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Health Indicators Associated with Falls Among Middle-aged and Older Women Enrolled in an Evidence-Based Program

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A B S T R A C T

Background: Evidence-based fall prevention programs primarily attract older women, who are increasingly burdened by fall-related injuries. However, little is known about the relationship between older female participants' baseline health status and self-reported falls over the course of fall prevention interventions. Using data from A Matter of Balance/Volunteer Lay Leader Model (AMOB/VLL) workshops, this study examines female participants' sociodemographics and health indicators associated with self-reported falls at baseline and postintervention.

Methods: Data were analyzed from 837 older women (M ¼ 76.2 years) collected during the statewide AMOB/VLL dissemination in Texas. Longitudinal Poisson regression models, using the generalized estimating equation method, were used to investigate the associations of personal characteristics and health indicators with and reductions in the number of self-reported falls from baseline to postintervention.

Findings: Approximately 21% of participants reported falling at baseline, and the number of reported falls significantly decreased from baseline to postintervention (b ¼ -0.443). At baseline, more unhealthy physical days (b ¼ 0.022), more unhealthy mental days (b ¼ 0.018), and lower Falls Efficacy Scale scores (b ¼ -0.052) were significantly associated with more falls reported at baseline. More falls at baseline was also associated with worse program attendance (b ¼ -0.069). Greater improvements in Falls Efficacy Scale Scores (b ¼ -0.069) and decreases in unhealthy physical health days (b ¼ 0.026) over the course of the intervention were significantly associated with greater reductions in reported falls at postintervention, respectively.

Conclusions: Findings have implications for identifying at-risk older women upon enrollment, expanding the reach of AMOB/VLL, and leveraging AMOB/VLL to refer participants to other evidence-based exercise, disease management, and mental health interventions.

Falls among older adults is a well-recognized health issue, impacting an estimated one in three individuals aged 65 and older (Centers for Disease Control and Prevention, 2009; National Center for Injury Prevention and Control, 2006). In addition to the injuries sustained during a fall and associated health care costs, falls are a leading cause of premature death among older populations (Nachreiner, 2007) and contribute to reduced physical functioning and quality of life, depression, loss of independence, social isolation, and institutionalization (Horton, 2007; Nachreiner, 2007). Fall-related risk increases with age (Stevens & Sogolow, 2005) and disproportionately impacts older adult women. A larger percentage of women have been documented to fall compared with men (Nachreiner, 2007), and in the event of a fall women are more likely than men to sustain a nonfatal injury (Centers for Disease Control and Prevention, 2009; Stevens & Sogolow, 2005), resulting in hospitalization (Smith, Ory, Beasley, et al., 2010). A variety of clinical and behavioral factors place women at greater risk for falling relative to their male counterparts. For example, as women age they become at greater risk for bone mass degeneration (Boele van Hensbroek, 2009) and physical inactivity (Stevens & Sogolow, 2005). Longer life expectancies among women accentuates their already heightened risk for falls in later years, potentially resulting in repeated fall events and more severe fall-related injuries (Overcash, 2008).

