



*Original Research*

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## **Impact of 10-Week Evidence-Based Falls Prevention Program on Outcomes Related to Falls Risk in Community-Dwelling Older Adults**

MARK A. SCHAFER‡, PAULA UPRIGHT‡, JANA L. MICHALIK†, and K. JASON CRANDALL‡

School of Kinesiology, Recreation & Sport, Center for Applied Science in Health & Aging, Western Kentucky University, Bowling Green, KY, USA

†Denotes graduate student author, ‡Denotes professional author

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### ABSTRACT

*International Journal of Exercise Science 16(7): 1131-1141, 2023.* This quasi-experimental study evaluated the impact of a 10-week evidence-based falls prevention program (Bingocize®) on self-reported fear of falling, general health, physical activity, social isolation, and avoidance behavior, in community-dwelling older adults in Virginia. Participants > 60 years of age (n= 481) attended Bingocize® group sessions twice per week for 10 weeks. The program combined conventional bingo with periodic strength, balance, flexibility exercises, and fall prevention education. Pre and post assessments gauged participants' self-perception of fear of falling, general health, physical activity, social isolation, and avoidance behavior. 481 participants attended at least 80% of the sessions. Following the intervention, paired sample t-tests revealed statistically significant improvements ( $p < .05$ ) in fear of falling, physical activity, social isolation, avoidance behavior, and yet there was no notable change in self-reported general health. The 10-week Bingocize® program appears to improve physical activity, social isolation, avoidance behavior, and fear of falling. Self-reported general health did not significantly change.

**KEY WORDS:** Aging, evidence-based practices, fall risk reduction, quality of life, physical activity

### INTRODUCTION

Falls are the leading cause of fatal and nonfatal injuries among older adults in the United States (27). Deaths from falls rose from more than 10,000 in 1999 to over 36,000 in 2020, with a total of more than 478,000 occurring among U.S. adults  $\geq 65$  during the 21-year study period (27). Falls threaten the safety and independence of older adults and lead to significant economic and personal costs. In 2015, the total financial cost of non-fatal fall injuries reached \$50 billion and is projected to exceed \$101 billion by 2030 (12,18). Many older adults, particularly those with poor general health, have an intense fear of falling, which may cause self-imposed restrictions on their physical and social activities. This can lead to further physical deterioration, depression, and social isolation (11,18). Nevertheless, falls are not inevitable and can be minimized by promoting

physical activity and encouraging older adults to implement home safety modifications, attend regular medical checkups, and properly manage their medications (6,14).

In response to the serious economic and personal consequences of falls among older adults, the United States Administration for Community Living (ACL) established the ACL Falls Prevention Resource Center. This initiative aims to support evidence-based falls prevention programs (EBFP) that are proven to reduce falls, fear of falling, and fall-related injuries in older adults (32). Qualifying organizations, such as Area Agencies on Aging, state departments on aging, and health care organizations throughout the United States can apply for ACL funding through the Prevention and Public Health Fund (21,32). This initiative is especially relevant considering that in 2020, only 15.3% of men and 10.8% of women over the age of 65 met the 2018 federal guidelines for aerobic and strength training exercises (11).

In addition to falls and physical inactivity among older adults is the potential for social isolation. Living alone, having few social networks, and little social contact are hallmarks of social isolation (5). Researchers have shown social isolation can lead to risk of premature death and is comparable to established risk factors for mortality such as obesity, substance abuse, and physical inactivity (17).

Bingocize® is an example of one EBFP available to organizations to help address the growing problem of falls. Bingocize® strategically combines the familiar game of bingo, falls prevention education, and exercise (9,10). Participants complete a series of strategically inserted exercises designed to increase or decrease the intensity and volume of exercise (10). Bingocize® also includes questions aimed at teaching participants valuable falls prevention information, such as home safety modifications, medication management, importance of regular health checkups, and more. Participants rest while numbers are called for the bingo game, then complete more strategically inserted exercises or falls prevention questions, rest during number calling, and so on. This pattern is continued until a participant wins the game (9). Curriculum reinforcements, including water bottles, night lights, and other falls prevention-focused items, are awarded to winners. Additional games are played until all planned exercises are completed. For a detailed description of the Bingocize® program, see Crandall et al. (2015) (8) and Dispennette et al. 2019 (10).

