Relationship Between Fear of Falling and Quality of Life in Nursing Home Residents: The Role of Activity Restriction

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Research Article

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Abstract

(1) Background: Fear of falling is the most common psychological consequence related to falls and is very prevalent among older adults. This study investigates the mediating role of activity restriction in the relationship between the fear of falling and health outcomes;

(2) Methods: This cross-sectional study was conducted from March to June 2018. Generalized structural equation modeling was conducted to test the mediating role of activity restriction;

(3) Results: Residents with fear of falling were more likely to restrict their activities and residents who often or always restricted activities reported lower levels of quality of life and higher levels of depression. Severe activity restriction accounted for 75% of the total effect of fear of falling on quality of life and 69% of the total effect of fear of falling on depression, respectively;

(4) Conclusions: Fall prevention efforts in nursing homes should focus on strategies or interventions to reduce residents’ excessive fear of falling and promote activity engagement. Physical and social activities will not only prevent future falls but also improve residents’ quality of life and mental health.

1. Introduction

Globally, falls are a major public health problem in terms of both mortality and morbidity, and adults aged 60 years and older suffer the greatest number of fatal falls [1]. Even when falls are not immediately fatal, they significantly increase the risk of disability, higher medical care costs, institutionalization, and early mortality [2–6]. Fear of falling (FOF) is the most common psychological consequence related to falls and is highly prevalent among older adults, irrespective of whether they have actually experienced falls [7]. FOF has been variously defined as including a cautious concern about falling, a lack of confidence in maintaining balance during normal activities, and low perceived self-efficacy in avoiding falls during essential, non-hazardous activities of daily living [7–9]. A mild level of FOF is very common and can be viewed as a normal part of life. However, a strong and ongoing FOF may become a major problem and create a vicious cycle [10]. FOF may lead older adults to withdraw from activities they enjoy and lose confidence in performing daily activities, which can worsen their muscle strength and gait balance. This all puts older adults at an increased risk of falling and makes future falls more likely. Falls with serious consequences can further increase the level of FOF [11, 12]. Moreover, FOF limits older adults’ daily activities as much as having had multiple previous falls does [10].

Besides limiting activities and increasing the risk of futural falls, FOF can also affect older adults’ mental health [13]. FOF reduced older adults’ confidence and makes them feel vulnerable and incompetent, which may lead to depression and reduced quality of life [11, 14]. In a large cohort of community-dwelling older adults, a previous study found that FOF and activity restriction were associated with the prevalence and incidence of late-life depression, respectively [8]. FOF was significantly related to declines in the Short Form 36 Health Survey (SF-36) scores and even non-fallers who reported FOF had a greater risk of nursing home admission [15]. A systematic review of the consequences of FOF among older persons found consistent results on reduction in social activities, depression, and diminished quality of life [13].

Restriction in physical and social activities has adverse effects on health outcomes. Previous research indicated that activity restriction significantly decreased the quality of life and increased depressive symptoms among older adults with chronic conditions [16–18]. On the one hand, physical exercise can affect the onset of depression by affecting central function, or by stimulating endorphin levels [19]. Exercise can prevent a variety of cardiovascular and cerebrovascular diseases, diabetes, and other health conditions, maintain functional independence, and improve quality of life. Social activities, on the other hand, may influence depression by increasing self-esteem. People improve their quality of life by engaging in social activities, building social relationships, and experiencing positive emotions [20].
Prior research provides an essential understanding of older adults' FOF; however, most studies have been focused on community-dwelling older adults, with less attention on nursing home residents. Nursing home residents fall at about three times the rate of older adults in the community [21]. They also have a higher risk of death or serious injury arising from a fall [22] and are more likely to adopt a sedentary lifestyle. Therefore, more studies are needed to investigate FOF among the nursing home population. Moreover, previous studies did not clearly highlight the mediating role of activity restriction played in the relationships between FOF and its impact on quality of life and mental health. One study found that activity restriction accounted for 45.8% of the effect of FOF on late-life depression in a cohort of community-dwelling older adults [8]. To address gaps in knowledge, this study aims to investigate (1) the mediating role of activity restriction in the relationships between FOF and quality of life, and (2) the mediating role of activity restriction in the relationships between FOF and depression among nursing home residents.