Experiencing a fall can result in a fear of falling (Friedman, Beatriz, West, Rubin, & Fried, 2002; Tennstedt, 1998), which has been shown to reduce daily activities among older adults because these individuals intentionally avoid activities perceived to be "risky" for subsequent falls (Murphy & Tickle-Degnen, 2001; Zijlstra et al., 2007). Activity avoidance can lead to physical inactivity that causes muscle atrophy and decreased balance, which in turn increases the risk of falling (Li, Fisher, Harmer, McAuley, & Wilson, 2003). Therefore, the fear of falling is considered among the leading causes of falls among older adults, even among those who have never experienced a fall (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008). Selfefficacy to prevent or overcome falls has been linked to decreased fear of falling and increased physical functioning (Li, Fisher, & McAuley, 2005; Li et al., 2002). These changes support the notion that strategies improving falls-related self-efficacy can alleviate fear of falling and thereby reduce falls. Given their increased risk for falls and reduced levels of physical activity in later years, women are ideal focal populations for fall prevention efforts (Weeks, 2007). A variety of evidence-based programs exist to reduce falls and fall-related risk factors (Centers for Disease Control and Prevention, 2008), and A Matter of Balance/Volunteer Lay Leader Model (AMOB/VLL) is among the most prevalent among older adults. Translated from the original randomized, controlled trial (Tennstedt, 1998) to be delivered in community settings (Healy, 2008), AMOB/VLL is an evidence-based program primarily intended to increase physical activity levels and reduce the fear of falling among older adults (Partnership for Healthy Aging, 2009). Currently delivered in 38 states, this eight-session intervention is facilitated by trained volunteer lay leaders using a structured curriculum and instructional videos. Sessions last for 2 hours and are hosted once a week for 8 consecutive weeks. Grounded in the cognitive-behavioral therapy model, intervention activities aim to instill

adaptive beliefs (e.g., perceived control, confidence in abilities, realistic failure assessment) with the goals of building fall-related self-efficacy and setting realistic goals for increasing physical activity (Partnership for Healthy Aging, 2009). The uniqueness of the intervention is its two-pronged approach to fall prevention, addressing attitudes and behaviors. Earlier sessions focus on diminishing the fear of falling and promoting participants to adopt the mindset that falls are preventable. Later sessions assist participants in changing their environments to reduce fall-related risk factors and in learning exercises to increase strength and balance (American Geriatrics Society, Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001; Partnership for Healthy Aging, 2009).

The benefits of AMOB/VLL are widely documented. Prior studies have reported significant improvements in participants' general health status, perceived physical and mental health, and physical activity levels (Ory, Smith, Wade, Mounce, et al., 2010; Ory, Smith, Wade, Wright, & Parrish, 2010). Additionally, researchers have identified the program's distinct ability to increase fall-related self-efficacy among diverse subgroups of older adult participants (Smith, Ahn, Mier, Jiang, & Ory, 2012; Smith, Ahn, Sharkey, et al., 2012; Smith, Hochhalter, Cheng, Wang, & Ory, 2011; Smith, Jiang, & Ory, 2012; Smith, Ory, Ahn, Bazzarre, & Resnick, 2011; Smith, Ory, Belza, & Altpeter, 2012; Smith, Ory, & Larsen, 2010; Smith, Quinn, Gipson, Wilson, & Ory, 2011). However, to date, improvements in health indicators during the course of the intervention have yet to be directly related to fall reductions. Women are the focus of investigation in the current study because they are at higher risk for injurious falls (Nachreiner, 2007; Stevens & Sogolow, 2005) and represent approximately 82% of AMOB/VLL participants nationally (Smith, Ory, et al., 2012). The purposes of this study were to 1) identify personal characteristics and health indicators of middle-aged and older female participants entering AMOB/VLL, 2) examine health indicators associated with reporting a fall in the previous 30 days upon entering the program, and 3) examine changes in health indicators from baseline to postintervention associated with self-reported fall reductions at postintervention.

Methods

Participants and Procedures

Data for this study were collected during a statewide effort to implement AMOB/VLL to older adults through the aging services network and public health system in Texas. During this 2-year initiative, AMOB/VLL was introduced to 26 Area Agencies on Aging regions and had potential to reach older adults in 239 of the 254 Texas counties. The program was delivered to participants in a variety of delivery site types, including residential facilities, health care institutions, public health departments, faith-based organizations, business sectors, and local government. Additional information and details about the intervention structure and dissemination in Texas are reported elsewhere (Ory, Smith, Wade, Mounce, et al., 2010; Ory, Smith, Wade, Wright, et al., 2010). Institutional Review Board approval at for this secondary data analysis was received from Texas A&M University.

