JTS

The Journal of Transdisciplinary Studies, 7(3): 311-324, 2023
https://doi.org/10.22685/JTS.2023.7.3.311

Association between Fear of Falling and Social Isolation: A Nationwide Cross-Sectional Study in South Korea

Joo-Ho Park[1], Min-Soo Kim[2], Jeong-Min Yang[3,†], Jae-Hyun Kim[4,†]

[1]Graduate Student, Department of Public Health, General Graduate School of Dankook University, Cheonan, Republic of Korea (Joohopark@dankook.ac.kr), First Author
[2]Graduate Student, Department of Public Health, General Graduate School of Dankook University, Cheonan, Republic of Korea (soo931108@gmail.com), Second Author
[3]Graduate Student, Department of Public Health, General Graduate School of Dankook University, Cheonan, Republic of Korea (jeongmin1206@dankook.ac.kr), Corresponding Author
[4]Assistant Professor, Department of Health Administration, College of Health Science, Dankook University, Cheonan, Republic of Korea (jaehyun@dankook.ac.kr), Corresponding Author

† These authors contributed equally to this work.

ARTICLE INFO

Article history:
Received 22 June 2023
Revised 28 August 2023
Accepted 18 September 2023

Keywords:
Fear of Falling,
Regular Exercise,
Social Isolation,
The Non-Old Age Group,
The Old Age Group

ABSTRACT

The purpose of this study is to determine the impact of fear of falling on social isolation among Korean adults aged 19 or older. In this study, 224,341 people were analyzed using the 2019 Community Health Survey, excluding missing values, Chi-square test and logistic regression analysis were performed to determine the relationship between fear of falling and social isolation. As a result of analysis across all age groups, compared to the group without fear of falling, the social isolation rate of the group with a slight fear of falling was 1.21 times (Adjusted Odds Ratio [AOR]: 1.21, 95% Confidence Interval [CI]: 1.15-1.27), compared to the group without fear of falling, the group with high fear of falling was 2.12 times (AOR: 2.12, 95% CI: 1.98-2.27). Additionally, a stronger association between fear of falling and social isolation was found in the group over 65 years of age compared to the group under 64 years of age. Meanwhile, as a result of a stratified analysis by whether or not there was regular exercise, it was found that fear of falling had a greater impact on social isolation in the group over 65 years old when they did not exercise regularly compared to the group under 64 years old.

This study conducted a statistical analysis of the relationship between fear of falling and social isolation to suggest policy and institutional measures to reduce social isolation among the old age group. Since the proportion of the old age group with a fear of falling has been shown to be relatively high in Korean society, it is expected that social isolation can be prevented if policy and institutional measures are developed to provide regular exercise for the old age group.

1. Introduction

According to World Health Organization (WHO) data, the population aged 60 or older is expected to increase from 900 million in 2015 to 2 billion in 2050 (WHO, 2023), and as of 2022, Korea has entered an aged society with 17.5% of the total population aged 65 or older. In addition, the number of years to reach a super-aged society is showing such an explosive growth rate in the old age group that Korea is predicted to reach a super-aged society in 7 years, compared to 53 years in Austria, 50 years in the UK, 15 years in the US, and 10 years in Japan (Statistics Korea, 2022). The old age group not only experience mental illnesses and physical problems such as dementia and depression, but also social problems such as increased poverty rates, lonely deaths, and the risk of falls in the old age group due to psychosocial and physiological factors brought about by aging (WHO, 2017; Clegg, 2018; Lee, 2020). In addition, falls in the old age group caused by psychosocial and physiological factors brought about by aging are one of the major social problems (Clegg, 2018).

A fall refers to a phenomenon in which a person falls to the floor or stairs due to carelessness, and there is a high risk of sudden injury or death in the old age group (WHO, 2023). Deaths due to falls increase with age regardless of gender and race, and among people over 75 years of age, deaths due to falls accounted for 70% of all deaths (George, 2000). The old age group who has experienced a fall show changes in emotional, psychological, and social behavior (Vallas et al., 1997) and develop depression, decreased self-confidence, and fear of falling (Salma et al., 2022), among these, fear of falling has been reported to occur even without previous falling experience (Odden et al., 2020).

According to previous overseas studies, the rate of experiencing fear of falling was found to be 3% to 40% (Yardely et al., 2002; Lach, 2005; Scheffer et al., 2008). In Korea, 68.8% to 77.5% of the old age group aged 65 or older have fear of falling, which is relatively high compared to overseas countries (Lee et al., 2020; Oh et al., 2017; Kim, 2013; Choi, 2015). Due to this fear of falling, people experience ‘post-fall syndrome’, which prevents them from participating in everything from walking to social activities (Parry et al., 2016). ‘Post-fall syndrome’ limits physical activity, causes lack of regular contact with family and friends, and causes It causes social isolation, which is loneliness caused by lack of participation in social organizations (Quach, 2021; Hajek, 2017; Stephanie et al., 2019).

