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The moderating role of social factors in the relationship between an incident of fall and depressive symptoms: a study with a national sample of older adults in South Korea

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ABSTRACT

Objectives: The purpose of the study was to examine the effect of an incident of fall on depressive symptoms and the moderating role of social factors (marital status, living arrangement, family network, and friend network) in older adults in South Korea. We hypothesized that the adverse mental health effect of a fall would be pronounced among those who lack social resources (e.g., no spouse, living alone, and social disconnectedness).

Method: Using the 2017 National Survey of Older Koreans, data were drawn from 8,522 survey participants (aged 65 or older). Multivariate linear regression models of depressive symptoms were examined with an array of predictors: (1) demographic and health variables, (2) social factors, (3) an incident of fall, and (4) interactions between falls and social factors.

Results: More than 15% of the sample had at least one fall in the past 12 months. Higher levels of depressive symptoms were associated with an incident of fall, not married and living alone, and lack of family and friend networks. Not married and living alone and family network significantly moderated the relationship between falls and depressive symptoms. The adverse mental health effect of a fall was more pronounced among those who were not married and living alone and who reported not having any close family members than their counterparts.

Conclusion: The findings highlight the critical role of family and social resources in protecting older Koreans from the negative mental health consequences of a fall. Findings also provide implications for developing fall prevention and management programs, suggesting prioritizing older adults with limited social resources.

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Fall; depression; social resources; older adults; South Korea

Introduction

A fall, defined as “an event which results in a person coming to rest inadvertently on the ground or floor or other lower level” (World Health Organization [WHO], 2018), constitutes a major health concern for older adults. According to existing research on falls among community-dwelling older adults, approximately 1 in 3 adults aged 65 or older experience at least one fall a year (Ambrose, Cruz, & Paul, 2015; Karlsson, Magnusson, von Schewelov, & Rosengren, 2013), and the likelihood of experiencing a fall increases with advanced age (El-Menyar, Tilley, Al-Thani, & Latifi, 2019; Gale, Cooper, & Aihie Sayer, 2016). Fall-related injuries in older adults can range from minor bruises or sprains to severe fractures or traumatic brain injuries (Lim, Park, Oh, Kang, & Paik, 2010; WHO, 2018), which may lead to chronic pain, functional impairment, disability, or even mortality (Karlsson et al., 2013; Oh et al., 2019). In fact, falls are the second leading cause of unintentional injury death (WHO, 2018), and the rate of fall mortality is the highest among older adults (Kiadaliri, Rosengren, & Englund, 2019). In addition to direct health effects, falls can also impact older adults’ psychosocial well-being. Older adults who experienced falls were about 4–5 times more likely to fear falling again or restrict their activity, and the odds of their

social participation also decreased by about 30% (Jang, Cho, Oh, Lee, & Baik, 2007; Pin & Spini, 2016). Moreover, the economic burden imposed on governments due to the medical costs of falls are substantial and continues to increase (Burns, Stevens, & Lee, 2016). For example, medical costs associated with both fatal and nonfatal falls in the United States were estimated to be approximately \$50 billion in 2015, and more than 75% of the costs were covered by Medicare or Medicaid expenditures (Florence et al., 2018). Given the multifaceted impacts of falls on older adults’ health and well-being and substantial economic costs, explicit attention needs to be paid to better understanding older adults’ experiences associated with falls.

The present study attempted to examine the effect of an incident of fall on depressive symptoms and how the effect is moderated by social factors, particularly among older adults in South Korea (hereinafter Korea). Falls are common among older adults in Korea, and their growing incidence and the associated costs have become a public health concern (Kim et al., 2017). According to a recent report by the Korea Institute for Health and Social Affairs (2017), approximately 13% of older adults in Korea reported at least one fall in the past year, 65% of whom required medical treatment. The hospitalization rate due to fall injury has increased with advanced age and over time.

For example, those older than 75 years were two times more likely to be hospitalized compared to those between 65 and 74, and the hospitalization rate has constantly increased since 2004 (Hong et al., 2017). Because Korea is projected to experience the fastest increase in the proportion of older population, from 11% in 2010 to 35% in 2050 (He, Goodkind, & Kowal, 2016; Pew Research Center, 2014), the risk of fall and fall-related injuries among older adults in Korea is likely to increase rapidly.

A substantial amount of fall-related research that focused on identifying various risk factors for falls found that depression predisposed older adults to high risk of falls (Ambrose, Paul, & Hausdorff, 2013; Deandrea et al., 2010; Kvelde et al., 2013; Pfortmueller, Lindner, & Exadaktylos, 2014), and this finding was consistent in research with older adults in Korea (Choi et al., 2014; Sohng, Moon, Song, Lee, & Kim, 2004). However, recent longitudinal research has demonstrated a significant bidirectional relationship between depression and falls (Choi, Marti, DiNitto, & Kunik, 2019; Nam & Yoon, 2014). Despite the possibility of the inverse relationship, relatively little research examined the impact of falls on psychological outcomes. Limited previous empirical research indicated that older adults who have experienced an incident of fall underwent diverse postfall emotions, including fear, anger, embarrassment, and helplessness (Bergeron, Friedman, Messias, Spencer, & Miller, 2016; Lavedán et al., 2018). Additionally, those with a fall experience had significantly higher levels of depression compared to those without such experience (Choo & Kim, 2012; Hajek et al., 2018; Jeon, Jeon, Yi, & Cynn, 2014). Thus, this study sought to expand the current literature by considering depressive symptoms as a significant psychological outcome of falls among older adults rather than an independent risk factor.

