The Impact of Osteoporosis, Falls, Fear of Falling, and Efficacy Expectations on Exercise Among Community-Dwelling Older Adults

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PURPOSE: The purpose of this study was to test a model delineating the factors known to influence fear of falling and exercise behavior among older adults.

DESIGN AND METHODS: This was a secondary data analysis using baseline data from the Bone Health study. A total of 866 individuals from two online communities participated in the study: 161 (18.6%) were from SeniorNet and 683 (78.9%) were from MyHealtheVet. More than half (63%) of the participants were male with a mean age of 62.8 (SD = 8.5) years. The majority was White (89%) and married (53%) and had some college education (87%).

RESULTS: Knowledge about osteoporosis and awareness one has a diagnosis of osteoporosis directly influenced fear of falling, and knowledge of osteoporosis directly and indirectly influenced exercise behavior. A diagnosis of osteoporosis indirectly influenced exercise behavior. Taken together, the hypothesized model explained 13% of the variance in exercise behavior.

IMPLICATIONS: Improving knowledge of osteoporosis and awareness of having a diagnosis of osteoporosis, decreasing fear of falling, and strengthening self-efficacy and outcome expectations for exercise may help improve exercise behavior among older adults.

Osteoporosis, defined by the World Health Organization as a bone density of less than 2.5 *SD*s below the young adult standard (World Health Organization, 2004), is a prevalent problem among older adults living in the community and affects approximately 9% of individuals over the age of 50 years (Looker, Borrud, Dawson-Hughes, Shepherd, & Wright, 2012; Woolf & Pfleger, 2003). The prevalence of low bone mass is even higher at 49%, with higher rates of both conditions noted in women. In men, the prevalence of low bone mass does not increase with age until the age of 70 years and at that time it increases progressively. In contrast, among women, the prevalence of low bone mass increases until the age of 70 years and then it remains stable (Looker et al., 2012). In men, non-White individuals generally have a lower prevalence of low bone mass (24%) than their White male counterparts (39%) (Barrett-Connor et al., 2005). Similarly, in women the prevalence of low bone mass is generally lower in Black women (44%) than in their White counterparts (74%) (Barrett-Connor et al., 2005; see Table 1).

Falls are also prevalent among community-dwelling older adults. Each year, one in every three adults aged 65 years and older sustains a fall (Hausdorff, Rios, & Edelber, 2001; Sekaran, Choi, Hayward, & Langa, 2013), and this is even higher in those in the 80 and above age group. Approximately 10% of all falls actually result in a serious injury, the majority of which are fractures (Owens, Russo, Spector, & Mutter, 2008). Osteoporosis is well known to increase the risk of falls and fall-related injuries (i.e., a fracture; Cheong, Peh, & Guglielmi, 2008; Guglielmi, Muscarella, Leone, & Peh, 2008).

Given the serious consequences of falls, it is not surprising that fear of falling has been reported in approximately 40%–60% of fallers in several community

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Table 1. Descriptive Findings for Study Outcomes

Variable	Range	Mean	*SD*
Falls in last 3 months	0–57	.79	2.72
Fear of falling	1–4	1.85	0.68
Osteoporosis knowledge	0–26	15.16	4.89
Self-efficacy for exercise	0–90	49.39	25.83
Outcome expectations for exercise	9–45	37.10	7.02
Minutes/week exercise	0–1800	108.42	166.26

samples (Boyd & Stevens, 2009; Scheffer, Schuurmans, Van Dijk, Van der Hooft, & de Rooij, 2008; Zijlstra, van Haastregt, & Eijk, 2007). Although findings are not always consistent (Yeung, Chou, & Wong, 2006), fear of falling tends to be more prevalent in women (Lim et al., 2011) and in those who are older (Donat & Ozcan, 2007; Gillespie & Friedman, 2007). Unfortunately, fear of falling commonly results in a restriction in exercise and overall physical activity and contributes to loss of independence beyond that warranted by physical injuries resulting from the fall or normal age changes (Boyd & Stevens, 2009; Fletcher & Hirdes, 2004; Friedman, Munoz, West, Rubin, & Fried, 2004; Iyigün et al., 2008; Painter, Elliott, & Hudson, 2009; Schepens, Sen, Painter, & Murphy, 2012). In a qualitative study (Mahler & Sarvinmaki, 2012) exploring the impact of fear of falling on daily life, community-dwelling older women indicated that they accepted and adjusted to a fear of falling and responded by decreasing their independence and their engagement in the outside world.