Social isolation has a negative impact on the physical and mental health of older adults (Conor et al., 2008; Leigh-Hunt et al., 2017), and affects health-deteriorating behaviors such as drinking and smoking and reduced nutritional intake, as well as sleep time, sleep efficiency, and daytime fatigue (Anthony et al., 2016). It has also been shown to increase the incidence of coronary artery disease and stroke (Nicole et al., 2018) and is associated with decreased quality of life (Giorgi et al., 2018) and depression in the old age group (Elmer et al., 2020).

To reduce social isolation, Australian health authorities implemented ‘Walk Talk for your Life (WTL)’, which improves participants’ sense of social belonging and motivates them in daily life by simultaneously practicing daily life and functional exercise for health management. It has been found that stimulation helps reduce social isolation and improve mental and physical health

(Hwang et al., 2019).

Although there are studies on the effects of social isolation on the old age group, it is difficult to consistently measure social isolation in the old age group, so research on the relationship between social isolation and the health of the old age group is needed (Conor et al., 2008). Therefore, this study aims to analyze the relationship between fear of falling and social isolation, and furthermore, conducts a detailed analysis according to whether or not people exercise regularly and provides basic policy and institutional data to reduce the occurrence of social isolation in vulnerable groups.

2. Materials and Methods

2.1 Data source and study participants

This study used raw data from the 2019 Community Health Survey conducted by the Korea Disease Control and Prevention Agency. Since 2008, the Community Health Survey has been conducted on adults aged 19 years or older by the Korea Centers for Disease Control and Prevention in 17 cities and provinces, 255 public health centers, and 35 responsible universities in accordance with Article 4 of the Regional Health Act and Article 2 of the Enforcement Decree of the Regional Health Act. The survey was conducted from August 16 to October 31, 2019, and trained investigators visited the sampled households in person and conducted a 1:1 electronic survey. As a result of the survey, 229,099 cases were surveyed. Among the non-response items that occurred during the survey period, ‘individual non-response’ was excluded from the survey subjects only if they did not participate in the survey, and ‘item non-response’ was not replaced but only excluded when calculating the index. As a result, a total of 224,341 people were selected as research subjects, excluding 4,858 people.

2.2 Dependent variables

In this study, the dependent variable was set as social isolation, and referring to the previous research by Steptoe and Mence, social isolation was defined through the presence or absence of a spouse, social relationships, single-person household, participation in social activities, and employment status. Spousal status was categorized into no spouse (divorced, widowed, separated, unmarried) and spouse present. One-person households were classified into one-person households and two or more person households. Participation in social activities was categorized as yes or no. Social relationships were classified into those who contacted acquaintances less than once a month and those who contacted acquaintances more than once a month. Job status was classified as unemployed, manager, professional, student, housewife, etc. The standard for judging social isolation was defined as meeting 3 to 5 of the social isolation items in a previous study by Steptoe and Mence. In addition, in the research model of this study, the degree of social isolation was set as 2 to 5 and 3 to 5, and based on the Hosmer and Lemeshaw test, a definition of 3 to 5 was found to be appropriate for the model, so a score of 3 to 5 was defined as social isolation.

2.3 Independent variables

In the community health survey, variables related to falls were investigated as ‘experience of falls per year’, ‘number of falls per year’, ‘experience of falls treatment’, and ‘fear of falling’. The variable regarding fear of falling was investigated through the item ‘Do you usually feel afraid of falling?’ and categorized into three categories: ‘Not at all’, ‘A little’, and ‘Very feared’. Regular exercise was investigated through the physical activity variables ‘number of days of high-intensity physical activity per week’ and ‘number of days of moderate-intensity physical activity per week’ in the community health survey. High-intensity physical activities are ‘work activities and physical activities such as running, hiking, fast-speed cycling, fast swimming, soccer, basketball, jumping rope, squash, singles tennis, and carrying heavy objects’, moderate-intensity physical activities are ‘occupational and physical activities such as slow swimming, doubles tennis, volleyball, badminton, table tennis, and carrying light objects’. In the physical activity survey, the number of times a week and the number of hours per day of high-intensity and moderate-intensity physical activity were investigated. In this study, people who exercised for more than 30 minutes a day for 3 days a week were classified as a regular exercisers group.