Instrument

Trained lay leaders surveyed participants at each delivery site using identical instruments at baseline and upon completion of the intervention. The self-report questionnaire was 9 pages, paper-based, and consisted of 28 items. Survey instrument items included Likert-type scales, yes/no, closed-response, and open-ended formats. Each measure included in the instrument was selected by public health and aging experts who established a common database for evaluating program effectiveness in a national consortium of studies (National Council on the Aging, 2007). Baseline and postintervention instruments took participants approximately 15 to 20 minutes to complete each. Completed, de-identified instruments were sent to the predetermined centralized evaluation center for data entry and analyses.

Measures

Dependent variable

The dependent variable for this study was self-reported falls, measured at two time points. At both baseline and postintervention, participants were asked to report the number of times they had fallen in the previous 30 days.

Health indicators

Indicators of participants' self-reported health were measured at baseline and postintervention. Participants were presented a list of chronic conditions (e.g., hypertension, diabetes, cancer, arthritis) and asked to self-report those in which they had been diagnosed (scores could range from 0 to 7 chronic conditions). For the purposes of this study, the number of chronic conditions reported at baseline was used for all analyses. Participants were asked to report the number of days in the previous 30 days that their physical health was not good (scores could range from 0 to 30 days; Centers for Disease Control and Prevention, 2000). Participants were also asked to report the number of days in the previous 30 days that their mental health was not good (scores could range from 0 to 30 days; Centers for Disease Control and Prevention, 2000). Participants were asked to report the number of days in the previous week that they were physically active (i.e., scores could range from 0 to 7 days). Finally, participants were asked to complete five 4-point Likert-type scale items, scored 1 for "not sure at all," and 4 if "absolutely sure," asking their perceived confidence to prevent or manage falls. Scores were summed to create a composite score, Falls Self-Efficacy Scale (scores could range from 4 to 20; Cronbach's a ¼ 0.859; Powell & Myers, 1995; Tinetti, Richman, & Powell, 1990). Details about the Falls Self-Efficacy Scale as related to AMOB/VLL are published elsewhere (Smith, Jiang, & Ory, 2012).

Intervention dose

Workshop session attendance was obtained for each participant from delivery site administrative records (scores ranged from 1 to 8 workshop sessions).

Personal characteristics

All participants in this study were female (100%). Other participant characteristics utilized in this study were age (treated as a continuous variable based on the participant's birth date), race/ethnicity (non-Hispanic White, African American, Hispanic, and other or multiple races), education (less than high school, high school graduate, some college/vocational, and college graduate), and whether or not the participant lived alone (yes/no).

Statistical Analysis

Baseline characteristics of female participants were compared between the two age groups (<75 vs. ┐ 75 years) using c2 tests for categorical variables and independent sample t tests for continuous variables. Although a substantial proportion of older adults fall each year, this age-based comparison was selected because research suggests fall-related risk increases among those aged 75 years and older (Dargent-Molina et al.,1996; Rubenstein, 2006). Longitudinal Poisson regression models were used to investigate the associations of personal characteristics and baseline levels of health indicators with self-reported number of falls. Specifically, bivariate associations were tested between the number of falls and potential explanatory variables by fitting a series of longitudinal Poisson regression models. Each model in the series included time and one other study variable. Then, time and the baseline level of explanatory variables significantly associated with the number of falls (i.e., in the series of bivariate models) were included in a regression model. The number of variables in this model was reduced using backward model selection method to create a semi-final model. Interaction terms between time and each variable (both baseline level and change from baseline to postintervention) in the semi-final model were then added to examine their relationships with reductions in the number of self-reported falls over the course of the intervention. Then, again using backward model selection, the final model was reached after excluding non-significant variables and interactions from the multivariate model. To estimate the parameters in the longitudinal Poisson regression analyses, generalized estimating equation method with empirical standard errors and an exchangeable working correlation matrix was employed. Significance for all analyses was determined using the criterion of $p < .05$.