Another gap in the literature is that research examining the impact of falls has taken mostly an epidemiological approach rather than a psychosocial approach. As older adults experience a fall incident and progress through the postfall recovery, various social dimensions of their lives are affected including restrained social engagement, increased need for social support and assistance from family or friends due to the loss of independence (Bergeron et al., 2016; Pin & Spini, 2016), and high involvement and burden for caregivers (Faes et al., 2010; Kuzuya et al., 2006). However, studies that have attempted to understand the psychological consequences of falls in the context of social factors are very limited.

The literature has documented that social resources or social factors, such as social support and social networks, have both main and buffering effects on psychological distress including depressive symptoms among older adults (Chang, 2019; Jang, Haley, Small, & Mortimer, 2002; Park, Jang, Lee, Ko, & Chiriboga, 2014; Sakurai et al., 2019; Tajvar, Fletcher, & Grundy, 2016). For example, older adults with greater levels of social support and social networks had significantly lower levels of depressive symptoms (Chang, 2019; Jang et al., 2002; Park et al., 2014), whereas those who were living alone and had poor social networks had higher levels of depressive symptoms (Sakurai et al., 2019). Additionally, stress-buffering effects of social resources mitigating the negative impact of stressors (e.g., disability, health risks) on depressive symptoms have been found

(Jang et al., 2002; Park et al., 2014; Tajvar et al., 2016). Despite strong evidence of the mental health benefits of social resources for older individuals (Chang, 2019; Jang et al., 2002; Park et al., 2014; Sakurai et al., 2019; Tajvar et al., 2016) and the positive impact of social support on recovery among older adults with fall-related injuries in particular (Kempen, Scaf-Klomp, Ranchor, Sanderman, & Ormel, 2001), there is a lack of information on how older adults' mental health is buffered by social resources in the context of a fall.

To address this gap, the present study paid particular attention to the mechanisms through which social factors (marital status, living arrangement, family network, and friend network) condition the mental health consequence of an incident of fall among older adults. We hypothesized that experiencing a fall would be positively associated with depressive symptoms and that the adverse mental health effect of a fall would be intensified when older adults lack social resources (e.g., no spouse, living alone, and social disconnectedness).

Method

Sample

Data were drawn from the 2017 National Survey of Older Koreans (NSOK), jointly conducted by the Korea Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs. The NSOK is a national study designed to explore diverse aspects of older adults' overall health and well-being (e.g., health status and behavior, cognitive function, social and economic activities, family and friend support, living environment, and quality of life). Surveys were conducted via in-person interviews with 10,299 community-dwelling older adults aged 65 or older using stratified two-stage cluster sampling (KIHASA, 2017). The final sample size for the present study was 8,522 after excluding those whose interview was conducted by a proxy ($n=226$), those with potential cognitive impairment ($n=1,534$), and those whose cognitive status was not reported ($n=17$). Cognitive impairment was determined by whether the participant was diagnosed to have dementia or scored lower on the Mini-Mental State Examination for Dementia Screening (MMSE-DS) than the suggested cutoff points, which range from 15 to 24 based on age, gender, and education (Han et al., 2010; Kim et al., 2010). The rationale behind the sample selection of excluding the participants with potential cognitive impairment was to ensure that their self-rated responses were trustworthy.

Measures

Depressive symptoms

Depressive symptoms were measured using the 15-item Geriatric Depression Scale-Short Form (GDS-SF; Sheikh & Yesavage, 1986). The GDS-SF includes five positive items, such as "Are you satisfied with your life?" and 10 negative items such as "Do you feel helpless?" in a yes-no response format. The total GDS-SF score was summated by counting the number of 'yes' responses after the positive items were reverse coded so that higher scores indicated higher levels of depressive symptoms. The total scores ranged from 0 to

15. The psychometric properties of the Korean translated version of GDS-SF have been validated (Jang, Small, & Haley, 2001), and Cronbach's alpha was .89 in the present study.

Incident of fall

Incident of fall was assessed using a question, 'Have you experienced a fall (e.g., falling, slipping, or flopping) over the past one year?' The response was coded as binary (0 = *no*, 1 = *yes*).

Social factors

Social factors considered in the study included marital status, living arrangement, and family and friend networks. Marital status was measured by asking if participants were (1) never married, (2) married, (3) widowed, (4) divorced, (5) separated, or (6) other in a yes–no format, and the response was coded as binary (0 = *married*, 1 = *never married*, *widowed*, *divorced*, *separated*, or *other*). Living arrangement was assessed by asking the type of household (1 = *live alone*, 2 = *live with a spouse*, 3 = *live with children*, 4 = *live with other*), and the response was coded as binary (0 = *not living alone*, 1 = *living alone*). However, due to the high correlation between marital status and living arrangement ($r = .75, p < .001$), a composite variable of not married and living alone (0 = *no*, 1 = *yes*) was created and used for the present analyses. Family and friend networks were measured with a single question asking for the number of close relatives or friends, respectively. The measurement item for family network was "How many relatives including siblings do you have who are close to you?" and the friend network item was "How many friends, neighbors, or acquaintance do you have who are close to you?" Participants of the survey were asked to report the number of relatives including siblings and the number of friends, neighbors, or acquaintances, respectively, and the reported numbers in a continuous format were used in the analyses.