2.4 Control variables

Among the socioeconomic characteristics and area-specific indicators surveyed in the 2019 Community Health Survey, age, sex, education level, monthly household income, resident region, smoking and alcohol status, regular exercise, perceived depression, diabetes and hypertension diagnoses, and experience of falling within 1 year were selected as control variables. Age was categorized into 65 and older and 64 and younger through a life cycle item. Sex was categorized as male and female, and education level was categorized as elementary school, middle school, high school, two- or three-year college, four-year college, and graduate school or higher, with options consisting of no education, Western and Korean, elementary school, middle school, high school, two- or three-year college, four-year college, and graduate school or higher in the graduation status question and graduation, completion, dropout, and enrollment/leave of absence in the final education question. Monthly household income was categorized as less than 100 thousand KRW, more than 100 thousand KRW but less than 200 thousand KRW, more than 200 thousand KRW but less than 300 thousand KRW, and more than 300 thousand KRW in the monthly unit of the monthly household income question. The residency region was identified through the city and province numbers in the basic information section and categorized as urban-large city, urban-small city, or rural area through the town, village, and county questions, smoking and drinking status were categorized as never and ever in the lifetime smoking question in Health Behavior, with options of less than 5 packs (100 cigarettes), more than 5 packs (100 cigarettes), and never smoked, and as never and ever in the lifetime drinking question. Regular exercise was categorized as yes for more than one day and no for not at all, based on respondents’ self-reported number of days they engaged in vigorous or moderate physical activity for at least 10 minutes in the past week in the physical activity section. Perceived depression was categorized as yes or no using the depression experience question in the mental health section,

and diabetes and hypertension diagnoses were categorized as yes or no using the diabetes diagnosis experience question and hypertension diagnosis experience question in the disease experience section, respectively. Experience of falling in the past year was categorized as yes or no in the annual fall experience question in the Accidents and Poisonings (Falls) section.

2.5 Analytical approach and statistics

In this study, statistical analyses were conducted to assess the association between fear of falling and social isolation. Statistical analysis methods were weighted chi-square test and weighted logistic regression analysis, taking into account the weights assigned to household and individual variables in the Community Health Survey. Statistical analysis was performed after controlling for the following variables: age, sex, education level, monthly household income, residency region, smoking and drinking status, regular exercise, perceived depression, diabetes and hypertension diagnoses, and experience of falling within 1 year.

3. Results

3.1 General characteristics of the study population

Table 1 investigated general characteristics of the subjects for the study, including fear of falling, age, gender, education level, monthly household income, residential area, smoking and drinking status, depression, experiences of diabetes and hypertension diagnoses, and recent falls within the past year. The fear of falling was assessed as follows: 148,012 individuals reported no fear at all, 55,538 individuals reported feeling a little fear, and 20,791 individuals reported feeling a lot of fear.

Table 1. General characteristics of the study population

Variables	Total		Social isolation				p-value
			No		Yes		
	N	%*	N	%*	N	%*	
Total	224,341	100.0	202,215	91.9	22,126	8.1	
Fear of falling							<.0001
Not at all	148,012	72.6	138,007	93.5	10,005	6.5	
A little	55,538	21.6	48,921	90.4	6,617	9.6	
Very feared	20,791	5.8	15,287	77.6	5,504	22.4	
Age							<.0001
≤34	33,615	24.2	30,008	88.9	3,607	11.1	
35-49	50,484	28.9	48,323	95.8	2,161	4.2	
50-64	67,274	27.9	63,797	95.3	3,477	4.7	
65-79	55,731	15.1	48,684	88.7	7,047	11.3	
≥80	17,237	3.9	11,403	69.6	5,834	30.4	

