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The effects of health status, leisure life, and social relationship satisfaction on depression of elderly people who live alone

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ABSTRACT

The increasing number of elderly people who live alone has raised serious social issues such as isolation, care problems, and lonely death. In particular, since elderly people who live alone have a higher rate of depression than general elderly people due to disconnection from good health and social life, it is necessary to promote health, form a social network, and increase leisure activities to prevent depression. Therefore, this study used data from the Korea Welfare Panel in 2020 and conducted a regression analysis to determine how much the health status, leisure life, and social relationship satisfaction of senior citizens who live alone explain the degree of depression. As a result of this study, it was found that the higher the education level of elderly people who live alone, the lower the feeling of depression, and the worse the health status, the higher the depression. The effect of education level on depression was significant with adjusted R^2 .020 (p>.001), but the impact was not so great. However, in the regression model with health status added, ΔR^2 increased by .151, confirming the effect of health status on depression. The explanatory power of the regression model, in which the variables of social relationship satisfaction and leisure life satisfaction were added, showed that the adjusted R^2 was .203 (p>.001). That means that the higher the satisfaction with the social relationship and the higher the satisfaction with leisure activities, the lower the level of depression. Based on the results of analysis, this study proposes measures to prevent and respond to depression of elderly people who live alone.

1. Introduction

This study used data from the Korea Welfare Panel in 2020 to identify the effects of leisure life and social relationship satisfaction on depression among elderly people who live alone. South Korea is facing the problems of the highest life expectancy, the poverty rate of the elderly, and the suicide rate among OECD countries (www.spckorea.or.kr). As the elderly population continues to increase due to the severe low birth rate and aging population, the proportion of elderly people aged 65 and over is reported to be 15.7% in 2020, and the proportion of elderly people who live alone in all households increased from 3.8% in 2000 to 7.56% in 2019 (http://kostat.go.kr/potal/korea). As the proportion of the elderly population is expected to reach 35.6% by 2045, one in three Koreans will be over the age of 65, on the verge of a super-aging society. Due to the increase in the elderly population, the proportion of elderly people who live alone is also increasing. The proportion of single-person households in Korea already exceeded 20% in 2005, was reported to be 27% in 2015, and continues to increase. As a result, the proportion of elderly people who live alone among the total elderly people has exceeded 20% since 2010 and has been on the rise.

The increasing number of elderly people who live alone has raised serious social issues such as isolation, care problems, and lonely death. Elderly people experience not only empty nests due to the independence and separation of their children but also the loss of social roles due to retirement. Social isolation due to the loss of roles in old age also means the loss of social networks of elderly people who live alone. The process of living alone in old age is diverse, such as the bereavement of a spouse, divorce, separation, etc. This process means a break-up of intimacy and makes the elderly experience psychological shock and loneliness, and negatively affects their psychological and emotional health.

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Compared to other classes, the elderly population is alienated from information and social relationships and live isolated lives, and they have difficulties in managing themselves in situations where cognitive and physical abilities are reduced due to aging. In addition, because they are exposed to the risk of depression, suicidal impulses, and lonely death, it is necessary to support the elderly so that they can lead a safe life in the local community by expanding social networks as well as support from the state or local governments. In particular, it is reported that elderly people who live alone are more vulnerable in social, economic, mental, and physical aspects than other elderly people (Mo, 2015). It is reported that elderly people who live alone experience more disconnection from social relationships than elderly people who live with their family and are at higher risk of being exposed to mental health problems such as depression (Seo and Lee, 2015; Lee and Shin, 2018). Therefore, expanding social networks and enhancing life satisfaction are very important for the welfare of these elderly.

In old age, there is more leisure time away from child-rearing and working life. How to effectively use the increased leisure time in old age affects the life satisfaction of the elderly. Leisure activities originally mean free time from work, but unlike that of ordinary adults, leisure activities of the elderly include activities at various institutions in the local community such as senior citizen centers and welfare centers to expand physical health and social contact opportunities. It is believed that physical, social, and cognitive health is improved, and depression and stress are reduced through appropriate social participation and active leisure activities. However, it is reported that most of the elderly in Korea spend leisure time at home or watching TV, so it is necessary to expand social exchanges and support systems through leisure activities (Kim and Ha, 2015).