Control variables

Demographic variables included age (in years), gender (0 = *male*, 1 = *female*), and education (0 = *< 12 years*, 1 = *≥ 12 years*). Perceived financial status was assessed with a single question asking the extent to which participants were satisfied with their financial status (1 = *very satisfied*, 5 = *not at all satisfied*). The response was dichotomized for analysis (0 = *high*, i.e., very satisfied, satisfied, or average; 1 = *low*, i.e., not satisfied or not at all satisfied). Physical health status was measured using chronic conditions, functional disability, and self-rated health. The total number of chronic conditions was measured using a list of 32 diseases diagnosed by a doctor (e.g., hypertension, stroke, diabetes, heart disease, asthma, cancer, arthritis, and liver disease). Functional disability was assessed with a composite measure of the Korean Activities of Daily Living scale (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Won et al., 2002). The measure consists of seven items that ask about independence in performing activities including dressing, washing, bathing, eating, transferring, toileting, and continence on a 3-point scale (0 = *without help*, 1 = *with some help*, 2 = *unable to do*). The total scores could range from 0 (*no*

functional disability) to 14 (*severe functional disability*). Cronbach's alpha was .73 in the present study. Self-rated health was measured with a single question asking "How would you rate your overall health?" on a 5-point scale (1 = *excellent*, 5 = *poor*). The response was reverse coded so that higher scores indicated better health.

Analytic strategy

Descriptive statistics and bivariate analyses (e.g., correlations, χ^2 tests, and *t*-tests) were performed to summarize the sample characteristics, detect collinearity, and examine group differences in study variables by an incident of fall. To examine the main effect of falls and interaction effects of falls and social factors on depressive symptoms, multivariate linear regression was conducted with an array of predictors: (1) demographic and health variables, (2) social factors, (3) incident of fall, and (4) interactions between fall and social factors. All analyses were conducted using IBM SPSS Statistics 25 (IBM Corp., Armonk, NY). There were no missing data for the variables used in the present study. Additionally, the study involved unweighted analysis to avoid potential inflation of statistical significance because weighted data in regression sometimes increase standard errors and adversely affect inferential data (Gelman, 2007). Considering that the data used in the study had been collected via stratified two-stage cluster sampling to represent the older population in Korea and represented a large sample, we decided not to apply weights because the objective of the paper was to examine the association of variables rather than the population parameter estimates.

Results

Sample characteristics

Descriptive characteristics of the overall sample, fall group, and nonfall group are presented in Table 1. The mean age of the overall sample was 73.5 years ($SD = 6.3$, range: 65 – 106), and more than 58% were women. Approximately 75% of the sample had less than 12 years of education, and 34.5% perceived their financial status as low. The number of chronic conditions averaged 2.7 ($SD = 1.8$), and the mean scores of functional disability and self-rated health were 0.1 ($SD = 0.5$) and 3.0 ($SD = 1.0$), respectively. As for social factors, the majority of the sample was married (64%) and living with others (76%), and less than a quarter (24%) was not married and living alone. The average numbers of close family members and friends were 0.9 ($SD = 1.2$) and 1.5 ($SD = 1.9$), respectively. More than 15% of the sample had experienced at least one incident of fall in the past year, and the average score of depressive symptoms was 3.9 ($SD = 4.0$).

Group differences in study variables by incident of fall

Table 1 also shows the group differences in study variables between fall and nonfall groups, and there were significant differences in all study variables between the groups. Compared to the nonfall group, the fall group was older, had a higher proportion of women, and had lower levels of education and financial status. All physical health

Table 1. Descriptive characteristics of the sample.

	% or M ± SD Overall sample (N = 8,522)	No Fall (n = 7,227)	Fall (n = 1,295)	χ^2 (t)
Demographic and health variable				
Age	73.5 ± 6.3	73.3 ± 6.2	74.8 ± 6.5	(-7.7)***
Gender				97.2***
Male	41.8	44.0	29.4	
Female	58.2	56.0	70.6	
Education				25.9***
<12 years	74.6	73.5	80.2	
≥12 years	25.4	26.5	19.8	
Perceived financial status				85.2***
Low	34.5	32.5	45.7	
High	65.6	67.5	54.3	
Chronic medical condition	2.7 ± 1.8	2.6 ± 1.8	3.4 ± 2.0	(-14.2)***
Functional disability	.1 ± 0.5	.1 ± 0.4	.2 ± 0.9	(-5.9)***
Self-rated health	3.0 ± 1.0	3.1 ± 1.0	2.6 ± 1.0	(16.6)***
Marital status				90.3***
Not married	36.0	33.9	47.6	
Married	64.0	66.1	52.4	
Living arrangement				43.4***
Not living alone	75.7	77.0	68.5	
Living alone	24.3	23.0	31.5	
Not married and living alone ^a				42.2***
No	75.9	77.2	68.8	
Yes	24.1	22.8	31.2	
Family network	0.9 ± 1.2	0.9 ± 1.3	0.8 ± 1.1	(3.5)**
Friend network	1.5 ± 1.9	1.5 ± 1.9	1.3 ± 2.0	(3.6)***
The incident of fall in the past year				
No	84.8	—	—	—
Yes	15.2	—	—	—
Outcome variable				
Depressive symptoms	3.9 ± 4.0	3.6 ± 3.8	5.6 ± 4.5	(-15.2)***