Variables	Total		Social isolation				p-value
			No		Yes		
	N	%*	N	%*	N	%*	
Total	224,341	100.0	202,215	91.9	22,126	8.1	
Sex							0.0014
Male	100,456	49.5	91,976	91.7	8,480	8.3	
Female	123,885	50.5	110,239	92.1	13,646	7.9	
Educational level							<.0001
≤Elementary school	53,454	11.6	42,406	80.8	11,048	19.2	
Middle school	25,985	8.3	23,747	90.7	2,238	9.3	
High school	64,258	29.6	60,003	92.8	4,255	7.2	
≥College	80,644	50.4	76,059	94.1	4,585	5.9	
Monthly household income, thousand KRW							<.0001
<1,000	34,435	8.0	23,201	66.7	11,234	33.3	
1,000-2,000	35,397	10.9	31,126	84.9	4,271	15.1	
2,000-3,000	33,831	13.7	31,152	89.6	2,679	10.4	
≥3,000	120,678	67.4	116,736	96.5	3,942	3.5	
Residency region							<.0001
Urban area - large city	62,590	43.6	57,426	92.4	5,164	7.6	
Urban area - small city	44,729	25.9	40,777	92.1	3,952	7.9	
Rural area	117,022	30.4	104,012	91.0	13,010	9.0	
Smoking status (within lifetime)							<.0001
Never	141,843	61.2	127,518	92.3	14,325	7.7	
Ever	82,498	38.8	74,697	91.2	7,801	8.8	
Alcohol status (within lifetime)							<.0001
Never	43,060	13.0	36,291	87.1	6,769	12.9	
Ever	181,281	87.0	165,924	92.6	15,357	7.4	
Regular exercise							<.0001
No	188,327	81.9	168,252	91.3	20,075	8.7	
Yes	36,014	18.1	33,963	94.5	2,051	5.5	
Perceived depression							<.0001
No	210,700	93.8	191,138	92.4	19,562	7.6	
Yes	13,641	6.2	11,077	84.1	2,564	15.9	
Diabetes diagnosis							<.0001
No	198,378	91.5	179,904	92.3	18,474	7.7	
Yes	25,963	8.5	22,311	87.8	3,652	12.2	
Hypertension diagnosis							<.0001
No	160,052	79.2	147,220	92.7	12,832	7.3	
Yes	64,289	20.8	54,995	88.6	9,294	11.4	
Experience of falling within 1 year							<.0001
No	193,343	86.3	175,653	92.3	17,690	7.7	
Yes	30,998	13.7	26,562	88.9	4,436	11.1	

%*: Weighted percentage

3.2 Association between fear of falling and social isolation

Table 2 presents the results of logistic regression analysis conducted to investigate the association between fear of falling and social isolation. Among the entire age group, the group with a slight fear of falling had a 1.21 times higher occurrence rate of social isolation compared to the group with no fear of falling (Adjusted Odds Ratio [AOR]: 1.21, 95% Confidence Interval [CI]: 1.15-1.27). Additionally, the group with a high fear of falling had a 2.12 times higher occurrence rate of social isolation compared to the group with no fear of falling (AOR: 2.12, 95% CI: 1.98-2.27).

For those aged 64 and under, the group with a slight fear of falling had a 1.18 times higher occurrence rate of social isolation compared to the group with no fear of falling (AOR: 1.18, 95% CI: 1.10-1.26). Moreover, the group with a high fear of falling had a 1.88 times higher occurrence rate of social isolation compared to the group with no fear of falling (AOR: 1.88, 95% CI: 1.64-2.15).

In individuals aged 65 and above, the group with a slight fear of falling had a 1.32 times higher occurrence rate of social isolation compared to the group with no fear of falling (AOR: 1.32, 95% CI: 1.23-1.41). Additionally, the group with a high fear of falling had a 2.15 times higher occurrence rate of social isolation compared to the group with no fear of falling (AOR: 2.15, 95% CI: 1.99-2.32).

Table 2. Association between fear of falling and social isolation

Variables	All age		Under 64 years		Over 65 years	
	Social isolation		Social isolation		Social isolation	
	AOR[a]	95% CI	AOR[a]	95% CI	AOR[a]	95% CI
Fear of falling						
Not at all	1.00		1.00		1.00	
A little	1.21	(1.15-1.27)	1.18	(1.10-1.26)	1.32	(1.23-1.41)
Very feared	2.12	(1.98-2.27)	1.88	(1.64-2.15)	2.15	(1.99-2.32)
Age						
≤34	1.00		1.00		N/A	
35-49	0.33	(0.31-0.36)	0.33	(0.31-0.36)		
50-64	0.21	(0.19-0.22)	0.20	(0.19-0.22)		
65-79	0.18	(0.16-0.19)	N/A		0.44	(0.41-0.47)
≥80	0.40	(0.36-0.44)			1.00	
Sex						
Male	1.00		1.00		1.00	
Female	0.76	(0.72-0.81)	0.60	(0.55-0.64)	1.59	(1.42-1.77)
Educational level						
≤Elementary school	2.08	(1.91-2.26)	1.71	(1.52-1.93)	1.44	(1.27-1.65)
Middle school	1.39	(1.27-1.52)	1.64	(1.46-1.84)	0.91	(0.79-1.05)
High school	1.39	(1.31-1.48)	1.41	(1.32-1.51)	0.98	(0.85-1.12)
≥College	1.00		1.00		1.00	