Depression in the elderly is an issue related to the mental health of elderly people who live alone. In Korea, one in five elderly people (20%) experience depressive symptoms, and about 30% belong to the depression category (Sohn et al., 2019). Depression in the elderly is caused by various factors such as maladjustment to the old life, economic difficulties, and health problems, but solitude and disconnection from social relationships are also the main factors affecting depression in the elderly (Jeon and Kahng, 2009). Therefore, it is a meaningful process to empirically identify the relationships of their social networks and social activities to depression. In particular, since the depression experienced by elderly people who live alone leads to the risk of suicide (Shin and Kim, 2016), it is very important to find ways to prevent and manage depression by identifying factors that affect depression in ultra-aged Korean society.

In response, this study seeks to identify social relationship factors that affect the depression of elderly people who live alone to improve their life satisfaction at a time when lonely death and mental health problems are emerging as serious social issues. Using the data of the 15th Korea Welfare Panel in 2020, this study will examine the current situation of elderly people who live alone, and analyze how much their satisfaction with leisure life and social relationships explains their depression, thereby finding ways to prevent their depression and help them lead a stable life in the local community.

2. Theoretical background

2.1. Aging in Korea and the problem of elderly people who live alone

The problem of low birth rates and aging in Korea is serious. By 2020, it is predicted that the aging of the population will accelerate further as baby boomers enter old age. As the number of elderly people who live alone is increasing due to the aging population, their number, which is, 1,442,544 in 2016, is 1.37 times higher than in 2010 and is 1,589,000 in 2020, thus the government has come up with comprehensive measures for them (http://kostat.go.kr/potal/korea).

As a policy response to the aging of the population, various policies such as retirement income security, care, health care, and housing are supported, but elderly people who live alone are exposed to not only economic difficulties and problems of care, but also the risk of isolation and loneliness. According to the 2015 survey on elderly people who live alone, 37% did not participate in social activities such as senior citizen centers, welfare centers, or religious activities at all, and 16% experienced social disconnection because they rarely meet with their family members or meet only once or twice a year. In addition, it is reported that 25% of the elderly eat less than twice a day.

Korea has the highest elderly poverty rate among OECD countries, and it is reported that elderly women who live alone are more economically vulnerable among the elderly population. This is because, in the past, economic activities were dominated by men in Korean society, and women, who had played the role of housewives without any experience in the labor market, lost their spouses and fell into the poor elderly in old age. Of course, the feminization of poverty is not limited to Korea, but in the absence of an appropriate measure to support income in old age, elderly people who live alone are more economically vulnerable than those who do not live alone, and the situation is more serious for women.

Elderly people who live alone are more difficult to care for than those who do not live alone. Common problems experienced by single-person households include difficulties in solving their daily lives alone, loneliness, and health care. In contrast, elderly men who live alone have difficulties with housework and psychological loneliness, while elderly women who live alone are at risk of being exposed to financial difficulties and lack of health care. Of course, at the government level, care services for elderly people

who live alone are provided, but it is estimated that 30% of them need care services, but only 10% receive the services, making supply and demand inconsistent (Jeong et al., 2012).

Elderly people who live alone are at risk of a lonely death. In Korea, there were 1,717 people who died lonely in 2013, an average of five people a day, and the ratio of lonely deaths was 73% for men and 17% for those in their 60s or older, leaving elderly men who live alone more at risk of a lonely death. Of course, these statistics are not official. In fact, there is no official statistical data on lonely death, so the government enacted the Lonely Death Prevention and Management Act to investigate and prevent lonely deaths every five years. Elderly people who live alone are more vulnerable to physical and mental health problems than those who do not live alone. It is difficult to receive proper care from their family in case of physical illness due to separation from family members or the death of a spouse. In addition, these physical health problems or disconnection from outside affect mental health (Choi et al., 2018).

There is also a change in the way people view the elderly as their lives are extended after old age due to the extended life expectancy. In the past, the elderly people were viewed as dependent and weak objects, but recently people are looking at the elderly situation in terms of active old age, a second life, and the stage of self-integration pursuing the completion of life (Cox et al., 2017). However, many elderly people in Korea are still unable to properly perform the task of self-integration due to economic difficulties, physical restrictions, and disconnection of social relationships, and are unable to lead an active life in old age due to lack of resources. In particular, those who live alone are not only more economically vulnerable than ordinary elderly households, but also feel more isolated in social relationships, making it difficult to lead an active life in old age. Many studies on elderly people who live alone are paying attention to their depression because of problems caused by social isolation and disconnection.