Results

Sample Characteristics

A total of 3,092 participants enrolled in AMOB/VLL during the study period of which 2,462 reported their sex at baseline. Of these participants, 2,007 (82.5%) were females; 55.9% of the female participants (n ¼ 1,121) completed both baseline and postintervention assessments. Of these women, 74.7% had complete data on all variables of interest. Thus, the final analytic sample for this study was 837 adult women aged 50 and older. Compared with the women excluded from the final analytic sample (n ¼

1,170), a significantly larger proportion of study participants was non-Hispanic White (c2 ¼ 46.17; p < .001) and had higher levels of education (c2 ¼ 48.83; p < .001). On average, study participants reported significantly more chronic conditions compared with those excluded from analyses (t ¼ 4.07;p < .001).

The average age of these female participants was 76.2 ± 8.41 years, and 59.5% were aged 75 years or older. As shown in Table 1, the majority of participants self-identified as non-Hispanic White (74.0%), with 13.6% identifying as African American, 9.6% as Hispanic, and 2.9% as other or multiple races. More than 60% of participants had more than a high school education, and 60.2% lived alone. On average, participants reported having 1.84 ± 1.16 chronic conditions. At baseline, the average number of falls reported in the previous 30 days was 0.34 ± 0.85, and 21.0% of participants reported falling one or more times during that time period. At baseline, participants reported an average of 4.78 ± 8.26 unhealthy physical days and 2.99 ± 6.63 unhealthy mental days in the previous 30 days, respectively. On average, participants reported being physically active 3.57 ± 2.28 days in the previous week and had Falls Efficacy Scale scores of 14.18 ± 3.54. Participants attended an average of 7.04 ± 1.17 of the eight AMOB/VLL workshop sessions offered.

Relative to participants under age 75, a significantly larger proportion of the older age group were non-Hispanic White (83.5% vs. 59.5%) and lived alone (68.7% vs. 47.8%). Upon entry to the program, women aged 75 and older reported significantly lower Falls Efficacy Scores relative to their younger counterparts (13.84 vs. 14.68). No other differences were observed at baseline by age group.

Table 1
Sample Characteristics by Age Group

Characteristic	Total (n = 837)	Age <75 (n = 339)	Age ≥75 (n = 498)	χ^2 or *t*	*p* Value
Personal characteristics					
Race, n (%)				74.73	< .001
Non-Hispanic White	619 (74.0)	203 (59.9)	416 (83.5)		
African American	80 (9.6)	56 (16.5)	24 (4.8)		
Hispanic	114 (13.6)	74 (21.8)	40 (8.0)		
Other/multiple races	24 (2.9)	6 (1.8)	18 (3.6)		
Education, n (%)				5.67	.130
Less than high school	113 (13.5)	47 (13.9)	66 (13.3)		
High school graduate	216 (25.8)	73 (21.5)	143 (28.7)		
Some college/vocational	285 (34.1)	125 (36.9)	160 (32.1)		
College graduate	223 (26.6)	94 (27.7)	129 (25.9)		
Live alone, n (%)				36.73	<0.001
No	333 (39.8)	177 (52.2)	156 (31.3)		
Yes	504 (60.2)	162 (47.8)	342 (68.7)		
Baseline health indicators, mean ± SD					
Chronic conditions (n)	1.84 ± 1.16	1.81 ± 1.25	1.86 ± 1.10	-0.55	.580
Days physical health not good	4.78 ± 8.26	4.68 ± 7.72	4.85 ± 8.62	-0.30	.760
Days mental health not good	2.99 ± 6.63	3.13 ± 6.37	2.90 ± 6.81	0.50	.620
Days physically active	3.57 ± 2.28	3.67 ± 2.20	3.51 ± 2.34	1.00	.320
Falls efficacy scale	14.18 ± 3.54	14.68 ± 3.50	13.84 ± 3.53	3.40	.001
No. of falls, mean ± SD					
Baseline	0.34 ± 0.85	0.37 ± 0.96	0.32 ± 0.76	0.87	.380
Postintervention	0.22 ± 0.66	0.25 ± 0.72	0.20 ± 0.63	0.90	.370
Intervention dose					
Number of sessions attended	7.04 ± 1.17	7.01 ± 1.19	7.05 ± 1.15	-0.49	.620