Like other U.S. states, Virginia has a serious and growing problem of older adult falls. The United States Centers for Disease Control and Prevention (CDC) reported that approximately 26% of adults 65+ in Virginia had experienced at least one fall in 2020 (3,4). Alarming, this rate increased to 40% for lower-income residents aged 45 and older with an income of \$15,000 or less (34). Between 2005 to 2014, the number of Virginians who died as the result of a fall surged to 54%, from 358 to 781, while an additional 16,647 people were hospitalized due to falls in 2014 (34).

To address the problem of older adult falls, the Virginia Department for Aging and Rehabilitative Services (VDARS) received ACL funding to implement Bingocize® in community-dwelling older adult facilities across the state of Virginia. Therefore, the purpose of this quasi-

experimental investigation was to examine the impact of a 10-week Bingocize® workshop on community-dwelling older adults in Virginia, focusing on pre and post changes in their self-reported fear of falling, general health, physical activity, social isolation, and avoidance behavior.

## METHODS

### *Participants*

Male and female older adult participants (> 60 y; N =481; age 75 ± 9.0) residing in 35 community-dwelling older adult facilities throughout Virginia were recruited to participate in group Bingocize® sessions. Recruitment strategies employed by each facility included referrals, grassroots engagement with existing members, word of mouth, and statewide advertising campaigns. Prior to the initiation of the investigation and in conjunction with VDARS, approval for data use and sharing procedures was obtained from the Western Kentucky University (WKU) Institutional Review Board (IRB 1445223-1).

### *Protocol*

Bingocize® is an EBFP approved by the National Council on Aging (NCOA). Each older adult facility required staff and/or volunteers to complete the Bingocize® asynchronous online training before conducting the Bingocize® workshop or administering the pre- and post-workshop assessments for participants. To receive Bingocize® facilitator certification, facilitators must score 80% or greater on the training competency quiz. To ensure program delivery fidelity, new facilitators were reviewed by an individual who was a current, certified Bingocize® facilitator or certified in another EBFP during the first two weeks of the workshop. The Bingocize® facilitator followed step-by-step instructions on how to lead each specific Bingocize® session, which included strength, balance, and flexibility exercises, as well as falls prevention education. Exercise resistance bands and stress balls were provided to the facilitators for use during the exercise component of the program.

After certification, Bingocize® facilitators conducted 10-week workshops at each of the 35 community-dwelling facilities throughout Virginia. Participants attended two in-person sessions per week, each lasting 45 - 60 minutes, for 10 weeks. The program combined the traditional game of bingo with a series of strategically inserted falls prevention-focused exercises (including range of motion, balance, muscle strengthening, and endurance exercises) at designated times throughout the sessions (8,10). A fall prevention curriculum was also integrated throughout the sessions. The game, intermittent exercises, and fall prevention information continued until a participant won a game and received a curriculum reinforcement (prize) valued at ≤ \$5.00. Each Bingocize® session continued until the fall prevention curriculum and exercises were completed. Of the 706 participants that began one of the Bingocize® workshops, those that attended at least 80% of the sessions (n=481; 68%) were considered completers and used in data analyses.

The Administration for Community Living (ACL) requires all grantees to administer standardized pre and post assessments to EBFP participants. From March 2021- April 2023, trained VDARS Bingocize® facilitators tracked daily attendance and collected demographic, health, and falls history data before the first session and after the last session of the 10-week Bingocize® workshop. These data were then entered into the NCOA National Falls Prevention database. A de-identified file was sent electronically to the researchers for retrospective analyses.