2.2. Social relationship of elderly people who live alone

Humans are social beings that satisfy their needs and grow through various relationships. Although the needs and types of social relationships differ from person to person, fundamentally, humans gain a sense of belonging and psychological stability through social relationships. Through these, humans experience frustration but also receive support. Social support is a positive resource obtained from others through social relationships or exchanges, and is an important mechanism for the need for relationships that are lacking in old age, and satisfies the elderly's sense of belonging, psychological well-being, and affection (Kwon and Koh, 2021). It is also a major concept related to the ecological system and the strengths perspectives, which are the main perspectives of social welfare. The strengths perspective sees the community as a repository of various resources and maintains that the discovery of support systems for the vulnerable and the linking of resources can buffer individual problems.

Lewis and Harrell (2002) suggested that the relationships between the elderly and significant others promote resilience, and these relationships can be discussed in the context of safety and support, affiliation, and altruism. The elderlies are provided with safety and health protection in relationships with family, neighbors, and communities. Through interactions with groups and others, they form a sense of belonging and solidarity. Through the process of caring for and helping others, they form a sense of value in the community. Therefore, a social relationship is a positive mechanism that gives meaning to the sense of value and life of the elderly as well as their safety (Lewis and Harrell, 2002).

The positive effects of social support or social networks on the elderly have already been suggested in previous studies. As the elderly have better relationships with family, neighbors, and friends, their life satisfaction increases, their stress and depression decrease, and the level of successful aging increases. Therefore, the social relationship of elderly people who live alone is a major predictor of relieving the feeling of social isolation and reducing depression.

2.3. Leisure life of elderly people who live alone

Leisure is a time other than economic activities that an individual can dispose of, and free time that includes various hobbies combined with rest (Kim and Ha, 2015). Elderly people may have most of the time free due to the reduction or extinction of housework, child-rearing, and work life. In particular, in the case of elderly people who live alone, the amount of free time may be greater than that of elderly people who do not live alone.

According to a study analyzing how the living time of the elderly is used, they spent 11.3 hours a day for personal maintenance and 7.1 hours for socializing and leisure activities within a day, a total of 18.4 hours. The elderlies have a lot of free time except for their personal time such as sleeping and eating. The places where leisure time usually takes place are homes and parks rather than welfare centers or public institutions in the local community. About 75% of leisure time is spent watching TV, and the average daily TV viewing time is 5.3 hours. Travel or participation in clubs differs depending on their economic conditions or educational level.

There are personal and environmental factors that limit the leisure activities of the elderly. Leisure activities may be difficult due to individual characteristics or health conditions. Alternatively, there may be restrictions on leisure activities due to physical or economic conditions.

Kang (2018) confirmed that leisure restrictions have a negative effect on productive leisure activities. It is confirmed that single-person

households have restrictions on leisure activities compared to non-single households, and low-educated households have restrictions on leisure activities compared to those with high education. In addition, health conditions, income, and job status limit the leisure activities of the elderly. These findings suggest that the low-income elderly who live alone with poor health may have restrictions on leisure activities. According to prior research, leisure activities affect depression. That means that higher participation in leisure activities leads to lower depression. The risk of depression in elderly people who live alone is higher than in those who do not live alone, due to restrictions on leisure activities.

2.4. Depression of elderly people who live alone

Depression refers to a state in which the overall mental functions such as mood, thoughts, thinking processes, motivation, will, interest, behavior, sleep, and physical activity are reduced. Depression, in general, may not be a big problem, but if the feeling of depression intensifies and makes daily life or social life difficult, a mental disorder may cause serious difficulties. If depression is severe, it leads not only to depression disorder but also to suicidal thoughts or intentions. Therefore, intervention is needed to buffer and alleviate depression. In particular, single-person households are reported to have a high feeling of depression due to the lack of human and social resources to buffer stress and the weak network in the local communities (Park and Lee 2016).

Elderly people who live alone have a greater sense of social isolation than the elderly who live with their family and have higher depression and suicidal impulses due to loneliness (Kim and Kim, 2019; Nam et al., 2019). According to studies related to the depression of elderly people who live alone, social relationships or social resources are major factors affecting the reduction of depression (Kim, 2020; Kim and Shin, 2015). Chang and Kim (2017) confirmed that depression was higher among the isolated elderly people who live alone, and the moderating effect of social support on the feeling of isolation and depression of elderly people who live alone (Chang and Kim, 2017; Sunghui and Sun, 2015).