Variables	All age		Under 64 years		Over 65 years	
	Social isolation		Social isolation		Social isolation	
	AOR[a]	95% CI	AOR[a]	95% CI	AOR[a]	95% CI
Monthly household income, thousand KRW						
≤100	13.44	(12.51-14.44)	15.66	(14.28-17.18)	5.19	(4.72-5.70)
100-200	5.02	(4.68-5.39)	7.31	(6.73-7.94)	1.49	(1.35-1.64)
200-300	3.11	(2.91-3.32)	3.73	(3.46-4.01)	0.97	(0.85-1.10)
≥300	1.00		1.00		1.00	
Residency region						
Urban area - large city	1.00		1.00		1.00	
Urban area - small city	0.89	(0.84-0.95)	0.90	(0.84-0.97)	0.89	(0.82-0.97)
Rural area	0.78	(0.74-0.82)	0.80	(0.75-0.86)	0.76	(0.70-0.82)
Smoking status (within lifetime)						
Never	1.00		1.00		1.00	
Ever	1.30	(1.22-1.38)	1.30	(1.21-1.40)	1.63	(1.46-1.81)
Alcohol status (within lifetime)						
Never	1.00		1.00		1.00	
Ever	0.74	(0.70-0.78)	0.78	(0.71-0.85)	0.83	(0.78-0.88)
Regular exercise						
No	1.48	(1.38-1.58)	1.48	(1.37-1.60)	1.67	(1.49-1.86)
Yes	1.00		1.00		1.00	
Perceived depression						
No	1.00		1.00		1.00	
Yes	1.55	(1.45-1.67)	1.73	(1.58-1.90)	1.29	(1.17-1.42)
Diabetes diagnosis						
No	1.00		1.00		1.00	
Yes	1.07	(1.01-1.13)	1.13	(1.02-1.25)	1.05	(0.99-1.13)
Hypertension diagnosis						
No	1.00		1.00		1.00	
Yes	1.09	(1.04-1.15)	1.00	(0.93-1.09)	1.10	(1.04-1.16)
Experience of falling within 1 year						
No	1.05	(0.99-1.11)	1.10	(1.01-1.19)	1.00	(0.93-1.07)
Yes	1.00		1.00		1.00	

AOR[a]: Adjusted weighted odds ratio

MVPE : Moderate or Vigorous Physical Exercise

3.3 Association between fear of falling and social isolation by regular exercise

Table 3 presents the results of the analysis examining the association between fear of falling and social isolation based on regular exercise participation.

For Model 1, which analyzed the entire age group, it was found that among those who do not engage in regular exercise, as the fear of falling increased, the occurrence rate of social isolation also increased. However, among those who engage in regular exercise, the association between

fear of falling and social isolation was only observed in the group with the highest level of fear of falling.

For Model 2, which analyzed those aged 64 and under, similar to the analysis conducted on the entire age group, it was observed that among those who do not engage in regular exercise, as the fear of falling increased, the occurrence rate of social isolation also increased. However, among those who engage in regular exercise, the association between fear of falling and social isolation was only observed in the group with the highest level of fear of falling.

Model 3, which focused on those aged 65 and above, showed that among those who do not engage in regular exercise, similar to the results observed in the entire age group and those aged 64 and under, as the fear of falling increased, the occurrence rate of social isolation also increased. However, among those who engage in regular exercise, contrary to the results from the entire age group and those aged 64 and under, no significant association was found between fear of falling and social isolation.

Table 3. Association between fear of falling and social isolation by regular exercise

Variables	All age (Model 1)			
	Regular exercise			
	No		Yes	
	AOR[a]	95% CI	AOR[a]	95% CI
Fear of falling				
Not at all	1.00		1.00	
A little	1.22	(1.16-1.29)	1.13	(0.97-1.31)
Very feared	2.16	(2.01-2.31)	1.53	(1.18-1.99)

Variables	Under 64 years (Model 2)			
	Regular exercise			
	No		Yes	
	AOR[a]	95% CI	AOR[a]	95% CI
Fear of falling				
Not at all	1.00		1.00	
A little	1.19	(1.10-1.29)	1.09	(0.91-1.31)
Very feared	1.89	(1.63-2.18)	1.63	(1.17-2.49)

Variables	Over 65 years (Model 3)			
	Regular exercise			
	No		Yes	
	AOR[a]	95% CI	AOR[a]	95% CI
Fear of falling				
Not at all	1.00		1.00	
A little	1.33	(1.24-1.43)	1.18	(0.99-1.41)
Very feared	2.22	(2.04-2.40)	1.12	(0.86-1.47)

Control variables: Age, Sex, Educational level, Household income, Residency region, Smoking & Alcohol status, Perceived depression, Diabetes & Hypertension diagnosis, Experience of falling within 1 year

4. Discussion

The world's population is aging faster and faster (WHO, 2023), and research is increasingly focused on the old age group. There are studies on the impact of physical changes occurring in the old age group on falls (Leigh-Hunt et al., 2017; Anthony et al., 2016; Nicole et al., 2018), studies on psychological changes with mental aging (George, 2000; Vellas et al., 2000), and studies on the need for exercise programs and proper nutrition in the old age group (Clegg, 2018; Gschwind et al., 2013; Zahedian et al., 2021; Liu-Ambrose et al., 2019). Korea is entering an aging society at a faster rate than other countries (Statistics Korea, 2022), and research on the old age group is important, and research on social isolation in particular is difficult to consistently measure, so it is necessary to continue research on the association between social isolation and old age group health (Conor et al., 2008). This study aims to provide a policy and institutional basis for reducing the incidence of social isolation in the old age group by drawing out the findings of research on the association between fear of falling and social isolation and the presence of regular exercise.