2. Materials and Methods

2.1. Data and Sample

This cross-sectional study was conducted from March to June 2018. A convenience sampling of residents was recruited from 27 nursing homes in Jinan, the capital city of Shandong province, China. All nursing homes have operated for at least one year with 30 or more beds.

The inclusion criteria were as follows: (1) being 60 years or older, (2) having lived in a nursing home for at least three months, and (3) willing to participate in the study and capable of understanding survey questions. Residents were excluded if they had (1) severe cognitive impairment, as indicated by the Mini-Mental State Examination (MMSE) total score < 10 [23], (2) vision and/or hearing problems, and (3) coma, end-stage disease, or receiving hospice care. (4) being bedridden. The Shandong University institutional review board approved the study before any data collection. Written informed consent was obtained from all residents. The residents were assured that their responses would be confidential and anonymous.

2.2. Measures

2.2.1. Outcome variables: Quality of Life and Depression

Quality of Life. The self-reported nursing home quality of life questionnaire was used to assess residents’ quality of life [24]. It has 38 items with nine domains: physical health, food enjoyment, security, environmental comfort, autonomy, meaningful activity, interrelationship, family relationships, and mood. Each domain was transformed into a 0–10 scale. The total score is the equally weighted sum of nine domain scores, with a higher score indicating better quality of life. It has been developed and validated in the Chinese nursing home population [24, 25]. The Cronbach's alpha was 0.89 in this study.

Depression. The Patient Health Questionnaire (PHQ-9) was used to evaluate participants’ depressive symptoms in the past two weeks [26]. Based on the frequency of feelings, items are scored from 0 to 3 points (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). The total score ranges from 0 to 27, with a higher score indicating higher levels of depression. The scale has been validated in the older population [27]. The Cronbach's alpha was 0.79 in this study.

2.2.2. Mediator: Activity Restriction

Participants were asked, “During the past year, have there been times when you have limited or avoided certain activities?” These activities could include taking a shower, going up or down stairs, doing physical activity, or going outside for social activity. Participants were categorized into 3 groups: (1) never, (2) rarely/sometimes, and (3) often/always.

2.2.3. Control variables

Participants were also asked information about their age, sex, race/ethnicity, marital status, education, length of stay, room arrangement, cognitive impairment, number of chronic conditions, activities of daily living (ADLs), lower extremity...
functioning, and whether they fell in the past year. The Mini-Mental State Examination (MMSE) was used to measure cognitive impairment [23]. The Barthel Index was used to measure ADLs disability [28]. The ADLs were classified into three categories: independence, partially dependence, and dependence. The Short Physical Performance Battery (SPPB) was used to evaluate lower extremity functioning in older adults [29].

2.3. Data Analysis

Descriptive statistics were used to describe the characteristics of nursing home residents. To test the mediating effect of activity restriction on the relationship between FOF and QOL, the multilevel mixed-effects multivariate linear or ordered logistic regression models were used, as appropriate, to determine whether the four criteria Baron and Kenny (1986) proposed were met: (1) FOF was significantly associated with QOL; (2) FOF was significantly associated with activity restriction; (3) activity restriction was significantly associated with QOL; and (4) the relationship between FOF and QOL was attenuated or no longer significant with the inclusion of activity restriction. For the ordered logistic regression model, a test of the proportional odds assumption was performed; this test demonstrated the assumption held for the three-category variable: activity restriction (p = 0.271). The multilevel models took into account residents nested within nursing homes.

Lastly, generalized structural equation modeling was conducted to test the mediating role of activity restriction. To estimate the magnitude of mediating effect, we calculated the indirect effect of FOF on QOL (i.e., the effect mediated through activity restriction) by multiplying the effect of activity restriction on QOL and the effect of FOF on activity restriction (Fig. 1). The total effect was then computed as the sum of the direct effect and the indirect effect of FOF on QOL. We did the same procedures to test the mediating effect of activity restriction on the relationship between FOF and depression (Fig. 2). All statistical models were adjusted for age, sex, marital status, education, length of stay, room arrangement, cognitive impairment, number of chronic conditions, ADLs, lower extremity functioning, and whether they fell in the past year. Only six residents had a different race/ethnicity; thus, race/ethnicity was not controlled in the models. All data were analyzed using Stata version 17.0 (Stata Corp, College Station, TX). Statistical significance was accepted at the p < 0.05 level.