The outcomes of interest for this investigation were participants' self-reported fear of falling, general health, physical activity, social isolation, and avoidance behavior. Physical activity was evaluated based on three response options indicating the participants' physical activity levels ("Vigorously active for at least 30 min, 3 times per week," "Moderately active at least 3 times per week," or "Seldom active, preferring sedentary activities"). Social isolation was assessed using a five-point scale (participants responded with "Never," "Rarely," "Sometimes," "Often," or "Always"). Self-reported general health was assessed using a five-point scale ("Excellent," "Very Good," "Good," "Fair," or "Poor"). Avoidance behavior was assessed by asking participants to rate the extent to which their concern about falling interfered with their normal social activities in the past four weeks on a five-point scale ("Not at all," "Slightly," "Moderately," "Quite a bit," or "Extremely"). Fear of falling was measured by asking participants to rate their fear on a four-point scale ("Not at All," "A Little," "Somewhat," or "A lot"). After the final Bingocize® workshop session, the facilitators input all de-identified pre and post-assessments into the NCOA National Falls Prevention database. These prospective data were then utilized to examine longitudinal changes in the outcomes of interest.

#### *Statistical Analysis*

Paired Sample t-tests were used to compare intervention effects among participants who successfully completed the program. Descriptive statistics were used to describe participants' demographic and health data. All data analyses were performed using R software (26). The level of statistical significance was set at  $p < .05$ .

## **RESULTS**

A total of 706 individuals enrolled in one of the 35 Bingocize® workshops, with 481 (68.1%) participants successfully completing a minimum of 80% of the workshop sessions. Upon the conclusion of the Bingocize® program, participants demonstrated significant improvements in four out of the five outcomes of interest: self-reported fear of falling physical activity, social isolation, and avoidance behavior. However, there was no statistically significant difference in participants' self-reported general health. Participant demographics are presented in Table 1, while the statistical results for each respective outcome are detailed in Table 2.

**Table 1.** Participant Demographics

Characteristic	<i>n</i>	%
"Completers" (>=80% attendance)	481	68.1
Age		
85+	57	11.9
75 - 84	181	37.6
60 - 74	189	39.3
Gender		
Female	380	79.7
Male	56	12.5
Education		
College (4+ years)	73	15.2
High School Graduate/GED	152	31.6
Some College or Tech School	96	20.0
Some Elementary/Middle/High School	75	15.6
Race		
American Indian or Alaska Native	10	2.1
Asian	8	1.7
Black	198	41.2
White	223	46.4
Chronic Conditions		
Alzheimer's	32	6.7
Anxiety	45	9.4
Arthritis	204	42.4
Asthma/Breathing Issues	85	17.7
Cancer	68	14.1
Chronic Pain	83	17.3
Depression	79	16.4
Diabetes	155	32.2
Glaucoma	17	3.5
Heart Disease	99	20.6
High Cholesterol	159	33.1
Hypertension	289	60.1
Kidney Disease	33	6.9
Obesity	84	17.5
Osteoporosis	86	17.9
Parkinson's	5	1.0
Schizophrenia	6	1.3
Stroke	39	8.1
Traumatic Brain Injury (TBI)	9	1.9
Urinary Incontinence	55	11.4
Other Chronic Conditions	43	8.9

**Table 2.** Pre and post participant outcomes

	Pretest		Posttest		<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Fear of Falling	2.25	.93	2.09	.91	t(364) = 3.393	<.001*	.178
General Health	2.97	.83	2.97	.82	t(376) = .0610	.476	.003
Physical Activity	2.02	.68	1.87	.58	t(341) = 4.628	<.001*	.250
Social Isolation	2.20	.96	2.10	.91	t(303) = 2.185	.015*	.125
Avoidance Behavior	1.71	.92	1.53	.81	t(345) = 3.424	<.001*	.184

Note. \* Denotes a statistically significant change from pre to posttest.