In addition, Lu et al. (2021) confirmed that social relationships have a positive effect on the life satisfaction of elderly people who live alone (Lu et al., 2021). These preceding studies show that elderly people who live alone experience higher depression due to social isolation than the ordinary elderly, and this depression can be reduced by social relationships (Lee et al., 2010; Lee and Cho, 2013).

3. Research methods

3.1. Research questions

The research questions are as follows:

- First, what are the effects of individual characteristics on the depression of elderly people who live alone?
- Second, what are the effects of health conditions on the depression of elderly people who live alone?
- Third, what are the effects of satisfaction with leisure activities and social relationships on the depression of elderly people who live alone?

3.2. Measure

This study used open data from the 15th Korea Welfare Panel in 2020. As for the dependent variable, the depression scale, use the CESD-11 (Kohout et al., 1993), with a four-point scale ranging from 1 for extremely rare (less than one day a week), 2 for occasionally (1-2 days a week), 3 for often (3-4 days a week), to 4 for mostly (more than 5 days a week).

The scale indicates that the higher the score, the more severe the depression. Health status is a five-point scale ranging from “very good” to “very bad,” with a higher score indicating a poor health condition. Satisfaction with leisure activities and social relationships are the life satisfaction items of the Welfare Panel, ranging from “very dissatisfied” (one point) to “very satisfied” (five points). The higher the score on the scale, the higher the satisfaction.

3.3. Analysis target

The 15th Survey of the Korea Welfare Panel had 6,026 household responses, of which 2,092 were single households, and among single households, 1,502 were 65 years of age or older at the time of the survey (before December 31, 1954). These 1,502 people are the data used in this study.

3.4. Analysis method

Descriptive statistics were used for the analysis of the demographic characteristics of respondents and the means of major variables. An Independent sample t-test was used to compare the means between groups, and a hierarchical regression analysis was used to determine the effect of antecedent variables on the depression of elderly people who live alone. For statistics, SPSS 23 was used.

4. Results

4.1. General characteristics of respondents

Of the 1,502 people, 254 were male (16.9%) and 1,248 (83.1%) were female. The average year of birth was 1941, and the average age at the time of the response was 78, and the oldest was 98. Elderly single households were 1,502. The major marital status of these single households was “widowed” at 1,271 (84.6%), followed by “divorced” at 159

(10.6%), "unmarried," and "separated." A total of 1.9% of the respondents indicated that they were elderly single households with married spouses. These people are not separated, widowed, or divorced, but are presumed to be people who have a spouse but are currently living alone. As for educational level, 66 people (44.3%) were elementary school graduates, followed by 436 (29%) uneducated, 209 (13.9%) middle school graduates, and 140 (9.3%) high school graduates. Those with a college degree or higher accounted for 3.4%.

As for the types of housing, the proportion of people living in individual homes was high, followed by apartments, multiple dwellings, and multiplex housing. The proportion of elderly people who lived in permanent public rental apartments for basic livelihood recipients and those who lived in national rental housing for low-income people was 5.7% and 2.8%, respectively. Most of them lived on the ground floor, but 2.6% lived in residentially vulnerable environments such as semi-basement and underground.

The economic level of elderly people who live alone was divided into 234 ordinary households (more than 60% of the median income) and 1,231 low-income households (below 60% of the median income) in the panel data. The majority of elderly people who live alone are distributed in low-income households. The average annual income of the respondents was 13,427,500 won, which was about 1.1 million won per month. Table 1 shows the general characteristics of respondents.

Table 1: General characteristics of respondents

Item		Frequency (%)	Item		Frequency (%)
gender n=1502	woman	1,248(83.1)	education level n=1,502	uneducated	436(29)
	man	254(16.9)		elementary School	666(44.3)
marital status n=1,502	with spouse	28(1.9)		middle school	209(13.9)
	widowed	1,271(84.6)		high school	140(9.4)
	divorced	159(10.6)		college	10(0.7)
	separated	18(1.2)		university	38(2.5)
	unmarried	26(1.7)		master/PhD	3(0.2)
housing type	individual home	662(44.1)	residential location	basement	2(0.1)
	multiple dwellings	240(16)		semi-basement	38(2.5)
	multiplex housing	109(7.3)		ground	1,462(97.3)
	row house	30(2)	economic level (60% of the median) n=1,465	low-income households	1231(84)
	apartment	295(19.6)		general households	234(16)
	public housing	85(5.7)	year of birth (average)	1940.95 (oldest: 1922/ youngest; 1954)	
	national rental	42(2.8)			
	flats with shops	30(2)	income (per year)	13,417,500 Won (SD: 8,264,410)	
	officetel	6(.4)			
	shacks	3(.2)			