To summarize the findings, the higher the intensity of fall fear, the higher the likelihood of experiencing social isolation, especially among old age group. However, among those who exercise regularly, social isolation was only associated with greater fall fear, and no association was found between fall fear and social isolation among old age group who exercise regularly.

Fear of falling has also been linked to social isolation (Quach, 2021; Hajek, 2017; Stephanie et al., 2019). People with fear of falling have been found to have very low mental, physical, and social functioning (Deshpande et al., 2009), and 20-55% of them have difficulty with activities of daily living, which can lead to reduced social integration and physical weakness, which can lead to health problems, including disability (Auais et al., 2016). The decline in physical functioning is especially accelerated in the elderly population with a fear of falling, as they self-limit the range of activities of daily living they can perform (Souza et al., 2022).

Thus, the finding in this study that social isolation increases with increasing intensity of fall fear is consistent with previous research.

Research on falls in the old age group recommends regular exercise to prevent falls. In an old age group aged 65 to 80 years, a static/dynamic steady-state balance test, a proactive balance test, and a reactive balance test were used to assess the Push and Release Test, hand grip strength, chair stand test, Stair Climb Power Test, countermovement jump test, a bio-electrical impedance analysis, Mini Mental State Examination (MMSE) and Fall Efficacy Scale - International (FES-I) tests for 24 weeks, including follow-up, showed that low-intensity strength/power training aimed at improving balance, gait, and muscle strength in the elderly population had a positive effect on physical and mental functions such as balance ability, muscle strength, agility, body composition, and cognition (Gschwind, 2013). In a VR-enabled Xbox Kinect Sports training of an old age group with balance disorders, simulated balance exercises with rehabilitation physician-selected penalty goalkeeping, skiing, and dart-throwing games resulted in statistically significant improvements in the Timed Up to Go (TUG) test, Falling Efficacy Scale (FES), and Berg Balance Scale (BBS) compared to pre-test, compared to an elderly population that participated in a program that included jogging, table tennis, and art activities typical of nursing home care (Zahedian-Nasab et al., 2021).

In addition, a home-based exercise program and fall prevention care provided by a geriatrician in a clinic to prevent secondary falls in a population aged 70 years and older who had fallen in the previous 12 months significantly reduced the incidence of secondary falls compared to a group that received only usual care provided by a physical therapist (Liu-Ambrose et al., 2019), suggesting that regular exercise has a positive effect on fall prevention in the old age group.

Fear of falling can also be managed through regular exercise (Auais et al., 2018). In an old age group aged 65 years and older, a program that combined a physiotherapist-led fall prevention exercise program, a home safety assessment, cognitive restructuring, and exposure to feared situations, along with a ABLE(Activity, Balance, Learning and Exposure) program that improved upon the limitations of existing tests of fall fear, resulted in a reduction and maintenance of fall fear and avoidance compared to a group that received simple fall prevention education (Wetherell et al., 2018). A study on whether the Biodex Balance System (BBS) for postural correction, improved balance, and neuromuscular and somatosensory control prevents fear of falling in the old age group aged 65 years and older similarly found that it significantly improved fear of falling in the old age group (Gusi et al., 2012). Furthermore, in a study investigating the impact of Muti-System Physical Exercise (MPE) on improving health-related quality of life (HRQoL) in the old age group, proprioception, muscle strengthening, reaction time, and balance training in a population aged 65 years and older resulted in a significant reduction in fall risk in the 24-week group compared to the 12-week group, statistically significant differences in improvements in proprioception, muscle strength, reaction time, postural sway, and fear of fall scores, suggesting that fall prevention programs reduce fear of falling in the old age group (Chittrakul et al., 2020).

