

A telehealth yoga program for older adults in rural Wisconsin: intervention development and process outcomes

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Abstract

Although yoga improves physical functioning, balance, and quality of life in older adults, rural residents are less likely to participate due to issues related to availability, access, and beliefs regarding yoga practice. To address these barriers, we worked with community partners to adapt a yoga program designed for older adults for telehealth delivery. In this report, intervention development and process outcomes are presented. Community collaborators identified strategies to recruit and retain older adults and suggested modifications required to maximize the adoption and maintenance of a telehealth exercise program by local community organizations. Four rural serving organizations evaluated the program using a wait-list comparison group design. Process measures collected at post-intervention supplemented program evaluation measures collected pre- and post-intervention. The adapted 8-week program consisted of two weekly group sessions delivered over video conferencing software. Of 48 enrolled participants, 83% completed the program. Participants were on average 72.6 (SD=6) years old, majority white (98%), female (85.7%), and attended some college (92%). Most were satisfied with the telehealth delivery, program content, and yoga instructor with mixed results regarding logistical issues such as program length and duration. Community organizations similar to those that will ultimately disseminate the program, yoga teachers, and older adults were engaged to maximize the feasibility of this telehealth exercise program. The program appeared to be safe and acceptable, indicating telehealth may be a strategy to increase access to yoga programs for rural-dwelling older adults. Lessons learned will inform future telehealth iterations of this and similar exercise programming.

Keywords: rural, telehealth, exercise, older adults, yoga

Rural community members are underrepresented in health promotion research due to barriers including cost, time, trust, and distance (Pender et al., 2019). Rural communities also have significant health needs with residents who are more likely to be older, experience higher levels of poverty, and be geographically and socially isolated (Pender et al., 2019). These findings have been made worse by COVID-19 and are unlikely to improve as the population ages (Henning-Smith, 2020; Kotwal et al., 2021). Effectively addressing the complex needs of rural communities require partnerships with individuals and organizations that understand the barriers and opportunities for health that exists in rural settings (Leider et al., 2020).

Most older adults wish to remain in their own homes and communities as they age, thus, strategies are needed to support healthy aging in place (AAPR, 2018; US Center for Disease Control and Prevention, 2016). Being physically active and socially engaged are essential in working towards this goal (US Center for Disease Control and Prevention, 2016; Cunningham et al., 2020; Majee et al., 2018; McPhee et al., 2016; Carver et al., 2018). However, older adults in rural communities report higher levels of physical inactivity and social isolation (Trivedi et al., 2015; Watson et al., 2016; NewMyer et al., 2022). For example, in Wisconsin, approximately one-third of older adults report doing no physical activity (PA), with only 61% of rural residents reporting having access to PA facilities as compared to 86% of urban dwellers (America's Health Rankings, 2021). In addition, older adults living in rural communities demonstrate a greater fear of falling, with evidence showing that falls by rural dwellers are more likely to result in a substantial decline in quality of life or death due in part to decreased access to healthcare, lack of timely healthcare, and lack of access to specialty care (Cho et al., 2013; Miller et al., 1998). Thus, there is a need for PA programs designed to be implemented in rural settings which address the unique challenges and barriers that exists in rural communities (Bhuiyan et al., 2019).

Yoga, classified as a form of complementary and alternative medicine, may offer a solution to engage an older population, target balance and falls, and be implemented in numerous settings due to its relatively low cost and minimal equipment needs (Wieland et al., 2011). Using yoga as an intervention strategy has shown multiple benefits, including but not limited to improved quality of life and sleep, arthritis symptoms, balance, and postural stability (Woodyard, 2011; Moonaz et al., 2015; Ni et al., 2014; Schmid et al., 2012). Additionally, community-based yoga classes offer social support and connections, which has been associated with better general health, higher activity levels, and lower levels of depression (Robins et al., 2018). In older adults, yoga interventions were effective in improving physical health domains such as physical functioning, balance, and gait as well as improving psychological health and health-related quality of life outcomes (Ni et al., 2014; Johnson et al., 2016; Loewenthal et al., 2023; Marten, 2022; Sivaramakrishnan et al., 2019). Moreover, yoga interventions for older adults have been shown to reduce fall risk and are associated with improvements in cognitive functioning (Bartos et al., 2022;

Hoy et al., 2021). However, evidence suggests that rural residents are much less likely to participate in yoga due to issues related to availability, access, and beliefs about yoga practice which include associating yoga with specific cultural or religious practices (Brown, 2018; PRRI and American Communities Project Staff, 2022; Sullivan et al., 2017; Wardle et al., 2012).

