

RESEARCH

Effectiveness of Virtual Delivery of the Build Your Bones Curriculum

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Abstract

Bone health is essential for quality of life and lifelong independence. The Build Your Bones curriculum, designed for the prevention of osteoporosis and adapted to include fall prevention and balance improvement, was piloted as a seven-session virtual series. Post-session evaluations supported knowledge gain, whereas the post-series survey showed bone-friendly lifestyle outcomes related to dietary intake, physical activity, strength training, balance, and posture, as well as positive steps toward personal health, such as reducing fall hazards and requesting vitamin D and bone mineral density testing. Delivering Build Your Bones as a virtual program effectively supports bone health knowledge and behavior change.

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Osteoporosis is viewed as a disease of aging. Bone mass peaks in young adulthood, followed by a gradual loss as we age, with an acceleration at menopause in women (Karlamañgla et al., 2018) and late middle age in men (Laurent et al., 2019). This timeline of disease development provides a lengthy window for primary and secondary prevention efforts. Although genetics influence susceptibility to osteoporosis (Yang et al., 2020), lifestyle factors are critical for ensuring maximal bone accrual (Weaver et al., 2016) and slowing the progression of bone loss and resulting fractures (Lewiecki et al., 2020). The numerous lifestyle factors that impact bone health, including diet, exercise, body weight, smoking, and alcohol intake (de Villiers & Goldstein, 2022), are modifiable through community programming that promotes goal-setting and behavior change. The deleterious impacts of osteoporosis and related fractures on quality of life (Dziedzic et al.,

2022; Wilson et al., 2012), together with the high costs of treating fractures, caring for these patients, and lost productivity (Lewiecki et al., 2019), support the need for targeted Extension programming to reduce the disease burden. Extension programming has been delivered face-to-face for over 100 years. However, the COVID-19 pandemic lockdown shook this foundation, resulting in a rapid shift to online programming (Dorn et al., 2021). Although challenging, the pandemic precautions highlighted the ease, reach, and low cost of online programming and its efficacy for disease prevention and management. For example, Family and Consumer Sciences (FCS) Extension successfully implemented a virtual National Diabetes Prevention Program during the pandemic (Wilson et al., 2022). Likewise, healthcare and education provide additional examples of successful virtual program delivery, such as a human immunodeficiency virus (HIV) pre-exposure prophylaxis program (Patel et al., 2022) and physical activity and nutrition education delivery (Whalen et al., 2021). However, the target audience for virtual education delivery requires consideration to determine its feasibility and effectiveness across age cohorts.

Healthy lifestyle choices are critical to bone health through the stages of life; however, urgency and interest in osteoporosis and prevention of fractures are typically greater in an older adult cohort. Although educational interventions have been shown to increase the knowledge of older adults regarding osteoporosis (Gai et al., 2020), the effectiveness of virtual program delivery requires evaluation. Given that many older adults have smartphones, do online banking (Wild et al., 2019), and are comfortable with online video conferencing platforms such as Zoom (Vincenzo et al., 2021), it was hypothesized that virtual delivery of a bone health program would be feasible and effective in eliciting positive behavior change.

Objective

This study aimed to assess the effectiveness of virtual delivery of the Build Your Bones curriculum on bone health knowledge, intentions, and behaviors of middle-aged and older adults.

Methods

Curriculum Development

The Build Your Bones curriculum was initially developed to target middle-aged women with a focus on the prevention of osteoporosis. However, local delivery of the program suggested that many attendees were older women and men who had already developed osteopenia or osteoporosis. The series was adapted over time to include more fall prevention and balance improvement to better serve this audience. The curriculum was delivered face-to-face statewide in Florida in 2019 and, following, updated with the most recent evidence-based content. In collaboration with dietetic faculty and graduate students in the Food Science and Human Nutrition Department, University of Florida, the program was evaluated using an adaptation of the Society for Nutrition Education and Behavior (SNEB) MyPlate e-Catalog review form. The revised curriculum has seven, one-hour lessons (Lesson 1: Osteoporosis Overview, Lesson 2: Screening and Medications, Lesson 3: Eating Tips for Your Bones, Lesson 4: Nutrition for Bones Health, Lesson 5: Bone Builders and Bandits, Lesson 6: Staying Strong, and Lesson 7: Physical Activity and Bone Health). Lessons include a lesson plan, key points, a PowerPoint presentation, take-home messages, interactive activities, and handouts.

Virtual Programming Evaluation

The Build Your Bones curriculum was delivered during the noon hour using the Zoom platform by a team of 14 FCS Extension agents, serving as presenters and co-moderators in April and May 2022. Post-session surveys examining session-specific perceived knowledge gain and intended behavior changes were sent via Qualtrics® to all attendees. Additionally, a 4-month post-series survey queried if participants had taken steps to improve or maintain bone health and if they perceived improvements in their health or wellness due to attending the virtual Build Your Bones program. The

study was approved by the University of Florida Institutional Review Board 2 (IRB201900131). Following program delivery, members of the FCS team reflected on the successes and challenges of virtual program delivery.