3. Results

A total of 317 eligible residents were recruited from 27 nursing homes and one was excluded from the analysis due to missing data. Table 1 shows the characteristics of the 316 residents. The average age was 79 years old. More than half (56%) were females and nearly 82% were married. About one-fourth (24%) were illiterate, half of them only attended elementary or middle school, and one-fourth (26%) had a high school or higher education. About 40% had lived in a nursing home for less than 1 year, 34% lived less than 3 years and 26% lived for 3+ years. Only 21% of them lived in nursing homes with their spouse or lived alone. Two-thirds had partial or total ADLs dependency. On average, residents had three chronic conditions. Nearly 31% of them fell in the past year. The average score of FOF was around 15 and 79% of residents had a score greater than 7, which indicates most residents were concerned about falling when doing daily activities. Only 23% never limited or avoided certain activities in the past year, 22% rarely or sometimes restricted, and more than half of them (55%) often or always restricted their activities. The self-reported QOL was relatively low, with a mean score of 66. The mean score of PHQ-9 was 5, which is the cutoff point to define mild depression.
Table 1
Sample characteristics (n = 316)

<table>
<thead>
<tr>
<th>Mean ± SD or N (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>79.20 ± 8.90</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>139 (43.99%)</td>
</tr>
<tr>
<td>Female</td>
<td>177 (56.01%)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>Han</td>
<td>310 (98.10%)</td>
</tr>
<tr>
<td>Other</td>
<td>6 (1.90%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>258 (81.65%)</td>
</tr>
<tr>
<td>Single/divorced/widowed</td>
<td>58 (18.35%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>76 (24.05%)</td>
</tr>
<tr>
<td>Elementary/middle school</td>
<td>159 (50.32%)</td>
</tr>
<tr>
<td>High school or above</td>
<td>81 (25.63%)</td>
</tr>
<tr>
<td>Length of stay</td>
<td></td>
</tr>
<tr>
<td>3 months − 1 year</td>
<td>125 (39.56%)</td>
</tr>
<tr>
<td>1–3 years</td>
<td>109 (34.49%)</td>
</tr>
<tr>
<td>&gt;3 years</td>
<td>82 (25.95%)</td>
</tr>
<tr>
<td>Room arrangement</td>
<td></td>
</tr>
<tr>
<td>Lived with spouse/lived alone</td>
<td>67 (21.20%)</td>
</tr>
<tr>
<td>Lived with others</td>
<td>249 (78.80%)</td>
</tr>
<tr>
<td>MMSE</td>
<td>21.61 ± 5.07</td>
</tr>
<tr>
<td>Number of chronic conditions</td>
<td>2.80 ± 1.95</td>
</tr>
<tr>
<td>SPPB</td>
<td>4.04 ± 3.45</td>
</tr>
<tr>
<td>ADLs</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>104 (32.91%)</td>
</tr>
<tr>
<td>Partially dependent</td>
<td>183 (57.91%)</td>
</tr>
<tr>
<td>Dependent</td>
<td>29 (9.18%)</td>
</tr>
<tr>
<td>Fell in the past year</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96 (30.38%)</td>
</tr>
</tbody>
</table>