To address these barriers, the *Yoga for Seniors* program was developed by author PM and evaluated by an interdisciplinary research team in collaboration with community partners located in Wisconsin (Smith et al., 2017). The program decreased self-reported falls and improved balance measures in a small sample of rural older adults. The program was then expanded to include standardized teacher training and a week-by-week implementation process (Hamrick et al., 2017; Oestreich et al., 2021). Certified instructors were contracted to travel to rural communities up to 90 miles to implement the program. While successful in addressing balance and occupational performance problems, the yoga teachers reported that traveling to the sites was not sustainable, especially during winter months (Oestreich et al., 2021). Moreover, in-person attendance was cited as a significant barrier by program participants. Telehealth delivery was identified as a potential solution for these barriers.

Telehealth refers to remote healthcare services supported through the use of communication technologies (Kruse et al., 2017). Yoga programs delivered online or by telehealth are a promising alternative that addresses accessibility barriers while allowing flexibility in delivery and practice (Brosnan et al., 2021). However, online delivery of health promotion programs, especially ones designed to reach older adults, must address challenges in utilizing telehealth in a rural setting (Rural Health Information Hub, 2020). Challenges include limited access to affordable high-speed internet, lack of available technology and equipment, and a lack of familiarity with video conferencing software (Rural Health Information Hub, 2020; Perrin & Duggan, 2015; Vogels, 2021). Finally, strategies are needed to address any potential mistrust of the program and program staff who are from outside of the community. Thus, to develop a yoga program that maximizes reach into rural communities, community collaborators were engaged in an iterative process to adapt the *Yoga for Seniors* program for telehealth delivery. In this report, we present the process of community collaborator engagement and program adaptation, focusing on incorporating strategies to overcome barriers in implementation and dissemination of telehealth yoga programming in rural settings, and the enrollment and process outcomes of the feasibility trial.

Methods

Building on existing partnerships between academic researchers and community collaborators in Wisconsin, *Yoga for Seniors* was adapted for telehealth delivery using an iterative process guided by the RE-AIM Framework to ensure the resulting program was useful, relevant, and ready for widespread and sustainable dissemination

(Glasgow et al., 2019; Glasgow et al., 1999). Adaptation activities were guided by the five key outcomes of the RE-AIM Framework: reach, effectiveness, adoption, implementation, and maintenance (Glasgow et al., 2019; Glasgow et al., 1999). A feasibility trial of the adapted program was conducted to examine the impact of the telehealth *Yoga for Seniors* program compared to a waitlist comparison group on fear of falling, occupational performance, and social isolation. The results of the pilot study will be presented in a future report. The study was approved by the University’s Institutional Review Board (protocol number 2021-1278) and was registered in Clinicaltrials.gov (NCT05287529). Participating sites were in counties that were identified as Rural Health Grant eligible by the United States Health Resources and Services Administration (Health Resources & Service Administration, 2022).

Original Program Description

The original *Yoga for Seniors* was a 12-week program developed for rural-dwelling older adults (Smith et al., 2017; Hamrick et al., 2017; Oestreich et al., 2021). Based on Hatha yoga, the program reduced self-reported falls and improved measures of balance. Participants met as a group two times a week for 75 minutes at a local site. In addition, participants were asked to complete 20 minutes of daily yoga at home. The program offered poses that did not require getting up and down from the floor and used a chair within arm’s reach for balance and stability. Each session followed the same structure: 1) time to collect attendance, falls information, answer questions, 2) community sharing time for thoughts and comments on the class and the instructor to provide an overview of the specific class

structure, 3) centering discussions of the specific class theme and focusing class attention to the present moment, 4) 45-minutes of yoga, and 5) relaxation. Instructors also provided guidance on the specific poses for the daily independent yoga practice.

Collaborator Engagement and Program Adaptation

Adaptation of the *Yoga for Seniors* program was built on the lessons learned and participant feedback received during the implementation of the original program. The project was a continuation of an ongoing partnership with a collaborative team that included yoga practitioners and representatives from five Wisconsin Aging and Disability Resource Centers (ADRCs). ADRCs provide services to support older adults related to healthy aging, serve as centralized connection points for older adults, and are potential adopters and disseminators of the program. This group worked together to respond to the funding announcement and made initial adaptations based on data from the previous *Yoga for Seniors* offering. The grant supported funding for the academic research team and the community collaborators which included the ADRC sites, yoga developer, and yoga instructors.

After receiving the notice of funding, an initial planning meeting with all partners was held, followed by discussion groups with each ADRC site and the yoga practitioners. Five discussion groups with ADRC site leaders were completed. Discussions focused on identifying site-specific modifications required for telehealth delivery and adaptations to existing protocols that increased the likelihood of future long-term adoption by the sites. Table 1 provides a summary of the discussions.