Self-efficacy expectations, specifically beliefs about ability to engage in exercise and outcome expectations or the beliefs in the benefits of exercise, have been associated with time spent in exercise among older adults (Gary, 2006; McAuley et al., 2006; Qi & Resnick, 2011; Resnick, Luisi, & Vogel, 2008). The theory of self-efficacy (Bandura, 1997) suggests that the stronger the individual's self-efficacy and outcome expectations the more likely it is that he or she will initiate and persist with a given activity. Fear of falling and knowledge of being at risk for falls, fracture, and/or osteoporosis have all been noted to influence self-efficacy and outcome expectations for exercise (Merrill, Shields, Wood, & Beck, 2004; Resnick, 2005; Wilcox, Castro, & King, 2006). If older individuals are aware that they have osteoporosis and fears falling, they may have low self-efficacy and outcome expectations for exercise and may subsequently engage in limited exercise. This only increases the risk of osteoporosis and falling.

Currently there is an increased focus on dissemination of information about osteoporosis to the lay public as well as an increased focus on disease identification and treatment. Bone density testing is now covered by Medicare for individuals 65 years of age and older who meet one of five requirements: estrogen deficiency, hyperparathyroidism, vertebral deformities, take steroids, or are on a medication for osteoporosis (Medicare Coverage of Bone Density Testing, 2012). In addition, the Centers of Disease Control and Prevention, the National Osteoporosis Foundation, and the Foundation for Health in Aging also disseminate information focused on increasing the public's knowledge and awareness of osteoporosis. Little is known, however, about the impact that a diagnosis of osteoporosis and overall knowledge about osteoporosis has on older adults' fear of falling, falls, and exercise activity. We hypothesized that increased knowledge of osteoporosis and awareness of having this disease would increase fear of falling and decrease beliefs in ability to engage in and the benefits of exercise and influence time spent in exercise. Understanding the impact of these variables on exercise can help guide educational interventions associated with osteoporosis and ensure that knowledge of osteoporosis does not decrease engagement in exercise (Gómez-Cabello, Ara, González-Agüero, Casajüs, & Vicente-Rodríguez, 2012; Howe et al., 2011; Moayyeri, 2008).

The purpose of this study was to test a model that explored the impact of the many variables known to influence exercise behavior among older adults and, specifically, to test the impact of knowing that one has a diagnosis of osteoporosis and knowledge about this disease on fear of falling and time spent in exercise (see Figure 1, Full Hypothesized Model). We hypothesized that, in addition to demographic variables, (1) knowledge about osteoporosis, a diagnosis of osteoporosis, and previous falls would be associated with fear of falling; and (2) knowledge about osteoporosis, a diagnosis of osteoporosis, previous falls, fear of falling, and efficacy expectations for exercise (self-efficacy and outcome expectations) would directly and indirectly (through efficacy expectations, fear of falling, and falls) be associated with time spent in exercise.

Methods

This was a secondary data analysis using baseline data from the Bone Health study (Nahm et al., 2013), an online bone health intervention study that included older adults from two online communities, SeniorNet and MyHealtheVet. To be eligible for the study, participants had to (1) be aged 50 years or older; (2) have access to the Internet and e-mail; (3) be able to use the Internet/e-mail independently; (4) have or obtain an e-mail account; (5) reside in the United States and in the community (i.e., not living in a nursing home setting); and (6) be able to read and write English. Individuals were excluded if they (1) were currently participating in any other study(s) about falls, osteoporosis, and/or nutrition; (2) participated in our preliminary study on web-based hip fracture prevention. The study was approved by a university-based institutional review board and consent was obtained via an online process.

Following consent, participants were given 1 week to complete the online survey. A "Help Desk" support person was available from 8 a.m. to 5 p.m. Eastern Standard Time, Monday through Friday via phone and e-mail. In appreciation of participants' time, a check for $20 was mailed to each participant upon completion of the baseline survey.