Notes: SD: standard deviation; MMSE: mini-mental state examination; SPPB: short physical performance battery; ADLs: activities of daily living.
As shown in Table 2,3 and Fig. 1,2. FOF was negatively associated with QOL ($\beta = -0.185, p = 0.010$) and positively associated with depression ($\beta = 0.172, p < 0.001$). When the mediator activity restriction was included in the models, the relationship between FOF and QOL ($\beta = -0.016, p = 0.865$) and the relationship between FOF and depression ($\beta = 0.032, p = 0.537$) were attenuated and no longer significant. As residents’ level of FOF increased, they were more likely to restrict their activities ($\beta = 0.333, p < 0.001$). As residents restricted their activities more frequently, they were more likely to report lower levels of QOL (often/always vs. never: $\beta = -3.850, p = 0.014$; rarely/sometimes vs. never: $\beta = -1.226, p = 0.386$) and higher levels of depression (often/always vs. never: $\beta = 3.281, p < 0.001$; rarely/sometimes vs. never: $\beta = 1.358, p = 0.072$). In terms of QOL and depression, there were no significant differences between residents who rarely/sometimes restricted activities and those who never restricted activities. Overall, activity restriction mediated the associations between FOF and QOL and between FOF and depression, respectively. As shown in Fig. 1,2, residents with FOF were more likely to restrict activities; however, only those who often or always limited or avoided their activities (i.e., severe activity restriction) reported poor QOL and depression symptoms. The mediation effect through severe activity restriction was 75% of the total effect of FOF on QOL and 69% of the total effect of FOF on depression, respectively.

Table 2. The mediating role of activity restriction (n = 316).
Residents with FOF were more likely to restrict their activities and residents who often or always restricted their activities in the past year and more than half of residents (55%) often or always restricted their activities. Our study provides new evidence that the relationships between FOF and QOL, and between FOF and depression, respectively, were mediated by activity restriction.

Moreover, residents with more chronic conditions were less likely to report good QOL ($\beta = 0.001$) and depression ($\beta = 0.002$) and more likely to have depressive symptoms ($\beta = 0.380, p = 0.005$) and living with others ($\beta = 1.316, p = 0.045$) were more likely to report depressive symptoms.

Besides the mediation effect, we found having a fall in the past year was significantly related to poor QOL ($\beta = -4.337, p < 0.001$) and depression ($\beta = 1.540, p = 0.004$). Compared to those without ADLs dependency, residents with ADLs dependency were less likely to report good QOL ($\beta = -6.313, p = 0.002$) and more likely to have depressive symptoms ($\beta = 4.365, p < 0.001$). Moreover, residents with more chronic conditions ($\beta = 0.380, p = 0.005$) and living with others ($\beta = 1.316, p = 0.045$) were more likely to report depressive symptoms.

Table 3
Direct effect and indirect effect of fearing of falling on quality of life/depressive symptoms mediated by activity restriction.

<table>
<thead>
<tr>
<th></th>
<th>Indirect Effect</th>
<th>Total Effect</th>
<th>Indirect Effect /Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fearing of falling and quality of life</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity restriction (often/always)</td>
<td>-1.28 (-2.33, -0.23)</td>
<td>-1.70 (-3.37, -0.03)</td>
<td>75% (40%, 99%)</td>
</tr>
<tr>
<td><strong>Fearing of falling and depressive symptoms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity restriction (often/always)</td>
<td>1.09 (0.51, 1.67)</td>
<td>1.57 (0.65, 2.49)</td>
<td>69% (51%, 88%)</td>
</tr>
</tbody>
</table>

Note: The numbers in brackets are 95% confidence interval.

4. Discussion
Using a large sample of nursing home residents, this study makes several important contributions to the small body of knowledge regarding FOF. Our findings suggest that nearly one out of three residents (31%) sustained a fall in the past year and most of them (79%) had concerns about falling during normal activities. Moreover, 22% rarely or sometimes restricted activities in the past year and more than half of residents (55%) often or always restricted their activities. Our study provides evidence that the relationships between FOF and QOL, and between FOF and depression, respectively, were mediated by severe activity restriction. Residents with FOF were more likely to restrict their activities and residents who often or always...
restricted activities reported lower levels of QOL and higher levels of depression. Severe activity restriction accounted for 75% of the total effect of FOF on QOL and 69% of the total effect of FOF on depression, respectively. Our findings strongly support the need for interventions to overcome FOF and promote activity engagement in nursing home residents to prevent falls and ultimately improve their QOL and mental health.