Topics	Discussion Summary
Adoption and sustainability	<ul style="list-style-type: none"> • Program has the potential to fill a need for accessible physical activity programming in the community • Site specific modifications needed for telehealth delivery including organizational needs such as staff training and resource needs, changes needed for long term adoption by the organization, data sharing
Recruitment and screening	<ul style="list-style-type: none"> • Site specific engagement and recruitment strategies identified, included emailing listservs, using flyers, announcements in local media, development of timelines • Developing a protocol that clearly delineated the role of the site staff in recruiting and screening interested community members in the program • Developing guidance for site staff responding to community member questions regarding participating in a research study, program requirements, timeline
Program Implementation	<ul style="list-style-type: none"> • Sites shared prior experiences in providing virtual programming, focusing on characteristics of successful past programming such as length, mode, frequencies of sessions as well as strategies that were most effective for the communities served • Developing a protocol that delineated the role of site staff in program implementation • Sites identified strategies to minimize technology challenges
Research and Data Collection	<ul style="list-style-type: none"> • Review of included data points being collected and data collection protocols, safety concerns related to the COVID19 pandemic • Data sharing and the role of the community site staff in data collection and research activities

Two discussion groups were held with the yoga teachers and the *Yoga for Seniors* program developer. Discussions included program delivery and content, standardization

across sites, quality control procedures, and issues related to telehealth program delivery. Because the developer and three of the five yoga teachers had previously taught yoga

via an online format, discussions were largely focused on best practices, intervention standardization, and sharing strategies for increasing the likelihood for successful implementation. Zoom video conferencing software was the preferred software by the community partners and was used for meetings, trainings, and program implementation (Zoom Video Communications, n.d.). Considerations around utilizing available features in the teleconferencing software such as Spotlight, hosting responsibilities, monitoring attendance, and research-related responsibilities were discussed.

Adapted Intervention Description

Summary reports of the discussion groups were developed, and the results were combined with feedback from prior program data to inform the adaptation. Adaptations to the study protocol centered on maintaining safety for the participants and research team during the ongoing COVID-19 pandemic. First, data collection protocols and plan data measures were modified so that all data collection visits were contactless due to the pandemic. Data collection was completed via mailed questionnaires and videoconferencing sessions to facilitate safe participant and research team interactions. Therefore, all gait and balance measures from the previous studies that required in-person measurement were removed. The second significant adaptation was the reduction of the program length from 12- to 8-weeks. All community sites noted that most of their health promotion programs are 8-weeks with past experience showing less demand for longer programs by community members. An additional week, or a “Zero Class” was added before the first yoga class to help mitigate technology challenges. This class was co-led by the research staff member and yoga teacher and attended by the community site representative. The class focused on participants meeting and getting to know the yoga teacher and other program attendees and to become oriented to and practice using the technology. The decision to keep the yoga program group-based and to offer synchronously was made early in the adaptation process. Prior research shows that group classes in online settings can potentially improve social connections within the group which can improve program experience (Smith et al., 2018; Turcotte et al., 2024). Therefore, in addition to the “Zero Class” activities, each session began with a community building and participant engagement component. Because the original in-person program included a social component that was well-received by program participants, the community building activities were aimed to replicate this component.

Adaptations made to the telehealth delivery program based on feedback from the yoga practitioner group and informed by best practices reported for online learning such as using strategies to effectively communicate, minimize technological challenges, and ongoing and proactive monitoring of participant engagement (Roddy et al., 2017). Specific adaptations included, 1) removal of daily independent practice as practitioners felt that participant safety could not be optimized during online sessions in a way that lent itself to a positive home practice; 2) addition of a “Zero Class” or “introduction meeting” to address

issues such as placement and positioning of the camera, computer, mat, and chair as well as the different roles of the study team; 3) inclusion of a “talk with your teacher” to provide an opportunity for participants to share any individual limitations or concerns with the yoga teachers; 4) finally, all participants were asked to keep their Zoom line unmuted during the sessions to facilitate time-sensitive questions and to better enable participant monitoring for unexpected or health events.

The final intervention consisted of group yoga sessions led by an instructor on Zoom. Sessions were started and hosted by a member of the research team along with a local ADRC site representative. Due to staffing shortages and COVID-related time commitments, the local representative was not required to attend all sessions but was asked to do so as frequently as possible. This observer role was another adaptation made for the telehealth version to provide a familiar face that welcomed participants, addressed any community-specific concerns, helped the yoga instructor and participants with technical issues, and assisted the yoga instructor if a participant experienced a health emergency during the session. The community site representative and the research team staff led the Zero Class, which was designed to build consistency and familiarity within the group. Whenever possible, the same staff person stayed with their assigned community group throughout the program. When a staff substitution was made, the individual filling-in was introduced to the individuals in the yoga class the week prior to facilitate familiarity and continuity of programming.