4.2. Descriptive statistics of key variables

Regarding the health status of elderly people who live alone, 619 people (41.2%) answered "not healthy," 488 people (32.5%) responded "normal" and 313 people (20.8%) answered "healthy." The health status of elderly people who live alone was measured on a five-point scale, and frequency analysis and descriptive statistics were simultaneously analyzed to find out the distribution of the health status. As shown in Table 2, 75 people, or 5%, responded that their health was very poor. Regarding the health status of elderly people who live alone, 619 people (41.2%) answered the most as "not healthy," 488 people (32.5%) responded to "normal" and 313 people (20.8%) answered "healthy." A total of 46% of elderly people who live alone were in poor health, and only 21.3% answered that their health was better than good. As shown in Table 3, the average health status was moderate at 3.29 (SD: .868).

Table 2: Health status of respondents

Health status	Frequency	Ratio
very healthy	7	.5
healthy	313	20.8
normal	488	32.5
not healthy	619	41.2
very bad	75	5.0
total	1,502	100.0

The average depression perceived by elderly people who live alone was 1.75 on a four-point scale, with a minimum value of 1.09 and a maximum value of 3.55. The average value of leisure life satisfaction was 3.20 on a five-point scale, and the average of social relationship satisfaction was 3.53.

Table 3: Average of key variables

	Minimum	Maximum	Mean	Std. deviation
leisure life satisfaction	1	5	3.20	.727
social relationship satisfaction	1	5	3.53	.682
depression	1.09	3.55	1.7554	.40980

4.3. Correlation between key variables

As for the correlation between variables, as shown in Table 4, poor health showed negative relationships with leisure life satisfaction and social relationship satisfaction. Health status and depression showed a positive relationship, and leisure life satisfaction and social relationship satisfaction showed negative correlations with depression at $p<.001$ level. Leisure life satisfaction

and social relationship satisfaction were positively correlated.

Table 4: Correlation between key variables

	Health status	Leisure life satisfaction	Social relationship satisfaction	Depression
health status	1			
leisure life satisfaction	-.253***	1		
social relationship satisfaction	-.236***	.535**	1	
depression	.384***	-.301***	-283***	1

**p<.01, ***p<.001

4.4. Means of major variables according to gender, education level, and economic level

The independent sample t-test was used to confirm whether there was a difference in the average value of the major variables according to the gender of elderly people who live alone. The t-values presented by Levene's test for equality of variances are as follows (Table 5). As a result of comparing the health status of men and women, the average health status of elderly women who live alone was 3.34, and the average health status of elderly men who live alone was 3.08. Therefore, the health of elderly men who live alone was worse than that of women (as an inverse question, the higher the score, the poorer the perception of health), and the average between the two groups was statistically meaningful at the significance level of .001. Regarding social relationship satisfaction, the average of elderly women who live alone was slightly higher than that of elderly men who live alone, and the average between the two groups showed a statistically significant difference at p<.05 level. There was no statistically significant difference in leisure life satisfaction. In the case of depression, the average value of elderly women who live alone was higher than that of elderly men who live alone, and there was a statistical difference between the two groups at a significance level of .05.

Table 5: Means of variables according to gender

	Male	Female	t
	M(SD)	M(SD)	
health status	3.08(.88)	3.34(.86)	4.289***
leisure life satisfaction	3.22(.74)	3.20(.72)	-.324
social relationship satisfaction	3.44(.76)	3.55(.67)	2.087*
depression	1.704(.41)	1.766(.41)	2.182*

*p<.05, ***p<.001

The independent sample t-test was used to confirm whether there was a difference in the mean values of major variables according to the educational level of elderly people who live alone. The t values suggested by Levene's test of equal variance are as follows (Table 6). Educational level was analyzed by dividing it into “lower than middle school” and “higher than high school.” The average health status of elderly people who live alone with a middle school or less was 3.34 and those with high school or higher were 2.96, indicating that elderly people who live alone with low educational level perceived their health status to be poor (inverse question, the higher the score, the poorer the health).