* $p < .05$, ** $p < .01$, *** $p < .001$.^aA composite variable used in the multivariate analyses due to a high correlation between marital status and living arrangement ($r = .75$, $p < .001$).**Table 2.** Multivariate linear regression models of depressive symptoms.

	Standardized Regression Coefficient (β)			
	Model 1	Model 2	Model 3	Model 4
Age	.10***	.08***	.07***	.07***
Female	.02*	.01	.01	.01
≥ 12 years of education	-.04***	-.03**	-.03**	-.03**
Low financial status	.24***	.22***	.22***	.22***
Chronic disease	.10***	.09***	.09***	.09***
Functional disability	.09***	.09***	.08***	.08***
Self-rated health	-.31***	-.30***	-.29***	-.29***
Not married and living alone		.06***	.06***	.05***
Family network		-.03**	-.03**	-.02
Friend network		-.10***	-.10***	-.10***
The incident of fall			.07***	.05***
Fall × not married and living alone				.03**
Fall × family network				-.04***
Fall × friend network				-.01
Overall R^2	.312***	.327***	.331***	.333***
ΔR^2	.312***	.015***	.004***	.002***

* $p < .05$, ** $p < .01$, *** $p < .001$.

indicators were worse for the fall group, with more chronic conditions, greater functional disability, and poorer self-rated health. As for social factors, the proportion of those who were not married and living alone was significantly higher in the fall group, and the numbers of close family and friends were significantly lower than the nonfall group. The average score of depressive symptoms was also higher in the fall group.

Multivariate linear regression models of depressive symptoms

Findings of multivariate linear regression models examining the effect of fall and moderating effects of social factors on depressive symptoms are presented in Table 2.

Demographic and health variables were entered in Model 1, all of which were significant, and they explained approximately 31% of the total variance of depressive symptoms. Advanced age, female gender, lower levels of education and perceived financial status, greater chronic conditions and functional disability, and poorer self-rated health predicted depressive symptoms. When social factors (not married and living alone, family network, and friend network) were entered in Model 2, they increased the total variance of depressive symptoms by 1.5%, and all were significant. All demographic and health variables remained significant except for gender. As a next step, incident of fall was entered in Model 3, and it significantly predicted depressive symptoms even after all demographic, health-related, and social variables were controlled.

Table 3. Comparison of partial correlation coefficients between fall and depressive symptoms.

	Partial correlation coefficients between fall and depressive symptoms ^a (<i>r</i>)	<i>z</i>
Not married and living alone		2.39*
Yes (<i>n</i> = 2,054)	.12***	
No (<i>n</i> = 6,467)	.06***	
Family network		2.32*
None (<i>n</i> = 4,456)	.10***	
≥1 (<i>n</i> = 4,066)	.05**	

* $p < .05$, ** $p < .01$, *** $p < .001$.

^aDemographic and health variables are partialled out in calculating correlation coefficients.

Moderating role of social factors in the link between fall and depressive symptoms

In Model 4, interaction terms of fall with social factors were added, and the full model explained approximately 33% of the total variance of depressive symptoms. The interactions between a fall and not married and living alone as well as between a fall and family network were found to be significant, whereas the interaction between a fall and friend network was not. To further probe the nature of the significant interaction effects, partial correlation coefficients between a fall and depressive symptoms adjusted for demographic and health variables were compared (Table 3). The sample was divided into two groups based on the status of not married and living alone and on the median score of the number of close family members. Partial correlation coefficients between a fall and depressive symptoms in the subgroups of those who were not married and living alone ($r = .12$, $p < .001$) and those who were married and living together ($r = .06$, $p < .001$) were significant, and the difference of partial correlation coefficients between these two groups was statistically significant ($z = 2.39$, $p < .05$). In addition, partial correlation coefficients between a fall and depressive symptoms in the subgroups of those who did not have any close family member ($r = .10$, $p < .001$) and those who had at least one close family member ($r = .05$, $p < .01$) were significant, and the difference between partial correlation coefficients in these two groups was also statistically significant ($z = 2.32$, $p < .05$).

Discussion

Using a national sample of 8,522 older adults in Korea, the present study investigated the association between an incident of fall and depressive symptoms as well as the mechanisms through which social factors (marital status, living arrangement, family network, and friend network) modified adverse effects of a fall on depressive symptoms. The study found that more than 15% of the sample experienced an incident of fall in the past year. This prevalence rate is comparable to the 13% reported in a study of a population-based sample of community-dwelling older adults in Korea (Lim et al., 2010). Compared to the nonfall group, those who had fallen in the past year were more likely to be older, women, not married and living alone, and have lower levels of education and financial status, more chronic conditions, greater functional disability, poorer self-rated health, and fewer close family and friends. Additionally, the

fall group had higher levels of depressive symptoms compared to the nonfall group. These findings suggest that older Koreans who are in a more vulnerable position in terms of sociodemographics, health, social resources, and mental health dimensions are prone to the risks of fall. These results are supported by previous studies that identified various risk factors that contributed to increased fall risk among older adults (Ambrose et al., 2013; Deandrea et al., 2010; Kvelde et al., 2013) and the studies that compared sample characteristics by fall history among older Koreans (Choi et al., 2014; Sohng et al., 2004; Yoo, 2011).