In addition, participants were provided with materials to support their learning and continued yoga practice after the study. The *Yoga for Seniors* developer created a course on Canvas, a web-based learning management system, that provided session materials with videos showing poses and sequences of poses. Corresponding materials for program sessions were made available each week. Participants continued to have access to the site after the end of the program.

Program Implementation

After the program was finalized, follow-up site meetings were scheduled with the research team, ADRC site leader, and yoga instructor. These meetings focused on introducing the community site to their yoga teacher, finalizing schedules, and reviewing the final program content, training protocol, and data collection protocols. During these meetings, site-specific recruitment strategies were reviewed and final discussions regarding program content and implementation strategies were completed.

Yoga Teacher Recruitment and Training

Certified and experienced yoga instructors were recruited. Instructors who were recruited had completed the Duke University Integrative Yoga for Seniors Professional Training, which focused on the delivery of yoga to an older adult clientele. Seven individuals originally expressed interest in teaching for the program. Five individuals who

had prior experience teaching yoga to older adults and were able to teach online classes during the daytime hours were selected. All five individuals completed the 40-hour teacher training sessions. After training, one withdrew due to unexpected caregiver responsibilities. The remaining teachers were matched to a site and worked primarily with that site during the study period.

The teacher training was a hybrid model delivered via Canvas that included interactive virtual group trainings, individual check-ins, and self-paced online training. All teachers were required to complete a series of tests and practice videos prior to program implementation. Training materials were delivered during a mix of synchronous and asynchronous sessions and covered the following: 1) program overview, 2) research and background information; 3) program progression; 4) poses; 5) specific contraindications; 6) adaptations and using a specialized visual mat; 7) question and community chat. An additional module specifically addressed best practices for teaching yoga online.

Participant Engagement, Recruitment, Enrollment, and Data Collection

Each community site planned to offer two rounds of the adapted *Yoga for Seniors* program as part of the pilot feasibility study using a waitlist comparison group, with participants being assigned to the first or second offering. While most participants were randomized to either the first or second offerings, 11 participants enrolled in the study after the first offerings had begun. The study team decided that no interested community members should be turned away for this pilot study. Thus, these participants were enrolled and assigned to the second offering. These participants will be dropped for the main outcomes analysis. However, because the goal of this report is to describe the development of the intervention, data collected from all participants are included in this report.

Guided by best practices from the literature, recruitment plans were developed in consultation with the community sites (Carroll et al., 2011; Craike et al., 2018). Participants were recruited using site-specific strategies that included sending messages to email listservs, distributing study flyers, advertising in local media, and using snowball sampling. Due to COVID-19 related constraints, only four of the five sites recruited participants. Additionally, staffing shortages and COVID-related events placed significant strain on all community sites. Thus, recruitment protocols were updated to refer interested participants directly to the study team for initial contacts to minimize staffing constraints at the community sites.

Interested community members were screened for eligibility by the research team. Individuals were eligible if they were 60 years or older, had not participated in a yoga program in the last 6 months, were able to walk for 10 minutes, had a history of a fall or a fear of falling, and were able to attend most program sessions. Because of the online

program delivery, individuals were also required to have vision at or corrected to 20/40 or better and access to a stable internet connection.

