our sample. Attrition was also higher than is desirable, but not surprising given the lack of funding for participant compensation and the study being unable to have staff follow-up participants outside of the yoga sessions.

However, our analysis of factors related to attrition was quite informative (See table 3). Although not statistically significant with

	n	Baseline mean	3-month mean	mean change	standard deviation of difference	p	Effect size[a]
Depression	24	7.75	6.00	-1.75	3.57	**0.016***	**0.49**
Fatigue	31	3.90	3.39	-0.51	2.10	0.180	0.25
Pain - total	31	56.4	51.0	-5.33	18.08	0.117	0.29
Pain - average	30	4.20	3.83	0.367	1.866	0.291	0.20
Pain - discomfort	31	3.42	3.16	-0.258	1.064	0.140	0.24
Pain - duration	31	3.90	3.55	-0.355	1.780	0.226	0.20
Pain - frequency	30	4.00	3.47	-0.533	1.358	**0.038***	**0.39**
Pain - worst	30	5.20	4.73	0.467	2.285	0.273	0.20
HAQ Disability Index	31	0.327	0.315	0.012	0.276	0.549	0.04
EQ5D Index	31	0.778	0.799	0.021	0.134	0.183	0.16
Self-rated Health	28	68.86	72.75	3.893	18.546	0.298	0.21

[a] Effect sizes are Cohen's "d" (small = 0.20, medium = 0.40, large = 0.80)
*p < 0.05

Table 2: Mean scores on health questionnaires.

	Completers (n= 31)	Non-completers (n = 22)	p-value
Age	69.1	68.1	0.690
% female	81%	77%	0.771
Education – mean yrs	15.2	15.1	0.935
Race/ethnicity (n)			**0.083***
African-American	0	1	
White (non-hispanic)	24	11	
Hispanic	7	10	
Income (n)			0.286
$0-19K	7	8	
$20-39K	10	8	
$40-59K	5	5	
$60-99K	7	1	
$100K+	1	0	
Marital Status (n)			0.245
Single/never married	1	1	
Married/permanent	21	9	
Separated/divorced	6	8	
Widowed	2	4	
Health variables (means)			
CESD - depression	7.35	6.47	0.584
Pain - total	56.4	46.1	0.127
Pain - average	4.20	2.86	**0.060***
Pain - discomfort	3.42	2.77	**0.059***
Pain - duration	3.90	3.36	0.251
Pain - frequency	4.00	3.67	0.501
Pain - worst	5.20	3.64	**0.078***
Fatigue	3.90	3.14	0.294
HAQ - disability	0.32	0.40	0.569
EQ5D - QOL Index	0.78	0.78	1.000
Self-rated health	68.86	71.09	0.739
Comorbidities	2.45	2.68	0.626

* Trend $p < 0.1$

Table 3: Baseline characteristics of follow-up assessment completers and non-completers

the small sample size, it was notable that people completing both assessments, which may be a sign of more regular attendance and compliance, reported higher scores on multiple pain variables. In addition, a much higher proportion of Hispanics did not complete the follow-up assessment. Prior research on perceptions of yoga among older adults suggests that religious beliefs may impact willingness to participate among Hispanics [54]. These trends will be explored in future research.

We also made an effort to examine the effect of cohort/location effects on results. However, our ability to detect significant differences in this respect was limited by sample size. The correlations between cohort and improved health outcomes were not significant, but there was some variability in the results and in attrition by cohort. These effects and variability between cohorts must be examined in a larger study and should be considered when designing studies of yoga requiring multiple cohorts.

Overall, yoga appears to have very good potential for impacting multiple aspects of health and well-being among low-income older adults. The physical, mental and social aspects of health and quality of life are interdependent [55], yet they are often addressed independently, as distinct challenges. Interventions that are more holistic and comprehensive can address multiple aspects of health in well-being at the same time [56,57]. Although a variety of behavioral interventions have been linked to aspects of improved health in older adults [58], mind-body interventions such as yoga may produce broader changes and impact multiple health outcomes simultaneously.

In conclusion, our study provides preliminary data indicating that yoga interventions can improve the health of low-income older adults. A larger randomized controlled trial is needed to answer these questions more definitively.

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