Factors Related to Falls Reported at Baseline

Table 2 presents bivariate associations between study variables and the number of falls reported at baseline. Participants who reported more chronic conditions upon entry of the program reported a significantly greater number of falls at baseline (β = 0.172; *p* < .001). Those who reported more unhealthy physical (β = 0.028; *p* < .001) and mental (β =

0.032; $p < .001$) health days in the 30 days before enrolling in the program also reported a significantly greater number of falls at baseline. Higher baseline Falls Efficacy Scale scores were significantly associated with fewer self-reported falls at baseline (β = -0.075; $p < .001$). Participants who attended fewer AMOB/VLL workshop sessions reported more falls at baseline (β = -0.070; $p = .006$).

Table 2
Bivariate Association between Number of Falls and Sample Characteristics

Characteristic	Regression Coefficient*	*P* Value
Personal characteristics		
Age	-0.006	.410
Race		
Non-Hispanic White	0.000	NA
African American	-0.126	.510
Hispanic	-0.089	.570
Other/multiple races	-0.168	.550
Education		
Less than high school	0.000	NA
High school graduate	-0.085	.590
Some college/vocational	-0.106	.490
College graduate	-0.019	.930
Live alone		
No	0.000	NA
Yes	0.052	.670
Baseline health indicators		
No. of chronic conditions	0.172	<.001
Days physical health not good	0.028	<.001
Days mental health not good	0.032	<.001
Days physically active	-0.028	.300
Falls efficacy scale	-0.075	<.001
Intervention dose		
No. of sessions attended	-0.070	.006

* From longitudinal Poisson regression models.

Table 3 presents the multivariate regression model without interaction effects (semi-final model). At baseline, more unhealthy physical days (β = 0.022; $p = .001$), more unhealthy mental days (β = 0.018; $p = .007$), lower Falls Efficacy Scale scores (β = -0.052; $p = .001$), and attending fewer workshop sessions (β = -0.069; $p = .020$) were significantly associated with more reported falls at baseline. Table 3 also shows that the number of falls reported in the previous 30 days significantly decreased from baseline to postintervention (β = -0.443; $p < .001$).

Table 3
Semi-final Multivariate Longitudinal Poisson Regression Model for Number of Falls (Without Interaction Terms)

Variable	Regression Coefficient	95% CI		*p* Value
		Low	High	
Time	-0.443	-0.636	-0.251	<.001
No. of sessions attended	-0.069	-0.127	-0.011	.020
Days physical health not good	0.022	0.009	0.035	.001
Days mental health not good	0.018	0.005	0.032	.007
Falls efficacy scale	-0.052	-0.084	-0.021	.001

Quasi-likelihood information criterion (QIC) = 1065.91.

Factors Related to the Reduction of Reported Falls

Table 4 presents the multivariate regression model with interaction effects between time and other study variables (final model). Although higher Falls Efficacy Scale scores at baseline were significantly associated with fewer self-reported falls at baseline (Table 3), greater improvements in Falls Efficacy Scale scores over the course of the intervention were associated with greater reductions in reported falls at postintervention (β = -0.070; *p* = .012). Larger decreases in unhealthy physical health days over the course of the intervention were associated with greater reductions in reported falls at postintervention (β = 0.026; *p* = .011).