## DISCUSSION

The aim of this quasi-experimental study was to assess the effectiveness of a 10-week Bingocize® workshop for improving five key outcomes in community-dwelling older adults in Virginia. Overall, the findings suggest the program positively impacted community-dwelling older adults' self-reported fear of falling, physical activity, social isolation, and avoidance behavior without significant changes in self-reported general health after the Bingocize® workshop.

There are multiple EBFP available to organizations that target the older adult population with the goal of falls prevention. Each EBFP offers unique opportunities for providing falls prevention education and physical activity, but despite the clear benefits, older adults commonly experience social, psychological, and physical barriers to participation. Many older adults find themselves stuck in a self-fulfilling health cycle. For example, a fear of falling can lead to reduced physical activity, social interaction, and increased risk of falling. A greater risk of falls means a greater chance of injury, further increasing the barriers to escaping the cycle. Fear of falling, which can affect up to 92% of older adults, often leads to the avoidance of physical activities, deterioration of functional fitness, and increases in social isolation (22).

In this investigation, social isolation was significantly reduced. There is ample evidence showing social isolation can have a detrimental effect on older adults' health. Social isolation increases the risk for premature death by 29% (17). A lack of social connection can also increase the risk for premature death as much as smoking up to 15 cigarettes a day (16). In another study, Huang et al. (2023) (19) found that among 5,022 participants, almost a quarter (23.3%) reported experiencing social isolation. This state of isolation was linked with a 28% increased risk of developing dementia over a period of nine years, irrespective of race or ethnicity. Such findings reinforce the urgent need for interventions not merely focused on enhancing physical health, but also designed to improve social engagement and connection among older adults (30).

The Virginia Bingocize® workshops were implemented at the height of the COVID-19 pandemic. Given the need for mitigating factors such as distancing measures and lockdowns, it was anticipated that social isolation among older adults might further escalate. Studies by Armitage & Nellums (2020) and Berg-Weger & Morley (2020) (1,2) highlight the potential for

increased social isolation among older adults during the COVID-19 pandemic due to distancing measures and lockdowns. Stolz et al. (2021) and Macdonald & Hülür (2021) (23,31) discussed the potential long-lasting and severe impacts of infection control measures on loneliness and emotional well-being. The Bingocize® workshops significantly reduced social isolation, which is comparable to other EBFP. Based on our findings, the Virginia Bingocize® workshops effectively mitigated social isolation among a diverse group of older adults. These findings align with the positive outcomes seen in Zureigat & Fattah's (2020) (35) culturally informed intervention study involving Quranic listening sessions. The significant reduction in social isolation found in this study affirms the capacity of the Bingocize® program to engage a diverse group of older adults with varying physical and cognitive abilities, even under less-than-optimal circumstances.

Bingocize® was originally conceived for physically inactive older adults with multiple comorbidities. Considering just 21.8% of older adults in Virginia are physically active, the statistically significant increase in physical activity found in the current study is encouraging. Of the 706 initial participants, 68% (n=481) completed 80% or more of the workshop sessions. This rate aligns with completion percentages for other EBFP in comparable rural regions. Smith et al., 2018 (29) demonstrating the program's efficacy for engaging and maintaining the participation of older adults at high risk for continued physical inactivity. An intriguing finding was the high completion rate among African American older adults (41.2%), which contrasts with a recent analysis of 7315 other EBFP workshops (such as A Matter of Balance, Enhance Fitness, etc.), where Gilchrist et al. (2019) (13) reported that only 8% of the more than 92,000 participants were African American.