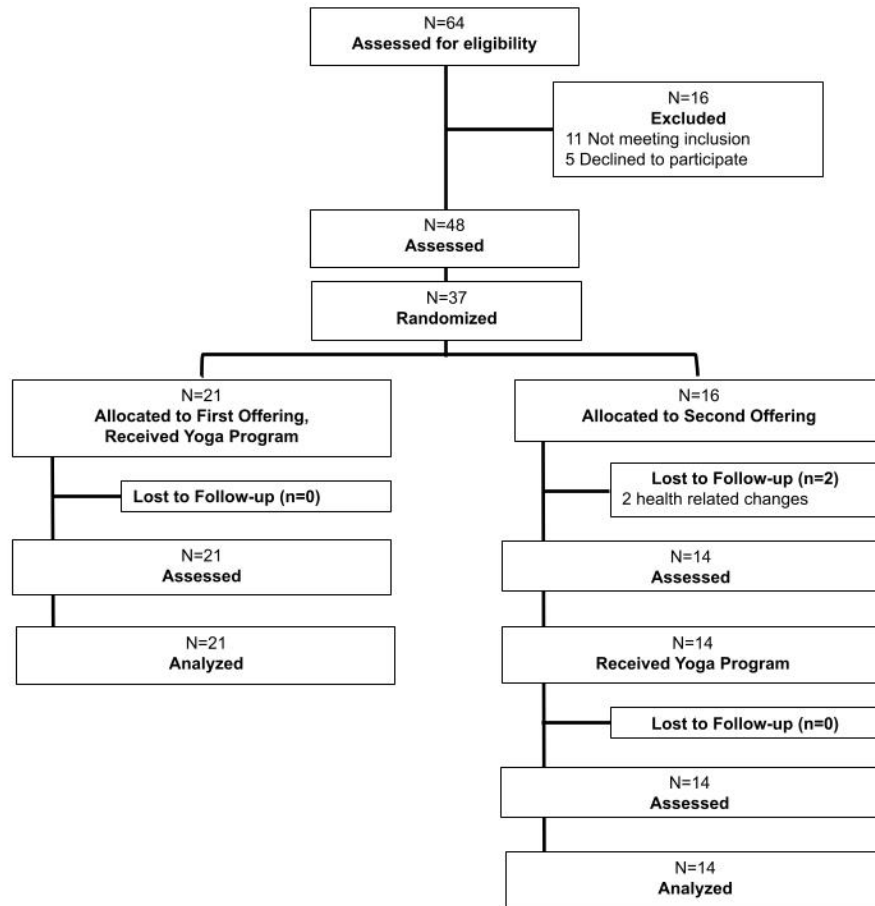
Eligible participants completed a virtual data collection study visit via Zoom. Before this visit, participants were mailed a baseline questionnaire packet which included a copy of the consent form. Informed consent was obtained via DocuSign© before or at the beginning of the first data collection session. Data were collected at pre- and post-intervention for participants assigned to the first program offering. For participants assigned to the second offering, data were collected at baseline, pre-, and post-intervention. Process measures were included in the final data collection. The data and implementation tracking metrics were guided by the RE-AIM framework, specifically reach (recruitment and retention strategies and rates, enrolled participant characteristics), effectiveness (working with our collaborator team to identify participant centered outcomes), adoption (work with our collaborator team to collect data that could inform organizational decisions to adopt or not adopt this program in the future), and implementation (session attendance data, regularly meeting with yoga instructors and session observers to identify implementation challenges early in the program, tracking modifications or adaptations made during implementation). The research team met with each yoga teacher prior to every session. In these meetings, the team discussed program progress, best practices, and challenges encountered delivering the yoga program. After the program ended, the research team met with the yoga teachers to better understand their experiences implementing the program. The research team also met with each collaborating organization's site representative to better understand their experiences in participating in the program, focusing on what worked well and aspects of the program to change in future offerings.

Results

Participant Recruitment and Enrollment

The study flow is presented in Figure 1. Sixty-four individuals were screened and 53 (86.9%) met eligibility criteria. Four individuals elected not to enroll following a discussion of the study and the consent form. One individual completed the consent but withdrew before baseline data collection. Table 2 presents the baseline characteristics of the 48 enrolled study participants by group assignment. Study participants were majority white (98%), female (85.7%), and attended some college or more (92%). 74.4% reported that this was their first time participating in research. The most frequently cited reason for enrolling in the program was interest in the benefits of yoga on balance and physical mobility, stress reduction, and increasing physical activity levels. Many cited that the program being offered via telehealth was a positive, noting the convenience of participating from their homes and not typically having access to a yoga program in their communities.

Figure 1. Study recruitment flowchart



	All N=48	First offering n=21	Second offering n=27
Age, mean ± SD	72.6 ± 6.6	71.8 ± 6.4	73.3 ± 6.8
White, n (%)	47 (98%)	21 (100%)	27 (96%)
Gender, n (%)			
Female	41 (85%)	17 (81%)	25 (89.3%)
Male	7 (15%)	4 (19%)	3 (10.7%)
Education, n (%)			
11th grade or less	0 (0%)	0 (0%)	0 (X)
12th grade, GED, or high school diploma	4 (8%)	2 (10%)	2 (7%)
Some college or more	44 (92%)	19 (90%)	25 (93%)
Income, n (%)			
No response	4 (8%)	0 (0%)	4 (15%)
<\$30,000	8 (17%)	5 (24%)	3 (11%)
\$30,000 – \$59,000	16 (33%)	8 (38%)	8 (30%)
≥\$60,000	20 (42%)	8 (38%)	12 (44%)

Of the 48 participants enrolled in the study, two withdrew prior to the intervention due to ongoing medical concerns. Two participants withdrew after completing three classes, citing that the class was not what they expected. 44 (91.7%) individuals completed the study. In total, 628 of the 748 or 84% of classes were attended by participants

with 35 (73%) participants missing one or more sessions. To note, the most reported reasons for missing a session or withdrawing from the study were unrelated to technology barriers. Rather, reasons were similar to those reported in health promotion programs such as competing life demands, such as dealing with medical issues for

themselves or family members (Craike et al., 2018; Galvim et al., 2019). No adverse events were reported during the program implementation period.