In general, social isolation decreases with age because contact with people like family, friends, and caregivers increases with age. However, and old age group who has experienced a fall or perceive themselves to be in poor health experience increased social isolation and are more likely to experience repeated falls. Repeated falls and fear of falling can lead to social isolation and depression, which in turn can lead to declining physical abilities in the old age group, creating a vicious cycle of increased risk of falling. This fear of falling reduces the old age group health-promoting behaviors and reduces their opportunities to participate in social activities. On the other hand, there was no statistical significance to this vicious cycle for an old age group who manage their own health. Notably, there was no statistical significance between social isolation and fear of falling among the old age group with high Activities of Daily Living (ADL) scores or those utilizing walking aids. These seniors were found to be physically active and active in their communities, such as meeting friends and participating in church or social gatherings. Therefore, it is possible that increased physical functioning in the old age group may has an impact on increasing social activity in the old age group, thereby reducing the fear of falling and the likelihood of falling (Pohl et al., 2018).

Fear of falling has been shown to be more prevalent in women, the old age group, and people with disabilities who have relatively low physical functioning, leading to decreased physical activity, so these individuals may improve in performing daily activities if they engage in regular exercise and rehabilitation programs over the long term (Curcio et al., 2020). Based on these previous findings and the present study's finding that there is no association between fear of falling and social isolation

in old age groups aged 65 and older who engage in regular exercise, it is possible that fear of falling can be alleviated through regular exercise, which in turn can alleviate social isolation.

Limitations of this study include: First, the community health survey used in the analysis is subject to subjective bias due to the fact that it includes the views of the respondents. Second, the cross-sectional nature of the study does not allow for clear causality between variables. Third, the definition of social isolation, which is the dependent variable in this study, is based on previous studies.

Despite these limitations, the strengths of this study include the following: The survey participants are representative of the entire population, which allows us to generalize to Korean adults over the age of 19. Second, it is important to note that unlike previous studies that have analyzed social isolation primarily among the old age group, we conducted a comprehensive study among the non-old age group. Third, the researchers used objective indicators to measure social isolation, as opposed to subjective indicators such as loneliness, which have been used to define social isolation in the past.

5. Conclusion

This study conducted a statistical analysis of the association between fear of falling and social isolation in order to provide direction on policy and institutional measures to reduce social isolation among the old age group. The study found an association between fear of falling and the occurrence of social isolation, with the association being stronger in old age groups. However, while we were able to identify a link between fear of falling and social isolation in the non-exercising group, we did not find a link in the regular exercising group. Since Korean society has a relatively high percentage of elderly people with a fear of falling, it is expected that policy and institutional measures to provide regular exercise for the elderly population can prevent social isolation.

Conflicts of Interest

The authors declare no conflict of interest.

References

Auais, M., Alvarado, B. E., Curcio, C. L., Garcia, A., Ylli, A., & Deshpande, N. (2016). Fear of falling as a risk factor of mobility disability in older people at five diverse sites of the IMIAS study. *Archives of Gerontology and Geriatrics, 66*, 147-153.

Chittrakul, J., Siviroj, P., Sungkarat, S., & Sapbamrer, R. (2020). Multi-system physical exercise intervention for fall prevention and quality of life in pre-frail older adults: A randomized controlled trial. *International Journal of Environmental Research and Public Health, 17*(9), 3102.

Clegg, M. E., & Williams, E. A. (2018). Optimizing nutrition in older people. *Maturitas, 112*, 34-38.

Deshpande, N., Metter, E. J., Lauretani, F., Bandinelli, S., & Ferrucci, L. (2009). Interpreting fear of falling in the elderly: What do we need to consider? *Journal of Geriatric Physical Therapy, 32*(3), 91-96.

Fuller, G. F. (1997). Falls in the elderly. *Age and Ageing, 26*(3), 189-193.

Fuller, G. F. (2000). Falls in the elderly. *American Family Physician, 61*(7), 2159-2168.

Gschwind, Y. J., Kressig, R. W., Lacroix, A., Muehlbauer, T., Pfenninger, B., & Granacher, U. (2013). A best practice fall prevention exercise program to improve balance, strength/power, and psychosocial health in older adults: Study protocol for a randomized controlled trial. *BMC Geriatrics, 13*, 105.

Gusi, N., Adsuar, J. C., Corzo, H., Del Pozo-Cruz, B., Olivares, P. R., & Parraca, J. A. (2012). Balance training reduces fear of falling and improves dynamic balance and isometric strength in institutionalized older people: A randomized trial. *Journal of Physiotherapy, 58*(2), 97-104.

Hajek, A., & König, H. H. (2017). The association of falls with loneliness and social exclusion: Evidence from the DEAS German Ageing Survey. *BMC Geriatrics, 17*(1), 204.

Hwang, J., Wang, L., Siever, J., Medico, T. D., & Jones, C. A. (2019). Loneliness and social isolation among older adults in a community exercise program: A qualitative study. *Aging and Mental Health, 23*(6), 736-742.