The difference in mean between the two groups was statistically significant at the level of p<.001. Satisfaction with leisure activities and social relationships according to educational background was slightly higher on the average of elderly people who live alone with high educational levels than those with low educational levels, but the difference in average between the two groups was not statistically significant.

The average depression of elderly people who live alone with less than middle school education was 1.77, which was higher than the average 1.67 of those with higher than high school education. The average between the two groups showed a statistically significant difference at p.<.001. In summary, elderly people who live alone with low educational level perceived their health status to be poorer and perceived depression more highly than those with high educational levels.

Table 6: Means of variables according to education level

	Less than middle school	Higher than high school	t
	M(SD)	M(SD)	
health status	3.34(.86)	2.96(.86)	-5.793***
leisure life satisfaction	3.19(.71)	3.31(.81)	-.1.884
social relationship satisfaction	3.53(.67)	3.57(.75)	-.809
depression	1.77(.42)	1.66(.34)	-4.159***

***p<.001

Whether there is a difference in the mean values of major variables according to the economic level of elderly people who live alone was confirmed by an independent sample t-test. The t values suggested by Levene's test of equal variance are as follows (Table 7). The average health status perceived by low-income elderly people who live alone with less than 60% of the median income was 3.34, and the average health status perceived by general elderly people was 3.03. That means that low-income elderly

people who live alone were not in better health than general elderly people (as an inverse question, the higher the score, the worse the perception of health). The difference in means between groups according to income was statistically significant at the level of p<.001.

The average leisure life satisfaction of general elderly people who live alone was 3.41, which was higher than the average (3.16) of low-income elderly people who live alone. The average difference between the two groups was significant at p>.001. The average social relationship satisfaction of general elderly people who live alone was 3.77, which was higher than the average (3.49) of low-income elderly people who live alone, and the difference in average between the two groups was also statistically significant.

In the case of depression, the average of low-income elderly people who live alone was 1.77 on a 4-point scale, which was higher than the average (1.66) of general elderly people who live alone, and there was a statistical difference between the two groups at p.<.05. The average score of depression according to income was the same as the average score of depression according to educational level in Table 6 (but there is a difference in standard deviation).

In short, low-income elderly people who live alone perceived poorer health, lower satisfaction with leisure life and social relationship, and higher depression than general elderly people.

Table 7: Means of variables according to economic status

	General	Low income	t
	M(SD)	M(SD)	
health status	3.03(.852)	3.34(.862)	-5.304***
leisure life satisfaction	3.41(.73)	3.16(.72)	4.747***
social relationship Satisfaction	3.77(.56)	3.49(.69)	6.879***
depression	1.66(.37)	1.77(.42)	-4.026***

***p<.001

The independent sample t-test was used to confirm whether there was a difference in the average value of the major variables according to the gender of elderly people who live alone. The t-values presented by Levene's test for equality of variances are as follows (Table 8). As a result of comparing the health status of men and women, the health of elderly women who live alone was worse than that of men, and the average between the two groups was statistically meaningful at the significance level of .001. Regarding social relationship satisfaction, the average of elderly women who live alone was slightly higher than that of elderly men who live alone, and the average between the two groups showed a statistically significant difference at p<.05 level.

There was no statistically significant difference in leisure life satisfaction. In the case of depression, the average value of elderly women who live alone was higher than that of elderly men who live alone, and there was a statistical difference between the two groups at a significance level of .05.

Table 8: Comparison of means of variables by gender

	Male	Female	t
	M(SD)	M(SD)	
health status	3.08(.88)	3.34(.86)	4.289***
leisure life satisfaction	3.22(.74)	3.20(.72)	-.324
social relationship satisfaction	3.44(.76)	3.55(.67)	2.087*
depression	1.704(.41)	1.766(.41)	2.182*

*p<.05, ***p<.001

4.5. Regression analysis results

To analyze the effects of “health Status”, “leisure activities” and “social relationships” on the depression of elderly people who live alone, the Korea Welfare Panel items of satisfaction with leisure activities and social relationships were used. A hierarchical regression analysis was used to analyze step-by-step the effects of individual characteristics (Model 1), health status (Model 2), and social relationship variables (Model 3) on depression. The main purpose is to control the effects of individual characteristics and to identify the effects of health status and social relationships on depression.