Table 4
Final Multivariate Longitudinal Poisson Regression Model for Number of Falls (With all Significant Interactions)

	Regression Coefficient	95% CI		*p* Value
		Low	High	
Intercept	-1.514	-1.754	-1.274	<.001
Time	-0.271	-0.51	-0.033	.026
Baseline health indicators				
Days physical health not good	0.039	0.017	0.061	<.001
Days mental health not good	0.021	0.005	0.037	.013
Improvements of health indicators				
Change:* Days physical health not good	0.008	-0.012	0.028	.447
Change:* Falls efficacy scale	0.045	-0.005	0.095	.080
Time × change:* Physical health not good	0.026	0.006	0.046	.011
Time × change:* Falls efficacy scale	-0.069	-0.125	-0.016	.012

Quasi-likelihood information criterion (QIC) = 1259.36.
* Change = postintervention minus baseline.

Discussion

Findings from this study indicate that AMOB/VLL can reduce self-reported falls among middle-aged and older female participants. Although other studies have identified the intervention's ability to improve health indicators categorized as fall-related risk factors (Ory, Smith, Wade, Mounce, et al., 2010; Smith, Ahn, Mier, et al., 2012; Smith, Ahn, Sharkey, et al., 2012; Smith, Jiang, et al., 2012; Smith, Ory, & Larsen, 2010), this study is among the first to use longitudinal analyses to directly link program effects and health indicator improvements to reported fall incidence upon program enrollment. Although the intervention consists of only eight 2-hour sessions, its ability to influence health indicators related to falls has implications for evidence-based programming for older adult females and overall women's health. This is especially salient given that women comprise the vast majority of participants who enroll in evidence-based programs (Ory et al., 2002).

Study findings revealed that female participants who entered AMOB/VLL with more unhealthy physical and mental health days and lower falls efficacy also reported more falls at baseline. When implementing evidence-based programs in community settings, it is important to acknowledge each participant's unique health status and set of health needs. Participant characteristics should be assessed upon program enrollment because these characteristics can potentially influence participants' level of program participation (e.g., activity engagement, attendance) as well as the benefits received from the program. Routinely assessing participants' characteristics (i.e., sociodemographics) and health status indicators (e.g., fall history, physical and cognitive functioning, depressive symptomology) at the beginning of interventions enables program deliverers to identify the degree to which they are reaching/serving participants representative of the greater population. Based on the characteristics of program participants, program deliverers can refine participant recruitment strategies to better reach their target audience or attract a more diverse subset of participants (Smith, Belza, et al., 2012; Smith, Ory, et al., 2012).

Implications for Policy and/or Practice

In the current study, baseline health indicators were associated with falls reported at baseline and improvements in self-reported falls at postintervention. Although these findings indicate the program elements are successfully meeting program objectives, female participants may benefit from additional guidance and attention while enrolled in the program to ensure they are absorbing and retaining workshop content and developing necessary skills. Results also highlight the importance of evaluation strategies that adequately assess participants' health indicators upon entering the intervention, document benefits that can be achieved by a more inclusive group of participants, and avoid stereotypic perceptions about who might benefit based on entry health status (Ory, Hoffman, Hawkins, Sanner, & Mockenhaupt, 2003; The EASY Screening Group, 2007). In keeping with the Exercise is Medicine movement (American College of Sports Medicine, 2008), the use of pre-enrollment assessment instruments and safety tips to accompany community-based interventions is recommended (Resnick, Ory, Hora, Rogers, Page, Bolin, et al., 2008), with the caveat that such tools should not be used to

'screen out' participants who can safely engage in and benefit from the intervention (Resnick, Ory, Hora, Rogers, Page, Bolin, et al., 2008; Resnick, Ory, Hora, Rogers, Page, Chodzko-Zajko, et al., 2008; Smith, Ory, et al., 2011).

Results from this study confirm other findings that AMOB/VLL can benefit female participants in community settings (Healy, 2008; Smith, Ory, & Larsen, 2010). In this study, baseline falls efficacy and unhealthy physical health days were associated with greater reductions in falls at postintervention. This finding is especially noteworthy because, as stated, the earlier AMOB/VLL workshop sessions were focused on developing coping skills to reduce fear of falling and increase confidence to prevent and overcome falls (Partnership for Healthy Aging, 2009). As such, AMOB/VLL has great potential to reduce the number of falls reported by its participants by accomplishing its specified objectives while acknowledging each woman enters the program with varying needs and capabilities.