Sample

A total of 866 individuals from two online communities participated in the study: 183 (21%) were from

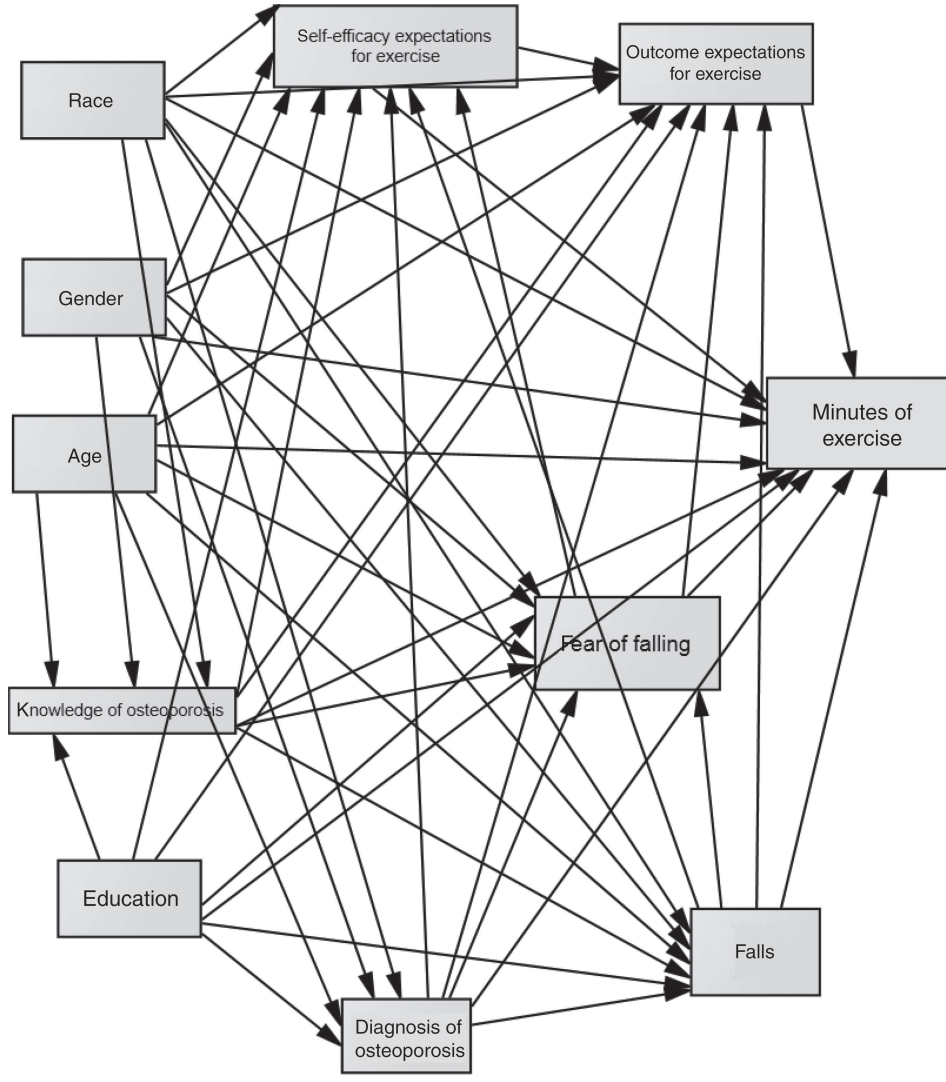

FIGURE 1. Full hypothesized model.

SeniorNet and 683 (78.9%) were from MyHealtheVet. More than half (63%) of the participants were male with a mean age of 62.8 (SD = 8.5) years. The majority was White (89%) versus Black or other and married (53%) and had some college or higher level of education (87%).

MEASURES

Demographic information included age, race (White or Black/other), gender, marital status, and education. Awareness of having a diagnosis of osteoporosis was based on subjective reports from participants about whether they had been told by a provider that they had a diagnosis of osteoporosis. Knowledge about osteoporosis was based on the Osteoporosis Knowledge Test (OKT; Kim, Horan, Gendler, & Patel, 1991). The original OKT measure has two subscales: a 16-item Exercise Scale and a 17-item Calcium Scale. Items reflect knowledge about the influence of health behaviors and other factors (e.g., body type, family history of osteoporosis) that increase or decrease the likelihood of developing osteoporosis. Prior testing of the original OKT with a similar sample provided evidence of internal consistency (alpha coefficients were .74 and .76, respectively) and validity using hypothesis testing (Nahm et al., 2010). For this study, one item specific to the use of milk products for calcium intake was removed as many older adults felt that the question was biased as they reported having lactose intolerance and thus deliberately avoided milk products. In addition, two items were revised to reflect current exercise and calcium recommendations from the National Osteoporosis Foundation and the U.S. Department of Health and Human Services for prevention and management of osteoporosis (National Osteoporosis Foundation, 2008, 2012; U.S. Department of Health and Human Services, 2008). Finally, three items were added to address vitamin D and the relationship between vitamin D and bone health. The alpha coefficient for the revised OKT in this study was .80.