With regard to the main effect of the incident of fall on depressive symptoms, the study found that a fall was positively associated with depressive symptoms after covariates were adjusted, and the adverse mental health effect of a fall remained significant even when the interaction terms were added. This result not only supports previous research that identified the adverse mental health effect of the incident of fall (Hajek et al., 2018), but also expands prior studies that examined the associations between falls and depression among older Koreans only at a bivariate level (Choo & Kim, 2012; Jeon et al., 2014). Moreover, considering that depression is a well-documented risk factor for falls (Ambrose et al., 2013; Choi et al., 2014; Deandrea et al., 2010; Kvelde et al., 2013; Pfortmueller et al., 2014; Sohng et al., 2004), the detrimental mental health effect of a fall observed in the present study builds on previous research that indicated a bidirectional or reciprocal relationship between falls and depression (Choi et al., 2019; Nam & Yoon, 2014). In addition to the incident of fall, all variables considered in the study, except for gender, were significant predictors of depressive symptoms. As for social factors, those with more social resources (e.g., being married, not living alone, and social connectedness) were associated with lower levels of depressive symptoms, consistent with previous research demonstrating psychological benefits of social resources among older adults (Chang, 2019; Jang et al., 2002; Kempen et al., 2001; Sakurai et al., 2019; Tajvar et al., 2016).

As for the moderating role of social factors, we found that the status of marital status and living arrangement as well as family network had significant interactions with the incident of fall in predicting depression, whereas friend network did not. The finding that the correlation between falls and depressive symptoms were significantly stronger among older adults who were not married and living alone and who had no family network partly supports our hypothesis that the adverse mental health effects of a fall would be pronounced among those who lack social resources. This finding is in line with prior research that reported significant buffering effects of living arrangement, family support, and family involvement on the association between health-related stressors and mental health among older adults (Leung, Chen, Lue, & Hsu, 2007; Silverstein & Bengtson, 1994). According to these studies, the adverse effects of health-related stressors on mental health were more salient among older adults living apart from their children or lacking family social support (Leung et al., 2007; Silverstein & Bengtson, 1994). Significant moderating roles of marital status, living arrangement, and family network as well as the nonsignificant role of friend network observed in the study could be better understood in the context of

Korean cultures, in which familism is a core value and families are perceived as the major source of support (Chang, 2010). Considering that the incident of fall and the process of postfall recovery involve increased need for intimate personal care from caregivers (Bergeron et al., 2016; Faes et al., 2010; Kuzuya et al., 2006; Pin & Spini, 2016), family members become a more salient resource than friends in coping with fall injuries. In addition, this finding is consistent with both task-specific model of helper selection (Litwak, 1985) and the hierarchical compensatory model (Cantor, 1991), which posit that family, friends, and professionals serve different functions in providing help and that family members such as a spouse or adult children are the primary source of support.

There are several limitations to this study. First, causal inferences among study variables cannot be drawn due to the nature of cross-sectional study design, and thus the findings of the study need to be interpreted with caution. As previously discussed, the inverse relationship between the incident of fall and depressive symptoms is also possible. Therefore, this relationship needs to be further explored using longitudinal data. Second, despite the use of a national sample, we excluded respondents with potential cognitive impairment and examined those who were cognitively intact to ensure the trustworthiness of self-rated responses. However, this approach may have led to the underrepresentation of the fall prevalence and older adults in a vulnerable position. Third, the construct of family and friend networks was limited to quantity, using a single question. Future research should explore varied aspects of social factors (e.g., perceived quality of social network and types of social support) in addition to the number of close ties using more comprehensive measures. Fourth, information on the diverse aspects of a fall, such as the severity (a light fall vs. a heavy fall) and the experience of recurrent falls, was limited in the present study. Because the severity and frequency of falls can be highly associated with depressive symptoms, future research needs to consider multiple aspects of a fall in terms of exploring its mental health effects.

Despite the limitations, the study has implications for research, practice, and policy in fall prevention and management. In terms of fall prevention, the study finding that older adults in a vulnerable position have a higher risk of falling calls for particular attention to developing prevention programs that target those who are vulnerable in their sociodemographic, health, social resources, and mental health dimensions. Additionally, given that the incident of fall is associated with physical, sensory, and cognitive changes accompanied by aging (WHO, 2018) and that Korean older adults experience falls unintentionally while doing daily indoor activities (Kim et al., 2018), fall prevention programs need to consider multiple aspects including health and environmental factors to decrease the risk of falls among older adults. With regard to managing falls, adverse mental health effects of falls and significant buffering role of social factors found in the study provide important implications for health professionals, community practitioners, and family members who help older adults recover from fall injuries. The study finding calls for increasing the level of awareness among stakeholders about the detrimental mental health effects of falls and the role of

older adults' social resources in decreasing the effects. Also, intervention efforts need to consider the social context in which older adults live in and provide tailored assistance according to the level of social resources that older adults possess.