Previous researchers found older adults that report a fear of falling also reported lower physical activity. Given the significant increases in physical activity observed in this study, the participants improved ratings for fear of falling aligned with expectations. These results are consistent with previous investigations of EBFP demonstrating improvements in fear of falling upon completion of the program (6,15,20,24,28,33). Similarly, our study found a notable reduction in participants' avoidance behavior. For this investigation, avoidance behavior was measured by asking participants to respond to the question, "During the last 4 weeks, to what extent has your concern about falling interfered with your normal social activities with family, friends, neighbors or groups?". As previously described, older adults commonly experience barriers to participation leading to a self-fulfilling negative health cycle. Participants improvements in fear of falling, avoidance behavior, and social isolation likely led to increased confidence in engaging in both physical and social activities.

There were no significant changes in participants' self-reported general health following completion of the Bingocize® program. This is consistent with Sartor-Glittenberg C et al. (2018) (28) where participants completed the EBFP program, *A Matter of Balance*, and demonstrated no improvement in their rating of general health. In contrast, researchers reported improvements in overall health after participation in other EBFP (13). It is important to note that for this investigation, the average pre and post-workshop self-reported ratings of general health were

“good,” suggesting the majority of the sample were higher functioning. There is some evidence that higher functioning older adult samples are the ones most likely to benefit physically and cognitively from exercise interventions (a “rich get richer” effect) (7). In addition, given that this study relied on self-reported data, it is conceivable that participants' daily variations in health perceptions could have influenced their responses. For instance, 42% of our sample reported arthritis as a chronic condition. There is a possibility that symptoms and/or discomfort from various chronic conditions could impact a participant’s rating of their general health at any given time. For example, if a participant was undergoing an acute flare-up of arthritis on the day of post-assessment completion, their general health may have been reported as poor, despite possible improvements.

This investigation has strengths based on the real-world data collected from each of the Bingocize® workshops that resulted in a robust number of real - world data representing a diverse older population. Bingocize® workshop fidelity was ensured based on the online training of lay facilitators ensuring consistency in delivery of each workshop and represents the day-to-day implementation of the EBFP Bingocize® program. When considering the results of the current investigation, some limitations that may impact the results from quasi experimental pre - post test data collection with lack of randomization or a control group. Results should be considered regarding the older community dwelling participants attending a 10-week Bingocize® workshop and providing a subjective rating for the outcome variables. Based on the pre-post data collection procedures, there is a potential for participants’ bias when recalling the individual subjective responses for each of the outcome variables. Also, there is a potential that the participants’ current frame of mind, based on any symptoms or any discomfort could impact responses when completing the pre and post assessments.

As Bingocize® continues to be implemented across the United States and around the world, future investigations should further attempt to determine the impact Bingocize® has on specific special populations i.e., Diabetes, Arthritis, Cognitive impairment etc. and the modifications that may be necessary to accommodate the needs of the special populations. Additional investigations are also warranted to determine the cost effectiveness of Bingocize® when implemented in community-dwelling facilities. Tracking Bingocize® participants long-term upon the completion of the 10 -week workshops will be of benefit to determine the potential for sustained improvements or maintenance in overall physical health, cognitive function, social engagement, and confidence to engage in activities of daily living and physical activity.

In conclusion, Area Agencies on Aging, state departments on aging, and health care organizations throughout the United States continue to utilize EBFP to target the older adult population with the goal of falls prevention (6,15,20,24,25,28,33). For a complete list of EBFP refer to the National Council on Aging website (32). Each EBFP offers unique approaches, but despite the clear benefits, older adults experience barriers to participation leading to a self-fulfilling negative health cycle. The results of this study confirm Bingocize® is an effective and appealing EBFP with the capacity to improve social engagement and connection among ethnically and racially diverse populations, even under less-than-optimal circumstances such as



the COVID-19 pandemic. The high completion rate for participants demonstrates the program's efficacy for improving fear of falling, avoidance behavior, and social isolation. As Bingocize® continues to be disseminated nationally and internationally, future investigations should further attempt to determine the impact Bingocize® has on specific special populations and the modifications that may be necessary to accommodate the needs of the special populations.

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