Exercise self-efficacy was evaluated using the Self-Efficacy for Exercise scale, a nine-item measure on an 11-point scale ranging from 0 (*no confidence*) to 10 (*very confident*) (Resnick & Jenkins, 2000). Prior use of the measure provided evidence of reliability based on squared multiple correlation coefficients using structural equation modeling, and validity based on

hypothesis testing (Resnick & Jenkins, 2000). Outcome expectations for exercise were evaluated using the Outcome Expectations for Exercise Scale, also a nine-item measure that focused on the perceived consequences of exercise (Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000; Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2001). Prior use provided evidence of internal consistency (alpha coefficients ranging from .88 to .93) and validity based on confirmatory factor analysis (Resnick et al., 2000, 2001).

Time spent in exercise was obtained by using the six-item moderate-level physical activity subscale that is part of the 27-item Yale Physical Activity Survey (Dipietro, Caspersen, Ostfeld, & Nadel, 1993). The six items include such things as swimming, biking, brisk walking, or jogging. Hours per week spent in each activity was obtained and summed to calculate time spent in moderate-intensity physical activity (i.e., exercise). Prior research supported test–retest reliability (Dipietro et al., 1993; Pescatello, DiPietro, Fargo, Ostfeld, & Nadel, 1994) and validity of this measure based on comparisons of the Yale Physical Activity Survey score with physiological variables (Dipietro et al., 1993; Pescatello et al., 1994).

Information about the number of falls that occurred in the prior 3 months was obtained on the basis of self-report. Fear of falling was assessed by asking participants to rate fear of falling on a 4-point Likert scale (1 being "none of the time"; 4 being "all of the time"). This single-item scale was reported to be a valid measure as fear of falling was consistent over time and significantly related to functional measures in older adults (Resnick, 1998).

Data Analysis

Descriptive statistics were done to describe the sample with regard to demographics and outcome measures. Number of falls was not normally distributed so a log transformation was used. Model testing was done using structural equation modeling and the Amos statistical program (Arbuckle, 2006). The sample covariance matrix was used as input and a full information maximum likelihood (FIML) solution sought. Missing data were handled, as per the Amos statistical program, using FIML. Assuming that the missing data are missing at random, this approach uses all available data and produces unbiased parameter estimates.

The chi-square statistic, the normed fit index (NFI), and Steigers Root Mean Square Error of Approximation (RMSEA) were used to estimate model fit (Bollen, 1989; Loehlin, 1998). A $p < .05$ significance level was used for all analyses. The larger the p value associated with chi-square, the better the fit of the model to the data (Bollen, 1989; Loehlin, 1998). Since the chi-square statistic is sample size dependent, chi-square divided by degrees of freedom (df) was also calculated. Ratios of 3 or less were considered to be a good fit of the model to the data (Bollen, 1989; Loehlin, 1998). The NFI tests the hypothesized model against a baseline model and should be 1.0 if there is perfect model fit. The baseline model is created by the statistical program and represents a model where all variables are unique and unrelated to each other (Arbuckle, 2006). The NFI is "normed" so that the values cannot be less than 0 or more than 1. The RMSEA is a population-based index and consequently is insensitive to sample size. An RMSEA of less than 0.10 is considered good, and <0.05 is very good (Loehlin, 1998). Path significance (i.e., significance of the Lambda values) was based on a critical ratio, which is the parameter estimate divided by the standard error. A critical ratio greater than 2 in absolute value was considered significant (Arbuckle, 2006).