Conclusion

The findings of the study highlight the crucial role of social factors in moderating the adverse mental health effect of a fall among older adults in Korea. Relevant to the significant role that social resources (e.g., living together or maintaining close relationships with family) play in mitigating the negative impact of falls on depressive symptoms, Korean society is currently experiencing a drastic change in its family structure and function. The proportion of older adults living with extended family has decreased from about 55% in 1994 to 24% in 2017, and more than 23% live alone (Ministry of Health & Welfare, 2018). Considering the rapid increase in the risk of falls and fall-related injuries among older adults in Korea and the finding of our study that the adverse mental health effect of a fall is more pronounced among those who lack social resources, prevention and intervention efforts need to prioritize older adults with limited social resources to help them better cope with fall injuries. It is also important for the Korean government and local community organizations to take a comprehensive approach to incorporating social contexts in developing fall prevention and management programs.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

References

- Ambrose, A. F., Cruz, L., & Paul, G. (2015). Falls and fractures: A systematic approach to screening and prevention. *Maturitas*, 82(1), 85–93. doi:10.1016/j.maturitas.2015.06.035
- Ambrose, A. F., Paul, G., & Hausdorff, J. M. (2013). Risk factors for falls among older adults: A review of the literature. *Maturitas*, 75(1), 51–61. doi:10.1016/j.maturitas.2013.02.009
- Bergeron, C. D., Friedman, D. B., Messias, D. K. H., Spencer, S. M., & Miller, S. C. (2016). Older women's responses and decisions after a fall: The work of getting "back to normal. *Health Care for Women International*, 37(12), 1342–1356. doi:10.1080/07399332.2016.1173039
- Burns, E. R., Stevens, J. A., & Lee, R. (2016). The direct costs of fatal and non-fatal falls among older adults—United States. *Journal of Safety Research*, 58, 99–103. doi:10.1016/j.jsr.2016.05.001
- Cantor, M. H. (1991). Family and community: Changing roles in an aging society. *The Gerontologist*, 31(3), 337–346. doi:10.1093/geront/31.3.337
- Chang, K.-S. (2010). *South Korea under compressed modernity: Familial political economy in transition*. Abingdon, UK: Routledge. Retrieved from <https://www.taylorfrancis.com/books/9780203854396>.
- Chang, M. (2019). Cross-cultural comparative study of psychological distress between older Korean immigrants in the United States and older Koreans in South Korea. *Aging & Mental Health*, 23(9), 1234–1212. doi:10.1080/13607863.2018.1484887