The multicollinearity of the regression analysis was confirmed by the tolerance and variance inflation factor. In the case of tolerance, the requirement of >.01 was satisfied with .929~.988, and the VIF (variance inflation factor) of 1.01~1.78 met the requirement of <10, indicating that there was no problem of multicollinearity.

As a result of regression analysis, as can be seen in Table 9, it was confirmed that gender did not affect the depression of elderly people who live alone, but education level did affect depression. The lower the education level of elderly people who live alone, the higher the depression. The effect of Model 1 on depression was statistically significant at p>.001, but adjusted R^2 was .02, indicating that the magnitude of the influence was small in size.

In Model 2, health status was added to Model 1, and the effect of Model 2 on depression was adjusted R^2 .151 at p>.001. The amount of change in the adjusted regression coefficient R^2 (model 2 R^2 - model 1 R^2). The amount of change in the adjusted R^2 (model 2 R^2 -model 1 R^2) was .132 and the change was statistically significant. In Model 2, education

level and health status affect depression. The worse the health status, the higher the depression. By adding variables of leisure activity and social relationship satisfaction to Model 2, the effects of social relationships on depression of elderly people who live alone were analyzed. The results show that education level, health status, and satisfaction with social relationships and leisure life affect depression. The higher the satisfaction with social relationships, the lower the perception of depression, and the higher the satisfaction with leisure activities, the lower the perception of depression.

The adjusted R^2 of Model 3 was .203 at p>.001, and the amount of change in the adjusted regression coefficient was .054, which was not large but showed a statistically significant change.

To summarize the results of the study, gender did not affect the depression of elderly people who live alone. The educational level had an effect on depression, so the higher the education level, the lower the depression. They had a higher level of depression as they perceived that their health was not good. Social life satisfaction was found to buffer depression. It was confirmed that the higher the satisfaction with social relationships, the lower the depression, and the higher the leisure life satisfaction, the lower their depression.

Table 9: The effects of social relationships and leisure life satisfaction on depression

	Model 1		Model 2		Model 3	
	β	t	β	t	β	t
gender (female=0)	.01	-.34	.01	.41	-.01	-.40
Education level	.14	-5.24***	.08	-2.99**	-.06	-2.29*
health status			.37	15.06***	.304	12.29***
social relationship satisfaction					-.13	-4.63***
Leisure life satisfaction					-.15	-5.28***
constant	1.92		1.27		1.89	
F Value	16.12***		88.05***		76.14***	
R^2(Adjusted R^2)	.022(.020)		.153(.151)		.207(.204)	
$\triangle R^2$($\triangle$Adjusted R^2)			.132(.131)		.054(.053)	

**p<.01, ***p<.001

5. Conclusion

This study identified the effect of health status and social relationships on the depression of elderly people who live alone to relieve the sense of isolation and improve their life satisfaction. The data of 1,502 elderly people aged 65 and over who live alone were analyzed using the 15th data of the Korea Welfare Panel in 2020.

As a result of this study, many of the respondents were elderly women who live alone, and there were differences in their perception of depression, social relationships, and health status depending on gender.

As a result of the study, there were many elderly women who live alone among the respondents, and the rate of elderly people who live alone was high among the bereaved households. These results reflect the difference between men and women in life expectancy and the longer life expectancy of women compared to men. In Korea, life expectancy in 2019 is 86.3 years for women and 80.3 years for men. More than six years of life expectancy for women is expected to lead to an imbalance in the gender ratio of elderly people who live alone.

In addition, the high bereavement rate in the process of living alone means that bereavement disrupts the intimacy of the elderly and increases the possibility of social isolation.

As for the housing types, there were many individual homes and apartments, which reflects the housing situation in Korea. In addition, 84% of the respondents were from low-income households with less than 60% of the median income, so there was also a certain percentage of people living in rental housing, public housing, and national rentals. Some elderly people who live alone were living without permission or living in a basement or semi-basement, so a small number of the housing vulnerable was included. The level of education was generally low, with 44.3% graduating from elementary school, 29% uneducated, and 13.9% graduating from middle school, with 87% combined. These results show that educational opportunities were not universally provided to all in Korean society in the past.