Results

Among all participants, 202 (23%) reported a known diagnosis of osteoporosis. Of these, 92 were male (representing 17% of the male participants) and 110 were female (representing 35% of the female participants). The mean number of falls overall was less than 1 and the majority of the participants (72%) had no falls. A total of 116 individuals (13%) had one fall, 58 (7%) had two falls, and the remaining 70 individuals (8%) reported from three to 57 falls over the past 3 months. With regard to fear of falling, 225 individuals (26%) did not respond to this item, 187 (22%) participants reported no fear, 380 (44%) reported fear some of the time, 57 (7%) reported fear most of the time, and 17 (2%) had fear all of the time. Overall, fear of falling was 1.85 (SD = 0.68). Based on mean scores, the participants had fair self-efficacy [49.4 (SD = 25.8), range 0–90] and outcome expectations [37.1 (SD = 7.02), range 9–45] related to exercise and a fair understanding of osteoporosis [mean 15.16 (SD = 4.8), range 0–26 on the knowledge of osteoporosis measure]. Overall, participants engaged in 108.42 (SD = 166.26; range 0–1800) minutes of exercise per week and 207 (24%) of the participants engaged in no exercise at all.

The full hypothesized model did not fit the data with a χ^2 of 77 (df = 7), χ^2/df ratio equal to 11, NFI equal to 93, and RMSEA equal to 0.11. A total of 23 of the 48 hypothesized paths were significant. The model was revised to include significant paths only (see Figure 2) with standardized regressions for each path as noted in Table 2. There was a significant improvement in fit of the revised model with a χ^2 of 108 (df = 31), ratio equal to 3.5, NFI equal to 0.90, and an RMSEA equal to 0.05.

Age, gender, and race were associated with having a diagnosis of osteoporosis and explained 6% of the variance. Those who were female, were Black or other, and were older were more likely to report a diagnosis of osteoporosis. Those who were older and female and had more education also had more knowledge about osteoporosis and together these three factors explained 22% of the variance in osteoporosis knowledge. Gender, the number of falls, having a diagnosis of osteoporosis, and having more knowledge about osteoporosis were all associated with fear of falling and explained 13% of the variance. Those who were female, had more falls, had a diagnosis of osteoporosis, and had less knowledge about osteoporosis were more likely to fear falling.

Knowledge about osteoporosis, self-efficacy, and outcome expectations were all directly associated with time spent in exercise. Those who had more knowledge about osteoporosis and stronger self-efficacy expectations and outcome expectations for exercise spent more time