Factors contributing to FOF seem to be similar to the causes of falls [11]. There is a large literature about intervention programs effective in preventing falls in older adults. These programs include environmental modification, medication management based on pharmacist-led clinical medication review, psychological interventions, group or individual exercise programs, and multifactorial intervention programs [30, 31]. Given the high prevalence of prior falls and the presence of multiple chronic conditions, an in-depth multifactorial risk assessment with multicomponent interventions in nursing home residents is necessary. FOF is an important psychological barrier and amenable to change [32, 33]. However, reducing the risk of falling may not decrease FOF, since to some extent they are independent of each other [11]. To overcome FOF, building older adults’ fall-related efficacy or confidence is very important. Studies found that fall education combined with exercise programs was effective to improve balance confidence and balance performance[32, 34, 35]. One component of the intervention program was cognitive reconstructing, which reconstructed maladaptive attitudes and beliefs about falling to promote a realistic view of fall risk and FOF as controllable [34]. Program success in reducing FOF partly depends on the ability to restore older adults’ confidence in their mobility and the sense of control over falling [11]. Our findings suggest that nursing facilities need to take additional efforts to reduce FOF and the incidence of falls.

Our study indicates that only severe activity restriction mediated the relationships between FOF and outcomes including QOL and depression. At the lower level, FOF may serve as a protective mechanism that fosters a healthy degree of caution. Residents may avoid activities with a high risk of falling but still perform essential activities. FOF may reach an unhealthy level and become a social dysfunction, resulting in severe activity restriction. In our study, more than half of residents often or always limited or avoided essential, non-hazardous activities of daily living. The self-imposed activity restriction significantly reduced their QOL and increased their depressive symptoms. Regarding mediation effects, about 69% of the total effect of FOF on depression was mediated by severe activity restriction in our study, which is higher than a previous study on community-dwelling older adults [8]. We could not find studies estimating the mediation effect of activity restriction in the relationship between FOF and QOL. An intervention designed specially to reduce FOF showed an immediate effect on increasing the level of intended physical and social activity [34]. There is also a need for intervention programs to promote diverse and meaningful activities for nursing home residents based on their needs and preferences. Previous research found that residents stayed in their rooms, sitting or alone for most of the time and only spent a small proportion of time on activities [25, 36, 37]. Participating in physical exercise and social activities may not only strengthen muscles, improve coordination, and decrease the risk of falling, but also reduce social isolation, restore confidence, and enhance quality of life and mental health [20, 38].

The study has several limitations. First, no rural nursing homes were included in our study, which limits the generalizability of our study findings. Second, self-reported questionnaires were used, so residents with severe cognitive impairment were not recruited. Third, although we performed multilevel models to account for residents clustered in nursing homes, we did not explore facility characteristics such as staff skill mix and organizational culture on fall prevention which may have influences on residents’ FOF, activity engagement, and QOL. Fourth, the cross-sectional design does not allow us to draw conclusions on causal relationships.

5. Conclusions

In a large sample of nursing home residents, we found 79% experienced an unnecessary concern of falling, and more than one-half often or always restricted their essential activities that would be beneficial for their quality of life and mental health. Our findings also emphasized the mediating role of activity restriction, which accounted for 75% of the total effect of FOF on QOL and 69% of the total effect of FOF on depression. Therefore, restricted activity due to FOF may lead to more depressive
symptoms and poor QOL. There is a substantial burden of falls on residents, nursing facilities, and the healthcare system. Additional fall prevention efforts in nursing homes should focus on strategies or interventions to reduce residents’ excessive fear of falling and promote activity engagement.

**Declarations**

**Data Availability Statement**

The datasets are not publicly available, but data are available from the applicants upon reasonable request and with permission of the researcher’s University.

**Acknowledgments**

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**Contributions**

Conceptualization, D.X. and S.Z.; methodology, D.X.; investigation, S.Z., Y.W., and M.Z.; data curation, S.Z, Y.W., and M.Z., writing—original draft preparation, D.X. and Y.W.; writing—review and editing, K.W.; and supervision, K.W. All authors have read and agreed to the published version of the manuscript.

**Ethics declarations**

**Ethics approval and consent to participate**

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Research Ethics Committee of the Shandong University (Approval number: 2018-R-028). Written informed consent was obtained from all residents.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare no competing interests.

**References**


**Figures**
Figure 1

The mediating role of activity restriction in the association between fear of falling and quality of life.

Figure 2

The mediating role of activity restriction in the association between fear of falling and depressive symptoms.