Kim, S., & So, W. Y. (2013). Prevalence and correlates of fear of falling in Korean community-dwelling elderly subjects. *Experimental Gerontology, 48*, 1323-1328.

Lach, H. W. (2005). Incidence and risk factors for developing fear of falling in older adults. *Public Health Nursing, 22*, 45-52.

Lee, A., Lee, J., Lee, G., & Lee, D. R. (2020). Fear of falling and mortality among older adults in Korea: Analysis of the Korean longitudinal study of aging. *Korean Journal of Family Medicine, 41*(4), 243-249.

Lee, C. S., & Kang, S. K. (2020). Associated factors with the trajectory of local elderly suicide rate. *Korean Journal of Gerontology and Social Welfare, 75*, 91−119.

Lee, S., Hong, G. S., Oh, E., & Han, S. (2017). Fear of falling and its predictors among community-living older adults in Korea. *Aging and Mental Health, 21*(4), 369-378.

Leigh-Hunt, N., Bagguley, D., Bash, K., Turner, V., Turnbull, S., Valtorta, N., & Caan, W. (2017). An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health, 152*, 157-171.

Liu-Ambrose, T., Davis, J. C., Best, J. R., Dian, L., Madden, K., Cook, W., Hsu, C. L., & Khan, K. M. (2019). Effect of a home-based exercise program on subsequent falls among community-dwelling high-risk older adults after a fall: A randomized clinical trial. *JAMA, 321*(21), 2092-2100.

Odden, J. L., Mihailovic, A., Boland, M. V., Friedman, D. S., West, S. K., & Ramulu, P. Y. (2020). Assessing functional disability in glaucoma: The relative importance of central versus far peripheral visual fields. *Investigative Ophthalmology & Visual Science, 61*(13), 23.

Oh, E., Hong, G. S., Lee, S., & Han, S. (2017). Fear of falling and its predictors among community-living older adults in Korea. *Aging and Mental Health, 21*(4), 369-378.

Parry, S. W., Bamford, C., Deary, V., Finch, T. L., Gray, J., MacDonald, C., McMeekin, P., Sabin, N. J., Steen, I. N., Whitney, S. L., & McColl, E. M. (2016). Cognitive-behavioral therapy-based

intervention to reduce fear of falling in older people: Therapy development and randomized controlled trial - the strategies for increasing independence, confidence and energy (STRIDE) study. *Health Technology Assessment, 20*, 1−206.

Quach, L. T., & Burr, J. A. (2021). Perceived social isolation, social disconnectedness and falls: The mediating role of depression. *Aging and Mental Health, 25*(6), 1029-1034.

Saidani, S., Haddad, R., Bouallegue, R., & Shubair, R. (2022). Fear of falling and risk factors in older adults. *Procedia Computer Science, 203*, 247-253.

Scheffer, A. C., Schuurmans, M. J., Van Dijk, N., Van der Hooft, T., & De Rooij, S. E. (2008). Fear of falling: Measurement strategy, prevalence, risk factors and consequences among older persons. *Age and Ageing, 37*(1), 19-24.

Schrempft, S., Jackowska, M., Hamer, M., & Steptoe, A. (2019). Associations between social isolation, loneliness, and objective physical activity in older men and women. *BMC Public Health, 19*.

Statistics Korea. (2022). 2022 Statistics on the Aged. Retrieved from <http://kostat.go.kr/portal/eng/pressRleases/1/idex.board?bmode=read&bSeq=&aSeq=421350&paeNo=6&rowNum=10&navCount=10&currPg=&searchInfo=&sTarget=title&sTxt=>.

Valtorta, N. K., Kanaan, M., Gilbody, S., & Hanratty, B. (2018). Loneliness, social isolation and risk of cardiovascular disease in the English longitudinal study of ageing. *European Journal of Preventive Cardiology, 25*(13), 1387−1396.

Wayne, S. J., Romero, L. J., Baumgartner, R. N., Garry, P. J., & Vellas, B. J. (1997). Fear of falling and restriction of mobility in elderly fallers. *Age and Ageing, 26*(3), 189-193.

Wetherell, J. L., Bower, E. S., Johnson, K., Chang, D. G., Ward, S. R., & Petkus, A. J. (2018). Integrated exposure therapy and exercise reduces fear of falling and avoidance in older adults: A randomized pilot study. *American Journal of Geriatric Psychiatry, 26*(8), 849-859.

WHO. (2017). 10 facts on ageing and health. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/10-facts-on-ageing-and-health>.

WHO. (2017). Mental health of older adults. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/mental-health-of-older-adults>.

WHO. (2021). Falls. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/falls>.

Yardley, L., & Smith, H. (2002). A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. *The Gerontologist, 42*, 17-23.