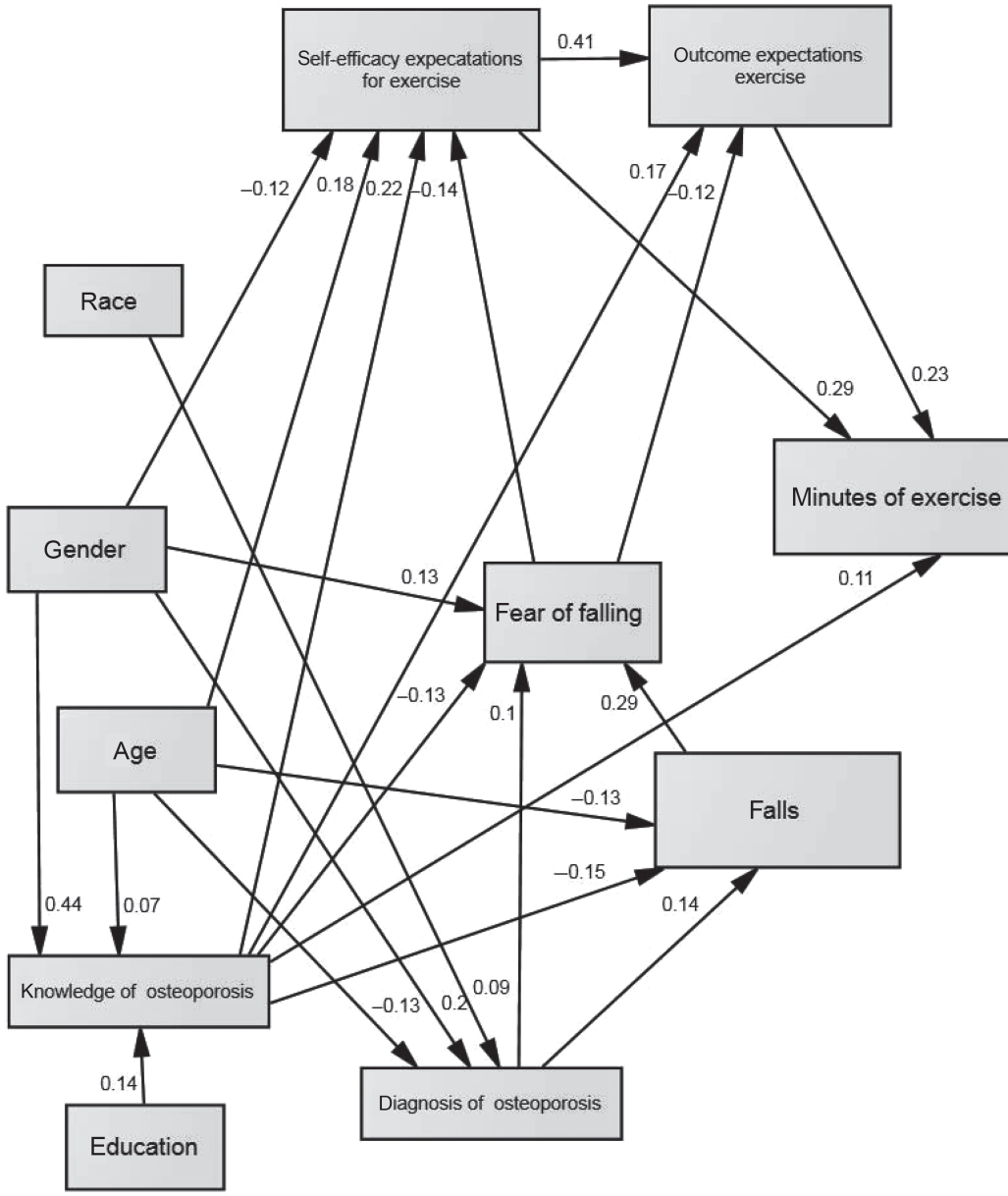

FIGURE 2. Hypothesized model with significant paths only.

exercising. A known diagnosis of osteoporosis was not directly associated with time spent in exercise. A known diagnosis of osteoporosis was, however, indirectly associated with time spent in exercise through falls, fear of falling, and efficacy expectations. Together all of the variables in the model explained 13% of the variance in exercise behavior.

Discussion

All of the factors in the model had either a direct or indirect relationship with exercise behavior. Having a known diagnosis of osteoporosis and knowledge about osteoporosis was directly associated with fear of falling. Knowledge about osteoporosis was directly and indirectly associated with time spent in exercise. A known diagnosis of osteoporosis, however, was only indirectly associated with time spent in exercise. The revised model with significant paths only included resulted in a good fit of the data based on fit indices.

As anticipated, awareness of having a diagnosis of osteoporosis and knowledge about osteoporosis had a direct relationship with falls. Those who were more knowledgeable about osteoporosis and the factors that influence osteoporosis were less likely to fall and those who reported a diagnosis of osteoporosis were more likely to fall. Prior research has noted that physiologically older adults with osteoporosis are at greater risk for falling (Burk-Doe, Hudson, Werth, & Riordan, 2008; Liu-Ambrose, 2004; Moayyeri, 2008) due to impaired balance and decreased strength. The diagnosis of osteoporosis in participants in the current study was based on subjective reporting rather than objective testing (e.g., bone density results). It is not certain, therefore, if

Table 2. Standardized Regression Weights for Hypothesized Paths in the Full Hypothesized Model