Results of the process evaluation

Responses from the process evaluation are presented in Table 3. Overall, participants were satisfied with the telehealth delivery method, program content, and yoga instructor. When asked what they liked about the program, participants most frequently noted the individual poses/postures, the instructor, that the program was site

specific, community/social aspects, home delivery, and breathing/meditation components. When asked what they disliked about the program, most participants did not report any items. The participants who responded to this question listed the time sessions were offered, the length of session time spent on community building or “chit-chatting”, difficulty with mirroring the movements on the computer screen, technology/internet limitations, and hearing the instructor. Younger participants were more likely to note that the pace of the class was too slow, too much time was spent correcting individual participant poses, and too much time was spent on poses that were not challenging.

Overall satisfaction with the yoga program, n (%)	
Extremely satisfied	24 (62%)
Somewhat Satisfied	13 (33%)
Neither satisfied nor dissatisfied	1 (3%)
Somewhat dissatisfied	0
Extremely dissatisfied	1 (3%)
Satisfaction with the yoga content, n (%)	
Extremely satisfied	23 (59%)
Somewhat Satisfied	13 (33%)
Neither satisfied nor dissatisfied	3 (8%)
Somewhat dissatisfied	0
Extremely dissatisfied	0
Satisfaction with online delivery, n (%)	
Extremely satisfied	28 (72%)
Satisfied	7 (18%)
Neither satisfied nor dissatisfied	2 (5%)
Somewhat dissatisfied	1 (3%)
Extremely dissatisfied	1 (3%)
Would recommend the program to a friend, n (%)	
Extremely likely	30 (77%)
Somewhat likely	5 (13%)
Neither likely nor unlikely	2 (5%)
Somewhat unlikely	1 (3%)
Extremely unlikely	1 (3%)
Felt comfortable with the yoga teacher, n (%)	
Always	31 (79%)
Most of the time	5 (13%)
About half of the time	2 (5%)
Sometimes	0
Never	1 (3%)
Yoga teacher knew the program, n (%)	
Excellent	34 (87%)
Good	2 (5%)
Poor	3 (8%)
Yoga teacher provided easy to understand instructions, n (%)	
Strongly agree	31 (79%)
Somewhat agree	6 (15%)
Neither agree nor disagree	0
Somewhat disagree	1 (3%)
Strongly disagree	1 (3%)
How challenging was the yoga program, n (%)	
Extremely easy	3 (8%)
Somewhat easy	9 (23%)
Neither easy nor difficult	11 (28%)
Somewhat difficult	15 (38%)
Extremely difficult	1 (3%)
Will continue practicing yoga learned after the program, n (%)	
Extremely likely	16 (41%)

Somewhat likely	19 (49%)
Neither likely nor unlikely	0
Somewhat unlikely	4 (10%)
Extremely unlikely	0
Satisfaction with the length of the program (8-weeks), n (%)	
Far too little	1 (3%)
Slight too little	7 (18%)
Neither too much nor too little	27 (69%)
Slightly too much	4 (10%)
Far too much	0
Satisfaction with the duration of the program (75-minutes), n (%)	
Far too little	0
Slight too little	1 (3%)
Neither too much nor too little	24 (62%)
Slightly too much	14 (36%)
Far too much	0

Across all participants, there were mixed findings on the program length and session duration, with over 60% reporting that 8-weeks and 75-minutes were “Neither too much nor too little”. In addition, participants provided mixed feedback on their preference for the mode of future program offerings. As an aim of this pilot program was to better understand participant preferences of future health promotion programming formats, a question was included to assess preferences regarding online, in-person, or hybrid formats. Participants reported liking both the telehealth and in-person formats, preferring online delivery for location flexibility, COVID-19 safety reasons, and not having to travel, but preferred the in-person format for the social aspect, ability to better communicate with the yoga instructor during the session, and the ability to facilitate community building. Winter weather considerations were repeatedly listed as a consideration for use of telehealth. 58% of participants reported that they were able to access online content and yoga videos at home from the Canvas platform. Most participants who did not access the online content had not attempted to access Canvas due to little or no interest in creating an account in a web-based learning management system.