- Choi, E. J., Kim, S. A., Kim, N. R., Rhee, J., Yun, Y. W., & Shin, M. H. (2014). Risk factors for falls in older Korean adults: The 2011 Community Health Survey. *Journal of Korean Medical Science*, 29(11), 1482–1487. doi:10.3346/jkms.2014.29.11.1482
- Choi, N. G., Marti, C. N., DiNitto, D. M., & Kunik, M. E. (2019). Longitudinal associations of falls and depressive symptoms in older adults. *The Gerontologist*, 59(6), 1141–1151. doi:10.1093/geront/gny179
- Choo, J., & Kim, E. (2012). Health-related quality of life of fallers vs. non-fallers in community-dwelling elderly people. *Journal of Muscle and Joint Health*, 19(3), 373–382. doi:10.5953/JMJH.2012.19.3.373
- Deandrea, S., Lucenteforte, E., Bravi, F., Foschi, R., La Vecchia, C., & Negri, E. (2010). Risk factors for falls in community-dwelling older people: A systematic review and meta-analysis. *Epidemiology*, 21(5), 658–668. doi:10.1097/EDE.0b013e3181e89905
- El-Menyar, A., Tilley, E., Al-Thani, H., & Latifi, R. (2019). Females fall more from heights but males survive less among a geriatric population: Insights from an American level 1 trauma center. *BMC Geriatrics*, 19(1), 238. doi:10.1186/s12877-019-1252-6
- Faes, M. C., Reelick, M. F., Joosten-Weyn Banningh, L. W., Gier, M. D., Esselink, R. A., & Olde Rikkert, M. G. (2010). Qualitative study on the impact of falling in frail older persons and family caregivers: Foundations for an intervention to prevent falls. *Aging & Mental Health*, 14(7), 834–842. doi:10.1080/13607861003781825
- Florence, C. S., Bergen, G., Atherly, A., Burns, E., Stevens, J., & Drake, C. (2018). Medical costs of fatal and nonfatal falls in older adults. *Journal of the American Geriatrics Society*, 66(4), 693–698. doi:10.1111/jgs.15304
- Gale, C. R., Cooper, C., & Aihie Sayer, A. (2016). Prevalence and risk factors for falls in older men and women: The English Longitudinal Study of Ageing. *Age and Ageing*, 45(6), 789–794. doi:10.1093/ageing/afw129
- Gelman, A. (2007). Struggles with survey weighting and regression modeling. *Statistical Science*, 22(2), 153–164. doi:10.1214/088342306000000691
- Hajek, A., Bretschneider, C., van den Bussche, H., Lühmann, D., Oey, A., Wiese, B., Weyerer, S., & König, H.-H., for the AgeCoDe & AgeQualiDe Study Groups (2018). Impact of falls on depressive symptoms among the oldest old: Results from the AgeQualiDe study. *International Journal of Geriatric Psychiatry*, 33(10), 1383–1388. doi:10.1002/gps.4949
- Han, J. W., Kim, T. H., Jhoo, J. H., Park, J. H., Kim, J. L., Ryu, S. H., ... Do, Y. J. (2010). A normative study of the Mini-Mental State Examination for Dementia Screening (MMSE-DS) and its short form (SMMSE-DS) in the Korean elderly. *Journal of Korean Geriatric Psychiatry*, 14(1), 27–37.
- He, W., Goodkind, D., & Kowal, P. (2016). *An aging world: 2015*. International Population Reports, U.S. Census Bureau. Retrieved from <https://www.census.gov/content/dam/Census/library/publications/2016/demo/p95-16-1.pdf>.
- Hong, S., Kim, B., Bae, J., Oh, J., Cho, M., ... Kim, Y. (2017). Epidemiologic characteristics of injured elderly inpatients in Korea: The results of the Korea National Hospital Discharge Survey, 2004 – 2013. *Weekly Health and Disease*, 10, 103–109.
- Jang, S. N., Cho, S. I., Oh, S. W., Lee, E. S., & Baik, H. W. (2007). Time since falling and fear of falling among community-dwelling elderly. *International Psychogeriatrics*, 19(06), 1072–1083. doi:10.1017/S1041610206004807
- Jang, Y., Haley, W. E., Small, B. J., & Mortimer, J. A. (2002). The role of mastery and social resources in the associations between disability and depression in later life. *The Gerontologist*, 42(6), 807–813. doi:10.1093/geront/42.6.807
- Jang, Y., Small, B. J., & Haley, W. E. (2001). Cross-cultural comparability of the Geriatric Depression Scale: Comparison between older Koreans and older Americans. *Aging & Mental Health*, 5(1), 31–37. doi:10.1080/13607860020020618
- Jeon, M., Jeon, H., Yi, C., & Cynn, H. (2014). Comparison of elderly fallers and elderly non-fallers: Balancing ability, depression, and quality of life. *Physical Therapy Korea*, 21(3), 45–54. doi:10.12674/ptk.2014.21.3.045
- Karlsson, M. K., Magnusson, H., von Schewelov, T., & Rosengren, B. E. (2013). Prevention of falls in the elderly: A review. *Osteoporosis International*, 24(3), 747–762. doi:10.1007/s00198-012-2256-7
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged: The index of ADL: A standardized measure of biological and psychosocial function. *JAMA*, 185(12), 914–919. [Mismatch] doi:10.1001/jama.1963.03060120024016
- Kempen, G. I., Scaf-Klomp, W., Ranchor, A. V., Sanderman, R., & Ormel, J. (2001). Social predictors of recovery in late middle-aged and older persons after injury to the extremities: A prospective study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 56(4), S229–S236. doi:10.1093/geronb/56.4.S229
- Kiadaliri, A. A., Rosengren, B. E., & Englund, M. (2019). Fall-related mortality in southern Sweden: A multiple cause of death analysis, 1998–2014. *Injury Prevention*, 25(2), 129–135. doi:10.1136/injuryprev-2017-042425
- Kim, J. K., Kim, S. P., Kim, S. H., Cho, G. C., Kim, M. J., Lee, J. S., & Han, C. (2018). Epidemiological and clinical characteristics of elderly fall patients visit to the emergency department: A comparison by gender. *Journal of Trauma and Injury*, 31(3), 117–124. doi:10.20408/jti.2018.025
- Kim, K.-I., Jung, H.-K., Kim, C. O., Kim, S.-K., Cho, H.-H., Kim, D. Y., Ha, Y.-C., & Kim, J. G., The Korean Association of Internal Medicine, The Korean Geriatrics Society (2017). Evidence-based guidelines for fall prevention in Korea. *The Korean Journal of Internal Medicine*, 32(1), 199–210. doi:10.3904/kjim.2016.218
- Kim, T. H., Jhoo, J. H., Park, J. H., Kim, J. L., Ryu, S. H., Moon, S. W., ... Kim, K. W. (2010). Korean version of mini mental status examination for dementia screening and its' short form. *Psychiatry Investigation*, 7(2), 102–108. doi:10.4306/pi.2010.7.2.102
- Korea Institute for Health and Social Affairs. (2017). *The 2017 national survey of older Koreans: Policy report (2017-53)*. Sejong: Korea Institute for Health and Social Affairs. [In Korean] Retrieved from http://www.prism.go.kr/homepage/entire/retrieveEntireDetail.do?research_id=1351000-201800182.
- Kuzuya, M., Masuda, Y., Hirakawa, Y., Iwata, M., Enoki, H., Hasegawa, J., ... Iguchi, A. (2006). Falls of the elderly are associated with burden of caregivers in the community. *International Journal of Geriatric Psychiatry*, 21(8), 740–745. doi:10.1002/gps.1554
- Kvelde, T., McVeigh, C., Toson, B., Greenaway, M., Lord, S. R., Delbaere, K., & Close, J. C. (2013). Depressive symptomatology as a risk factor for falls in older people: Systematic review and meta-analysis. *Journal of the American Geriatrics Society*, 61(5), 694–706. doi:10.1111/jgs.12209
- Lavedán, A., Viladrosa, M., Jürschik, P., Botigué, T., Nuín, C., Masot, O., & Lavedán, R. (2018). Fear of falling in community-dwelling older adults: A cause of falls, a consequence, or both? *PLoS One*, 13(3), e0194967. doi:10.1371/journal.pone.0194967
- Leung, K. K., Chen, C. Y., Lue, B. H., & Hsu, S. T. (2007). Social support and family functioning on psychological symptoms in elderly Chinese. *Archives of Gerontology and Geriatrics*, 44(2), 203–213. doi:10.1016/j.archger.2006.05.001
- Lim, J. Y., Park, W. B., Oh, M. K., Kang, E. K., & Paik, N. J. (2010). Falls in a proportional region population in Korean elderly: Incidence, consequences, and risk factors. *Journal of the Korean Geriatrics Society*, 14(1), 8–17. doi:10.4235/jkgs.2010.14.1.8
- Litwak, E. (1985). *Helping the elderly: The complementary roles of informal networks and formal systems*. New York, NY: Guilford.
- Ministry of Health and Welfare (2018). *Social security factbook, 2018*. Retrieved from http://www.mohw.go.kr/react/gm/sgm0601vw.jsp?PAR_MENU_ID=13&MENU_ID=1304020608&page=1&CONT_SEQ=301120.
- Nam, I. S., & Yoon, H. S. (2014). An analysis of the interrelationship between depression and falls in Korean older people. *Journal of the Korean Gerontological Society*, 34(3), 523–537.
- Oh, J., Choi, C. K., Kim, S. A., Kweon, S.-S., Lee, Y.-H., Nam, H.-S., ... Shin, M.-H. (2019). Association of falls and fear of falling with mortality in Korean adults: The Dong-gu Study. *Chonnam Medical Journal*, 55(2), 104–108. doi:10.4068/cmj.2019.55.2.104
- Park, N. S., Jang, Y., Lee, B. S., Ko, J. E., & Chiriboga, D. A. (2014). The impact of social resources on depressive symptoms in racially and ethnically diverse older adults: Variations by groups with differing health risks. *Research on Aging*, 36(3), 322–342. doi:10.1177/0164027513486991
- Pew Research Center (2014). Aging in the U.S. and other countries, 2010 to 2050. *Global Attitudes and Trends*. Retrieved from <https://www.pewresearch.org/global/2014/01/30/chapter-2-aging-in-the-u-s-and-other-countries-2010-to-2050/>.
- Pfortmueller, C. A., Lindner, G., & Exadaktylos, A. K. (2014). Reducing fall risk in the elderly: Risk factors and fall prevention, a systematic review. *Minerva Medica*, 105(4), 275–281.