Workshop attendance is an essential intervention element. Although researchers have found AMOB/VLL workshop attendance to be associated with improved falls efficacy and other health indicators (Smith, Hochhalter, et al., 2011), results of this study indicate that female participants who self-reported falls at baseline attended fewer workshop sessions than their counterparts, who did not report baseline falls. For AMOB/VLL, "successful" workshop completion is defined as attending five or more of the eight workshop session (Partnership for Healthy Aging, 2009). Although the average workshop attendance in this study was 7.04 sessions (i.e., well above the recommended workshop attendance), it is important to note many women reporting falls at baseline still went on to receive an adequate intervention dose.

Generally, issues of participant retention are critical to consider when delivering community-based programs to older adults because it is essential to participants receiving content and developing necessary skills (Yancey, Ortega, & Kumanyika, 2006). Therefore, to reduce program attrition, program deliverers should employ participant retention strategies (e.g., telephone-based reminders before workshop sessions) and attempt to identify and overcome common barriers to attendance (Goins & Krout, 2006; Goins, Williams, Cater, Spencer, & Solovieva, 2005).

Limitations

This study has limitations that must be acknowledged. Participation in this intervention was voluntary; therefore, those who self-selected to enroll may have been inherently different than those who elected not to attend. Further, the analytic sample size was greatly reduced because cases were omitted for missing data. Although no systematic patterns in missing data were observed, this study may represent a selective group of females that may not be representative of the larger population. There was no comparison group available in this community-based program implementation, which may have threatened internal validity. Although a control group for this study would have been ideal, AMOB/VLL is an evidence-based program that was translated for grand-scale dissemination after the original randomized control trial. Thus, based on the statewide delivery of AMOB/VLL in this study, and because the program is delivered in approximately 30 states nationally (Smith, Ory, Belza, & Altpeter, 2012), it was neither feasible nor necessary to include a control group. Yet, increasing pragmatic research

highlights the advantages of more community-based research designs that utilize pragmatic methods and measurements (Riley, Glasgow, Ethridge, & Abernethy, 2013).

Baseline and postintervention data were self-reported. Many of the instrument items utilized in this study required participants to report activities or the way they felt in the 7 to 30 days before completing the instrument; thus, recall bias may have been introduced. The measure for falls asked participants to report the number of times the participant fell in the previous 30 days. A specific definition of falling was not provided to participants. In future studies, a more precise measure for falls should be used, especially when evaluating brief interventions. More specifically, when participants were asked to report the number of times they fell in the previous 30 days at postintervention, they reported the number of falls they experienced since the half-way point of the intervention (from week 4 to the end of the program). Therefore, the time frame for reporting falls at postintervention overlapped with the time needed to receive the entire intervention dose. This may have caused a measurement-related issue because later AMOB/VLL workshop sessions focused on physical activity, which may explain why improvements in Falls Efficacy Scale scores were significantly associated with reduced falls, and no significant relationships or improvements were observed based on participants' physical activity. This measurement issue highlights the need for longer follow-up evaluation periods to assess the occurrence and sustainability of intervention effects.

In conclusion, this study is unique in that it shows the capability of AMOB/VLL to reduce self-reported falls among middle-aged and older adult women. It also identifies baseline health indicators associated with falls at baseline and the number of fall reported at postintervention. Findings from this study have implications for identifying at-risk women upon program enrollment, which can assist lay leaders in determining which participants may require additional attention to improve health indicators and reduce the likelihood of future fall occurrences. Given the relationship between baseline health indicators and falls, efforts should be dedicated to expanding the reach of AMOB/VLL. Additionally, program deliverers should leverage AMOB/VLL to refer at-risk participants to subsequently enroll in other evidence-based exercise, disease management, and mental health interventions (Gipson & Quinn, 2010; Smith, Quinn, et al., 2011).

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