Discussions with the yoga teachers focused on aspects of the program that worked well and recommendations to improve the program for future offerings. These included the impact of the “zero class” to troubleshoot technology issues with participants and begin the community building process within the group. Having a second observer present during the sessions helped to facilitate community building and participant engagement. During the sessions, this second observer allowed the instructor to focus on the students. The observer was available to help with technology problems, any other unexpected issues, and to help the instructor monitor participants for potential safety concerns during the session. Improvements and recommendations for future offerings focused on the lessons learned regarding computer setup and equipment needed to create the best environment for the instructors such as providing second computers, additional monitors, and microphones.

Finally, due to the ongoing pandemic, implementation protocols aimed to minimize program burdens on the site staff. Discussions with collaborating organization’s site representatives found that serving as a local contact for the community members to answer questions, address concerns, and to distribute program materials was helpful in building trust with the community members. Several sites provided additional technical and resource support to their site participants. However, all site representatives noted that the requirement to serve as a second observer for future programs would place a significant burden on the current site staff members. While many site observers attended as many sessions as their schedules allowed, research staff served as the second observers for all sites. Discussions focused on the need for future program offerings have adequate resources available to fund the observer to avoid asking already overburdened staff to serve in this capacity.

Discussion

Working with community-based organizations that serve rural older adults, community members, and yoga instructors, our team collaboratively adapted and implemented a telehealth-based yoga program designed for older adults. While the primary components of the original *Yoga for Seniors* program (poses, sequence, and pace) were not altered, key telehealth adaptations included adding an extra day of programming, including an additional staff member, creating online supplemental materials, and removal of the home practice component. Unplanned changes made during program implementation were mostly related to recruitment challenges because of the COVID-19 pandemic. The adapted program appears to be safe and was widely accepted by the participants, indicating that home-delivery yoga programming for older adults via telehealth may be an alternative option for rural communities that have limited access to trained yoga instructors and facilities.

The adaptation and implementation of the telehealth version of the *Yoga for Seniors* intervention provided insights that will inform future iterations of this and other health programming for rural communities. While the older

adults enrolled in the program were generally well versed in the use of Zoom and their digital devices, the addition of a “Zero Class” provided a chance for the team to troubleshoot technology issues with participants, work on camera positioning and begin the community building process. These three components are particularly important for telehealth delivery as technology interruptions can disrupt the flow of the program, feedback from the instructors is a vital component of participant safety, and community building has been shown to address loneliness and social isolation. The Zero Class filled a need that was similar to the informational video classes provided by Baumeister and colleagues to increase acceptance of a telehealth pain intervention for older adults (Baumeister et al., 2015). This type of orientation class may be particularly important for programs intended for older, rural-dwelling adults as they may have additional challenges such as less familiarity with yoga and less experience with internet navigation and videoconferencing. Additionally, providing an individual who served as a point of contact and was present at all sessions appeared to improve the overall delivery of the program. Having a second person observing the class sessions was important and allowed the yoga instructor to focus their attention on their students. The observer role included reaching out to absent participants at the beginning of the class to ensure that they were not having technical issues joining the class. During class, the observer monitored for safety events and dealt with unexpected issues as they happened so the yoga teacher could focus on teaching the content. In future iterations of physical activity programming delivered via telehealth, the instructor or member of the community site will likely serve in this role; however, for research projects, the individual that makes initial contact with the participant may be best fit to provide a consistent point of contact. It was invaluable to have local community organizations involved during all phases of the program, from the inception of the grant, program adaptation, and implementation. The community partners were actively involved in developing strategies to engage and recruit community members, provided input on study protocols, and served as a local contact for distributing program materials. Several sites provided technical assistance to community members, with one site purchasing and loaning participants tablet stands. The trusted and known site representative was available to serve as a local connection point to answer initial community member questions regarding the program and research process before referring participants to the research team for further details. The impact of a community’s existing public health infrastructure as well as impact of resources on the successful delivery of health promotion programs has been documented in the literature (Smith et al., 2018). It is vital to the success of future programming that implementation models consider the current and projected levels of commitment from rural community organizations. Staffing shortages, the pandemic, and the increasing number of rural older adults aging in place, especially those in need of additional supports, have significantly increased the financial load and time commitments of community organizations that serve this population. To address this, physical activity programs delivered via telehealth must be

able to work with these agencies and adapt programming. The potential for these adaptations is vast and may include everything from the inclusion of site personnel in daily class delivery to relying on local organizations for planning and recruitment activities.