- Pin, S., & Spini, D. (2016). Impact of falling on social participation and social support trajectories in a middle-aged and elderly European sample. *Ssm - Population Health*, 2, 382–389. doi:10.1016/j.ssmph.2016.05.004
- Sakurai, R., Kawai, H., Suzuki, H., Kim, H., Watanabe, Y., Hirano, H., ... Fujiwara, Y. (2019). Poor social network, not living alone, is associated with incidence of adverse health outcomes in older adults. *Journal of the American Medical Directors Association*, 20(11), 1438–1443. doi:10.1016/j.jamda.2019.02.021
- Sheikh, J. I., & Yesavage, J. A. (1986). Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist*, 5(1-2), 165–173. doi:10.1300/J018v05n01_09
- Silverstein, M., & Bengtson, V. L. (1994). Does intergenerational social support influence the psychological well-being of older parents? The contingencies of declining health and widowhood. *Social Science & Medicine*, 38(7), 943–957. doi:10.1016/0277-9536(94)90427-8
- Sohng, K. Y., Moon, J. S., Song, H. H., Lee, K. S., & Kim, Y. S. (2004). Risk factors for falls among the community-dwelling elderly in Korea. *Journal of Korean Academy of Nursing*, 34(8), 1483–1490. doi:10.4040/jkan.2004.34.8.1483
- Tajvar, M., Fletcher, A., & Grundy, E. (2016). Exploring associations between social support and mental health in older people: A systematic narrative review. *International Journal on Ageing in Developing Countries*, 1(2), 1–120.
- Won, J. W., Yang, K. Y., Rho, Y. G., Kim, S. Y., Lee, E. J., Yoon, J. L., ... Lee, Y. S. (2002). The development of Korean activities of daily living (K-ADL) and Korean instrumental activities of daily living (K-IADL) scale. *Journal of the Korean Geriatrics Society*, 6(2), 107–120.
- World Health Organization (2018). *Falls*. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/falls>.
- Yoo, I. Y. (2011). Recurrent falls among community-dwelling older Koreans: Prevalence and multivariate risk factors. *Journal of Gerontological Nursing*, 37(9), 28–40. doi:10.3928/00989134-20110503-01