Results

The Build Your Bones virtual series (7 sessions) attracted 280 synchronous-session participants with an average attendance of 40 for the single cohort, ranging from 49 (first session) to 34 (final session). Twelve out-of-state attendees (potentially duplicated participants) joined a session.

Osteoporosis Overview

Following Lesson 1, Osteoporosis Overview, survey respondents (n=32) agreed or strongly agreed that they increased knowledge of osteoporosis (81%), who is at risk (84%), the most common fracture sites (94%), and the risk factors (88%). Additionally, most respondents reported increased confidence in assessing their personal risk of osteoporosis (91%). When asked about intent to change behaviors related to personal risk factors, most respondents reported that they intended to increase calcium intake (63%) and exercise (72%).

Screening and Medications

Following Lesson 2, Screening and Medications, survey respondents (n=27) agreed or strongly agreed that they increased their knowledge of screening for osteoporosis (93%), medical conditions that affect bone health (96%), medications that contribute to bone loss (96%), and medications used to treat osteoporosis (96%). All respondents agreed or strongly agreed that they had increased confidence related to steps they can take to strengthen their bones. Respondents intended to discuss with their health-care provider how their medications may affect their risk for osteoporosis (56%) and fracture (44%). Additionally, 30% of respondents intended to get a bone density test.

Food and Nutrition

Three sessions focused on food and nutrition topics related to bone health. In response to Lesson 3, Eating Tips for Your Bones, respondents (n=32) agreed or strongly agreed that they increased knowledge on the importance of “food first” for the prevention of osteoporosis (88%), calcium supplements (91%), medications that interfere with calcium absorption (81%), and risk factors for vitamin D deficiency (88%). They reported increased confidence related to steps they can take to ensure adequate calcium and vitamin D intake (91%). Respondents intended to choose ‘bone friendly’ foods more often (81%), check the labels of their vitamin and mineral supplements (66%), increase calcium (59%) and vitamin D intake (47%), and get their vitamin D blood level checked (34%). Following Lesson 4, Nutrition for Bone Health, respondents (n=24) indicated increased knowledge of the MyPlate eating pattern (96%), calcium requirements (100%), food sources of calcium (100%), vitamin D requirements (100%), and food sources of vitamin D (100%). Respondents intended to choose magnesium-rich (71%) and calcium-rich foods (88%) and sources of vitamin D more often (75%) and to decrease their intake of processed foods with phosphorus additives (67%). Following Lesson 5, Bone Builders and Bandits, respondents (n = 21) agreed or strongly agreed that they increased knowledge of how beverage choice affects bone health (100%), sodium intake impacts the risk of osteoporosis (86%), dietary fiber affects calcium absorption (95%), foods high in oxalates (95%), and protein and bone health (90%). Respondents intended to choose foods high in dietary fiber more often (57%), more nutrient-dense foods to support bone health (81%), and cola beverages less often (29%).

Balance and Physical Activity

Body movement was a theme addressed through most lessons. Lesson 4 concluded with a virtual demonstration of yoga poses; 71% of survey respondents intended to practice yoga poses, and most increased confidence in performing yoga poses for balance (96%). Similarly, in Lesson 5, simple stretches were performed; 76% of survey respondents

intended to stretch more often, and 95% reported increased confidence in performing simple stretches. After attending Lesson 6, Staying Strong, respondents (n=18) agreed or strongly agreed that they increased their knowledge of posture and alignment (78%), risks of falling (94%), the importance of improving balance (100%), and ways to avoid falls (100%). Additionally, they agreed or strongly agreed with “increased confidence related to steps I can take to stay strong” (94%). Respondents intended to reduce fall hazards in their homes (67%), improve their posture (78%), practice balance exercises (100%), and install a safety feature in their homes (22%). Following Lesson 7, Physical Activity and Bone Health, respondents (n=22) agreed or strongly agreed that they increased their knowledge of weight-bearing exercise (95%), training and resistance training (95%), physical activity guidelines for different life stages (95%), and exercising safely with osteoporosis (95%). Many noted increased confidence in setting up a home fitness center (77%). Survey respondents intended to increase bone-building exercises (82%), try an exercise they enjoy and fits into their life (64%), hydrate more often when exercising (55%), exercise safely with osteoporosis (42%), and purchase hand-held weights (18%).

Post-series Evaluation

Respondents (n=22) to the post-program surveys represented 12 Florida counties. Participants were asked, “As a result of attending the Build Your Bones educational series, have you taken any steps to improve or maintain your bone health?” Of the respondents, 91% (n=20) responded positively with a “yes.” In response to “Which steps have you taken to improve or maintain your bone health?” respondents indicated making many behavior changes (see Table 1). None of the participants noted that they had quit smoking or changed their behavior regarding adhering to their osteoporosis medication instructions, and these options may not have been applicable. When asked if they had any improvements in health or how they felt due to attending the Build Your Bones program, respondents noted: “More exercise,” “Trying to reduce my weight little by little,” “I feel a difference since taking vitamin D on a regular basis,” and “better posture and balance.” Concerning the quality of their overall experience during the Build Your Bones educational series, 65% reported excellent, 30% good, and 5% average. Respondents indicated they

were extremely (80%) or somewhat likely (20%) to recommend the Build Your Bones series to a friend, family member, or co-worker. Finally, participants were asked to provide any comments or suggestions for the Build Your Bones educational program. One respondent stated, "This is a great program. I learned a lot about what affects bone strength. I will now be more diligent about taking my calcium and D3." Another respondent commented, "We are having a bathroom redone and didn't even think of the grab bar. Thanks for the idea!" Additionally, one participant responded with the following comment:

This class was an awakening for me. I have always had high [intakes] of vitamin D and calcium. However, I now have developed osteopenia and my vitamin D levels were extremely low. I am taking some of the tips from the program and using them hoping to improve or stay the same, not get worse! Thank you for the program.

Suggestions for program improvement included adding details regarding food sources of calcium for a vegan diet and enhancing the yoga demonstration. Additionally, one participant noted that the section on label reading, specifically interpreting Daily Values, was confusing and, thus, requires additional explanation and clarity.

Discussion

Overall, the virtual delivery of the Build Your Bones curriculum resulted in knowledge gain, intention, and behavior change supportive of bone health. These findings agree with a recent systematic review concluding that education increased knowledge of osteoporosis in older adults (Gai et al., 2020). However, the present program may have been more comprehensive than those reviewed, as the content not only covered osteoporosis but added education on food and supplement choice, balance and fall prevention, and physical activity. The virtual delivery of this health and wellness program proved to be feasible, as has been previously demonstrated by healthcare delivery (Li et al., 2021) and mental health support programs (Taylor et al., 2020).

Excellence in health and wellness programming requires continued reflection and improvement, including timely curriculum revision. Team reflection, along with the participant evaluation process, identified several points for consideration. It was suggested to have a yoga professional demonstrate balance poses for potentially high-risk participants. Given the logistical and cost implications of securing a yoga professional for future program delivery, team members instead agreed to develop succinct balance and stretching videos for use in future virtual program delivery. There was consensus among team members that incorporating more interactive activities during the sessions would add value to the program. Increased interaction, although challenging in a virtual format, may help to reduce attendance attrition. However, the attrition may also have been due to the number of sessions or relative interest in session topics. Additionally, team members suggested that developing lesson-specific fact sheets might strengthen the program and be particularly useful for future in-person delivery of the program. A final consideration was related to participant goal setting. Although there was agreement on the importance of goal setting and follow-up to increase the effectiveness of the program, there was not a team consensus as to whether time for participants' goal sharing should be implemented for future virtual program delivery, primarily given time constraints. Real-time polling may be a more time-efficient, interactive activity to satisfy the perceived need for participation and goal setting, and may possibly contribute to program evaluation.

The virtual Build Your Bones program evaluation included a post-session and post-program participant reflection on perceived knowledge gain, intention, and behavior change rather than a pretest-posttest knowledge-based design. The current expectation for Florida state-wide Extension programming is that county faculty write their knowledge gain (short-term intended outcomes) objectives as the number of participants or percentage of participants who increase their knowledge by at least a specified percentage, based on pre and post-test scores. Thus, the current program evaluation may need to be revised to meet the expectations of the Florida Extension administration. However, evidence suggests that a retrospective pre-test may be more appropriate for perceived knowledge and abilities than a pretest-posttest design impacted by response shift bias (Drennan & Hyde, 2008).

Furthermore, there may be unintended effects of anxiety due to testing and test failure, which has been shown to impact memory (Cavuoto et al., 2021), a potential problem for an education program. Such anxiety may be lessened if test data are collected anonymously without sharing the results with participants. Still, additional steps would be needed to match individual responses to the pre and post-tests.

In conclusion, the Build Your Bones virtual program, delivered by a cohesive team of FCS agents, provided thorough and effective coverage of bone health topics. Participants who responded to the evaluation surveys felt they received the information they needed to empower lifestyle change. Future work is required to evaluate the in-person delivery of the Build Your Bones program, with and without the addition of hands-on learning experiences such as cooking and taste-testing of bone-friendly foods, as well as group-based balance and stretching activities.

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Table 1

Behavior-change items selected by Build Your Bones program participant survey respondents at 4 months post-program.

Behavior change	Number of responses
I choose more nutrient-dense foods to support bone health	5
I choose less processed foods more often	4
I choose foods high in calcium more often	5
I choose foods high in vitamin D more often	3
I reduced my cola beverage consumption	3
I started taking a calcium and/or vitamin D supplement	2
I read labels on vitamin/mineral supplements	2
I increased my physical activity level	5
I adopted new strength-training exercises	4
I adopted new balance or posture activities	4
I stretch more often	3
I hydrate more often when exercising	1
I exercise more safely due to my osteoporosis	1
I reduced fall hazards in my home	2
I had my vitamin D blood level checked	2
I had a bone density screening	3
I discussed with my health care provider about my osteoporosis/fracture risk and/or related medications	1
I reduced my alcohol intake	1