The telehealth delivery of the yoga program received both positive and negative feedback from the participants. Collecting data by videoconference was a potential barrier to program enrollment for some community members. One potential participant declined program enrollment because of difficulties using the video conferencing software. However, the virtual data collection visit likely helped to orient program participants who were less familiar with the technology and provided an additional opportunity for practice before the yoga classes. Additional technology issues encountered during program implementation were similar to those encountered by other telehealth and virtual health programs (Addington et al., 2018; Chang et al., 2021; Speyer et al., 2018). For example, one participant traveled to a second location with a better internet connection, while three participants missed sessions because of interrupted connections. However, participants appreciated that they were able to attend classes while traveling or during days when winter weather impacted travel. Our experiences are similar to other groups developing a health promotion program for telehealth delivery (Speyer et al., 2018). For example, in a study evaluating the effectiveness of tai chi programs delivered in-person, via telehealth, or by home-based videos, participants cited similar advantages of the telehealth delivery mode such as the ability to still meet as a group, the convenience and flexibility of location, and not requiring travel in bad weather (Wu et al., 2010). Moreover, the study found that participants preferred the in-person and telehealth versions over the home-based video versions. Further examination of findings showed that the social support received from the in-person and telehealth versions may have increased participant retention compared to the home-based video program (Wu et al., 2010). In another feasibility study examining a telehealth yoga program for people with heart failure and chronic obstructive pulmonary disease, participants noted that the flexibility in program location increased access and their ability to participate in the program (Selman et al., 2015).

Technology also afforded benefits and barriers to implementation that should be considered during adoption. For example, visibility and sound challenges were encountered during implementation. For some sites, instructors and participants found it challenging to balance camera positions so that the students could see the instructor versus positioning the camera so that the teacher could clearly see the students’ movements. Numerous participants also cited mirroring of the instructor’s movements as an area of difficulty as the instructor would verbally state “right arm” but then move the arm on the left side of the screen (instructor’s right arm on the left side of the participant’s screen). Additional practical considerations included equipment needs for instructors and participants to minimize distractions during class. For example, yoga instructors needed a microphone and a

second computer to be the most effective. Teachers who were able to implement a two-computer adaptation found that having one Zoom log-in dedicated to seeing the participants and another dedicated to providing optimized camera placement for the participants to see the demonstrations improved the teaching experience. For participants using tablets, stands were needed to achieve proper camera placement. Multiple studies have found similar challenges regarding technology (Addington et al., 2018; Selman et al., 2015). Specifically for group yoga and physical activity programming delivered via video conferencing, interventionists and participants may need additional training and equipment to reduce these barriers. Equipment such as larger or second screens for the instructors, better microphones and audio systems, stands for tablets, having a dedicated person to help troubleshoot technology issues, or providing internet access could reduce or prevent some of these challenges. For our program, the second observer attending the sessions was able to serve multiple important roles, including being available to troubleshoot and assist with technology and other issues so that the yoga instructor could focus on the yoga content. While the need for additional staff may be a limitation, future offerings could fill this role with volunteers, teachers in training, or local community organizations, depending on available resources.

Finally, feedback received for the *Yoga for Seniors* content indicated that while telehealth delivery increased access to additional community members, the program as designed may not be challenging enough for more mobile or already physically active community members. This is similar to challenges encountered by other telehealth programs, where the online format can make it more difficult to provide an individually tailored program in a group class (Addington et al., 2018). Moreover, our solution of using the Canvas Learning Management Software system to provide access to the program content beyond the program's end was not an acceptable strategy with only 58% of participants accessing the materials. Other strategies to support participants in sustaining yoga practice beyond the program are needed for future offerings.

Our study has several limitations. Data were self-report with the risk of information biases such as recall and social desirability bias. Our study was based in one geographic area, limiting generalizability to other rural communities outside of the Midwest. Individuals who self-selected into the program were mostly women, possibly limiting generalizability to men. Finally, our sample had higher education and income levels compared to rural Wisconsin communities.

In summary, telehealth yoga programs that are tailored for older adults in rural communities have the potential to be scalable and accessible for communities that may not have access to trained yoga teachers or facilities. Community organizations that will ultimately disseminate the program, yoga teachers, and potential program participants were engaged to maximize the feasibility of this community-based telehealth exercise program. Our

approach may be helpful for other communities seeking to adapt evidence-based health programs to a virtual environment with a goal of improving sustainability and dissemination.

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Conflict of Interests

P. Mross is the founder and CEO of Happy Wellness. Mr. Mross created the *Yoga for Seniors* program and oversaw program implementation for this study. Other authors have no conflict of interests to disclose.

Author contributions

Conceptualization: SJA, PM, MM, KAP; Methodology, SJA, KAP.; Investigation, SJA, KAP; Writing – Original Draft: SJA, KAP; Writing – Review & Editing, SJA, TC, PM, MM, AMM, KAP, Funding Acquisition, KAP; Supervision: SJA, KAP; Project administration: SJA, PM, MM, AMM, KAP

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