Hypothesized Paths	Estimate	*SE*	CR	*p*
Age to osteoporosis diagnosis	0.12	0.002	3.604	**.001**
Gender to osteoporosis diagnosis	0.19	0.029	5.954	**.001**
Education to osteoporosis diagnosis	0.01	0.028	0.282	.77
Race to osteoporosis diagnosis	0.09	0.046	2.564	**.01**
Age to osteoporosis knowledge	0.07	0.017	2.022	**.04**
Gender to osteoporosis knowledge	0.44	0.299	14.873	**.01**
Education to osteoporosis knowledge	0.14	0.288	4.631	**.01**
Race to osteoporosis knowledge	−0.05	0.472	−1.741	.08
Race to falls	−0.04	0.297	−1.183	.24
Education to falls	0.04	0.182	1.170	.24
Gender to falls	−0.03	0.213	−0.864	.38
Age to falls	−0.13	0.011	−4.247	**.001**
Osteoporosis diagnosis to falls	0.14	0.220	4.408	**.001**
Osteoporosis knowledge to falls	−0.15	0.021	−3.953	**.001**
Race to fear of falling	0.02	0.081	0.533	.58
Education to fear of falling	−0.05	0.050	−1.352	.16
Gender to fear of falling	0.13	0.058	3.243	**.001**
Age to fear of falling	0.01	0.003	0.240	.82
Osteoporosis to fear of falling	0.10	0.009	7.817	**.02**
Falls to fear of falling	0.30	0.061	2.485	**.001**
Osteoporosis knowledge to fear of falling	−0.13	0.006	−2.800	**.01**
Osteoporosis to self-efficacy for exercise	−0.01	1.689	1.343	.62
Education to self-efficacy for exercise	0.04	2.744	0.455	.18
Race to self-efficacy for exercise	0.02	1.988	−3.413	.65
Gender to self-efficacy for exercise	−0.13	0.100	5.683	**.001**
Age to self-efficacy for exercise	0.18	1.524	−3.699	**.001**
Falls to self-efficacy for exercise	0.04	0.334	0.995	.32
Fear of falling to self-efficacy for exercise	−0.14	2.064	−0.497	**.001**
Osteoporosis knowledge to self-efficacy for exercise	0.22	0.200	5.722	**.001**
Falls to outcome expectations for exercise	−0.02	0.677	1.596	.51
Education to outcome expectations for exercise	0.02	0.417	0.775	.44
Gender to outcome expectations for exercise	0.06	0.493	1.747	.08
Age to outcome expectations for exercise	0.01	0.025	0.039	.96
Fear of falling to outcome expectations for exercise	−0.12	0.381	−3.557	**.001**
Self-efficacy expectations to outcome expectations for exercise	0.41	0.008	13.371	**.001**
Osteoporosis knowledge to outcome expectations for exercise	0.17	0.082	−0.649	**.001**
Osteoporosis diagnosis to outcome expectations for exercise	0.04	0.509	1.050	.29
Race to outcome expectations for exercise	0.05	0.050	3.634	.11
Falls to exercise	−0.02	0.007	−0.499	.89
Self-efficacy expectations to exercise	0.29	0.001	6.812	**.001**
Outcome expectations to exercise	0.23	0.003	5.795	**.001**
Race to exercise	−0.04	0.057	−1.142	.05
Education to exercise	0.04	0.035	1.187	.12
Gender to exercise	−0.01	0.042	−0.284	.52
Age to exercise	0.05	0.002	1.334	.57
Osteoporosis diagnosis to exercise	−0.07	0.033	−1.107	.69
Fear of falling to exercise	−0.05	0.043	−1.821	.19
Osteoporosis knowledge to exercise	0.11	0.004	2.557	**.01**

Note. CR = Critical ratio which is calculated by dividing the regression weight estimate by the estimate of its standard error. *SE* = standard error. *p* values in bold are significant at the $p < .05$ level.

they had physiological changes in the bone consistent with osteoporosis (i.e., a decrease in bone density) or if they believed they were osteoporotic based on other criteria. Nor is it known what degree of disease involvement or symptoms of osteoporosis they had in terms of such things as decreased height, kyphosis, or pain that might impact falls. Although further research is needed as to the cause of falls in individuals with osteoporosis, it is possible that the knowledge of having a diagnosis of osteoporosis, regardless of disease involvement, may have resulted in self-induced limitations of physical activity and subsequent deconditioning that increased participants' risk of falling. We recommend that caution be used when alerting older adults with osteoporosis to their increased fall risk. It is important that these discussions do not induce or exacerbate fear of falling and limit exercise and other types of physical activity. Discussions around fall risk and prevention should include information about how older adults can optimize balance and strength and decrease falls through appropriate exercise activities (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2010; National Institute of Aging, 2009).

Our findings confirm the benefits that increasing knowledge about osteoporosis can have on decreasing falls. In addition, knowledge about osteoporosis was associated with less fear of falling. Having this knowledge may have resulted in some sense of empowerment to protect oneself from falls and associated negative consequences of the fall. Using the fall experience in older adults as an opportunity to increase knowledge about osteoporosis, and particularly about the behaviors that can help decrease the risk and progression of osteoporosis and risk of falling should be considered. Conversely, as has been noted in prior research (Arnold, Busch, Schachter, Harrison, & Olszynski, 2005; Maggio et al., 2010), having a diagnosis of osteoporosis was associated with greater fear of falling. It is likely that those who knew they had osteoporosis feared a fracture with any fall, thus exacerbating their fear.