The average annual income of elderly people who live alone was 13,417,000 won, about 1.1 million won per month (1,096,698 won), which was 60% of the median income of single-person households in 2021 (1,827,831 won for 100% of the median income of single-person households). This indicates that the majority of elderly people who live alone are in an economic situation below 60% of the median income. These results are also related to their characteristics in this panel survey. The average year of birth was 1941, the average age was 79, and the oldest age of the respondents was 98. Considering these factors, the economic situation of elderly people who live alone is expected to worsen further.

Although the average difference between elderly men and elderly women who live alone was not large, the depression of elderly women who live alone was higher than that of men, and the average elderly women perceived their health status more poorly than elderly men. Satisfaction with the social relationship was high among elderly women who live alone. These results are also related to gender-specific life expectancy differences in life expectancy according to gender, and it is similar to the results of previous studies that women have a higher life expectancy, higher poverty rates, and higher feelings

of depression than men. In fact, many studies have reported that women are more prone to depression than men and that the degree of depression is more severe than men. This is because they are more likely to have lifestyle patterns that can affect depression due to weakened physical function and reduced social activities with older age (Kim and Ha, 2015). The result of verification through hierarchical regression analysis to examine the effect of the social relationship on depression shows that the higher the education level among the demographic variables, the lower the depression, reflecting the influence of other exogenous variables affecting the level of education. In other words, it can be interpreted as a result related to circumstances such as economic situation or age. Next, the health status of elderly people who live alone affects their perception of depression. This confirmed that health problems are important variables affecting not only difficulties in daily life but also mental health in the case of elderly people living alone who have to manage or take responsibility for nursing and care on their own. Finally, adding social relations variables, the satisfaction with leisure activities and the satisfaction with social relationships affect the depression of elderly people who live alone. As elderly people who live alone experience more social disconnection or have limited social relationships compared to ordinary elderly people, the formation of social networks can alleviate their depression to some extent, as the results of this study indicate. These findings are the same as those of previous studies (Park and Lee, 2016; Kim and Kim, 2019), which previously found that health status, leisure activities, and social relationships affect depression.

Based on the results of this study, the following are countermeasures to prevent depression in elderly people who live alone.

First, it is necessary to expand the social network for elderly people who live alone with a limited social network. Since the age distribution of elderly people who live alone is wide and their economic, health and psychological status are different, a strategic approach is required to expand the social network suitable for each elderly person's characteristics. If they are old and have restrictions on social activities, they should receive a companion or emotional support by sending care workers or volunteers. In the case of elderly people who can partially participate in social activities, their social networking should be expanded through various programs in social welfare community centers. Since elderly people who live alone live a long life separated from their families (Seo and Lee 2015; Sohn et al., 2019), it is necessary to promote the expansion of various facilities for the elderly in the local community so that elderly people who live alone can form new social relationships and expand social support system.

Second, it is necessary to expand opportunities for lifelong education for the leisure activities of the elderly. Satisfaction with leisure life can predict depression to a certain extent. In order to relieve the feeling of isolation of elderly people who live alone, it is necessary to expand opportunities to participate in lifelong education at various institutions in the local community and promote volunteer work or social participation that enables the elderly to form a sense of belonging or solidarity in the community.

In the case of elderly people who live alone, it is necessary to consider that there are many restrictions that make it difficult to lead a leisure life due to the influence of personal, health, and economic conditions. Because many of the leisure activities of the elderly are at home, watching TV (Lee and Shin, 2018; Kim and Ha, 2015), there are restrictions on their leisure activities due to limitations in social relations and economic problems. Accordingly, various leisure activities should be established in community social welfare facilities, and support should be provided to enable them to engage in leisure activities without restrictions on psychological access and economic conditions, according to the needs and characteristics of various elderly people.

Third, a differentiated approach at the community level is needed to manage the health of elderly people who live alone. In order for the elderly to actively form social relationships and engage in leisure activities, health must be a prerequisite. The relationship of physical health with depression has also been suggested in previous studies. Because health problems can lead to the lack of care and nursing under the situation of social isolation due to living alone, it is necessary to establish a system for regularly monitoring the health of elderly people who live alone through organic cooperation between community institutions and the public health centers.

Since this study used the data from the Korea Welfare Panel, it did not consider the influence of other variables that explain the depression of elderly people who live alone. In future research, comprehensive measures should be proposed to improve the life satisfaction of elderly people who live alone by identifying the influence of various variables that explain the depression of elderly people.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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