Knowledge about osteoporosis was directly associated with confidence in exercising as well as time spent in exercise. Those with greater knowledge had stronger self-efficacy and outcome expectations associated with exercise and were more likely to exercise. A prior study (Burk-Doe et al., 2008) exploring the relationship between knowledge about osteoporosis and confidence in performing activities of daily living reported similar findings. In that study, increased knowledge about osteoporosis was associated with increased confidence in performing activities of daily living. Thus, increasing osteoporosis knowledge may influence behaviors such as engaging in exercise, particularly exercise that improves bone health and decreases the risk of falling.

In addition to knowledge about osteoporosis, self-efficacy and outcome expectations also influenced exercise. Taken together, however, these variables only explained a small percentage of exercise activity (13%). Other factors such as pain, concerns about other disease states, motivation, and environment barriers (real or perceived) may also influence exercise and should be considered when developing interventions to increase exercise activity among older adults.

The demographic variables of race, education, gender, and age were not consistently associated with knowledge of osteoporosis, fear of falling, or exercise as was anticipated. Our findings were not consistent with prior epidemiological reports, suggesting that those who are older, those who are female, and those who were Black or other tend to be less likely to engage in exercise or other types of physical activity (Barkley, 2008; Centers for Disease Control and Prevention, 2010). The age range for participants in our study was 50–92; however, the median was 62, the mode 52, and 95% were younger than 80 years. Thus, age may have been too homogenous to reflect differences such as those noted in other studies. Similarly, the majority of the participants were White and male, thus influencing our findings. This is quite divergent from most studies of older adults, particularly those focused on osteoporosis in which the samples tend to be mostly women. The men in this study had a higher rate of osteoporosis when compared with the rates of osteoporosis reported in prior studies (Frost et al., 2012; Looker et al., 2012). The rates of male osteoporosis in those studies ranged from 3% to 11%, depending on the age of the participants, compared with the rate of 16% in our study. In addition, the participants in this study were also a select group of well-educated Internet users who were willing to participate in a study focused on increasing bone health.

Consistent with prior research (Filiatrault, Desrosiers, & Trottier, 2009; Ní Mhaoláin et al., 2012; Painter & Elliott, 2009; Sharaf & Ibrahim, 2008), we found that women were more likely to be fearful of falling. Conversely, we did not find that gender was associated with falls as it has been in prior studies (Hawkins et al., 2011; Painter & Elliott, 2009; Sharaf & Ibrahim, 2008). This may due to sample selectivity.

Nursing Implications

The findings from this study suggest that it may be helpful to be cautious about giving a patient a diagnosis of osteoporosis without providing accurate information about ways in which to optimize their bone health and prevent falls and fracture. We recommend that healthcare providers use the diagnosis of osteoporosis as an opportunity to encourage the importance of exercise for strengthening bone and fall prevention. Specifically, individuals should be taught the types of exercise that will mostly likely be beneficial to their bone health. The NIH National Osteoporosis and Related Bone Diseases Resource Center (2013) has resources that can be used with patients for this purpose. This type of education may help prevent the associated lower level of physical activity noted among those with osteoporosis.

Study Limitations

This study was limited in terms of including a very select, albeit large, group of young-old adults, the majority of whom were male and received care within the Veteran's Administration healthcare system, highly educated, users of the Internet, and interested in participating in a study focused on learning more about bone

health. Findings, therefore, cannot be generalized to all community-dwelling older adults. In addition, the outcomes were all based on self-report that may or may not reflect true outcomes (e.g., time in exercise or falls). Although missing data were handled using a traditional FIML approach, we acknowledge that 225 participants did not respond to the question about fear of falling. Based on a comparison in means between those who answered the fear of falling question and those who did not, those who answered the question had more falls in the prior 3 months, lower exercise self-efficacy, spent less time in exercise, and were less likely to have osteoporosis than those who did not answer the question. It is not known if the fit of the model might have been altered if these individuals responded to the fear of falling item. Despite these limitations, the findings from this study can be used to focus interventions to increase exercise among young-old community-dwelling adults. Most importantly, findings suggest that increasing individuals' knowledge of osteoporosis, decreasing fear of falling, and strengthening self-efficacy and outcome expectations for exercise will directly positively influence the time that older adults spend in exercise.

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