

ORIGINAL RESEARCH

Mediating effect of life satisfaction and depression on the relationship between cognition and activities of daily living in Korean male older adults

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Abstract

This study investigated the mediating effects of life satisfaction and depression on the relationship between cognition and activities of daily living (ADL) among male older adults. A secondary analysis was conducted utilizing data from the 2020 Elderly Survey. The participant pool consisted of 4035 Korean male older adults aged 65 years and above, selected from the total survey population of 10,097. The study focused on four variables: cognition, Korean Activities of Daily Living (K-ADL), life satisfaction and depression. The main analysis employed Hayes's PROCESS Macro for SPSS v.4.0, and Model 6 was applied to determine the mediating effect of life satisfaction and depression on the relationship between cognition and ADL. The analysis revealed a negative correlation between ADL and cognition scores. ADL scores exhibited positive correlations with both life satisfaction and depression scores. A positive correlation emerged between life satisfaction and depression scores. The examination unveiled an indirect mediating effect between life satisfaction and depression scores. It is necessary to establish an intervention strategy that considers life satisfaction and the degree of depression when establishing a strategy to predict and prevent the decline in daily living ability in older adults with cognitive decline.

Keywords

Elderly; Men; Cognition; Activities of daily living; Depression; Life satisfaction

1. Introduction

According to a report by the National Statistical Office of Korea, the segment of the population aged 65 years or older accounted for 17.5% of the populace in 2022, constituting approximately 9.02 million people. Projections indicate that by 2025, the older adult population is predicted to reach 20.6%, potentially categorizing Korea as a super-aged society [1]. Among the 37 Organization for Economic Cooperation and Development (OECD) countries, Korea is experiencing the fastest aging, and it is anticipated that by 2041, one out of three citizens will be classified as an older adult. The demographic transition could culminate in Korea becoming the world's most aged country by 2048. Significantly, as of 2018, Korea boasts the highest older adult poverty rate within the OECD, prompting concerns of an impending "elderly hell" should this issue remain unaddressed [2]. This rapid aging trend in Korea can lead to social conflicts and challenges in various domains such as physical and mental health, income, economy and social activities during extended old age [3].

In reality, the cognitive function of older adults is considered an important factor in determining their quality of life in old age. Deterioration in cognitive function causes a discordance between desire and action, which in turn induces stress and

depression in daily life. This acts as a factor that lowers the life satisfaction of older adults [4]. In the case of older adults in Korea, there are differences in the types of social relationships according to cognitive function level: the lower the cognitive function level, the higher the frequency of meetings with children. The cause is thought to be meeting the demands of daily life due to reduced cognitive function in children [4, 5].

However, in a study investigating disabilities related to activities of daily living (ADL) among older adults in Brazil [6], associations were found between age, depressive symptoms, stroke, slowness in male sitting and standing tests, cognitive ability, grip strength and ADL. Reductions in mobility, balance and health status were also observed to impact the central nervous system and contribute to cognitive impairment, particularly affecting men [6]. Analyzing the relationship between ADL and life satisfaction in Korean older adults revealed a positive (+) correlation among females, indicating that higher life satisfaction is linked to higher ADL. However, this relationship is not significant among older adult males [7].

Cognitive processing involves integrating experiences into coherent understanding. Moreover, happiness in life and cognitive processing has positive effects on overall happiness. The development of cognitive processing improves resilience and increases future happiness [8]. Research on older adults

consistently indicates a decline in life satisfaction as mental health status declines, notably with depression showing a significant negative impact [9, 10]. Other factors influencing life satisfaction among older adults encompass safety, interaction with neighbors, proximity to children or relatives, public transportation frequency and accessibility, as well as the availability of green spaces [11]. However, it was reported that older adults with mild cognitive impairment exhibit the ability to independently carry out daily tasks. Thus, lower cognitive function does not necessarily affect their life satisfaction [12].

Studies that verified the mediating effect of depression in older adults established that depression significantly impacts memory recall, processing speed and the relationship between various cognitive functions [13]. Depression in older adults also demonstrates a strong association with complex diseases, particularly among older men. In addition, functional health factors such as self-rated health, sleep deprivation, instrumental activities of daily living (IADL) disorders, ADL disorders and pain, as well as behavioral health factors like lack of physical activity, mediate the impact of depression [14].

Regarding life satisfaction, depression and ADL in older adults, the results indicated a direct association between age, functional disability, life satisfaction and depression. Functional disability is positively correlated with depression and negatively correlated with life satisfaction. It strongly mediates the relationships among age, depression and life satisfaction [15]. Maintaining independent mobility and functioning in old age are critical for continued community participation, health and well-being, posing a major challenge due to population aging [16].

Depression and life satisfaction have been found to have enduring effects and mutual influence. Moreover, a gender disparity has been identified in these aspects. Depression among adults requires increased attention, and strategies to prevent or improve functional disability could prove effective in enhancing life satisfaction and reducing depression levels among older adults. Additionally, addressing gender differences is essential for interventions aimed at preventing functional disability, depression and enhancing life satisfaction [15].

In addition to cognitive function, depression is also correlated with life satisfaction. It has been reported that higher subjective health status, cognitive function and depression scale scores are associated with higher life satisfaction [7]. Older males who are employed tend to experience higher life satisfaction [7].

All humans desire a happy life and strive toward increasing and maintaining life satisfaction. Life satisfaction is determined by physical and mental health, income achievement and social relationships. Rowe and Kahn [17] presented a model of successful aging, highlighting three factors: absence of physical disease or disability, sustained high levels of physical and cognitive functioning, and continuous participation in social activities. Maintaining robust cognitive function is particularly crucial for successful aging, enabling continued engagement in social activities. ADLs are an important factor in healthy aging. Studies have shown a strong positive (+) correlation between ADL and life satisfaction [18, 19], indicating that the ability to manage daily life directly impacts one's overall

life satisfaction. Previous research in Korea [7] also found a positive (+) correlation between cognitive function and life satisfaction among older adults. This suggests that cognitive function issues in older adults can lead to impaired balance, reduced physical activity, strained social relationships, and diminished life satisfaction, as observed by Park [7].

Previous studies on older adults reported that there were gender differences in the relationship between cognitive function, depression, ADL and life satisfaction [6, 7, 14–16, 20]. An earlier study [16] reported that older men exhibit lower levels of IADL disorders, lower levels of depression, and higher life satisfaction compared to older women. Although no gender difference has been observed in ADL disorders, gender has emerged as an important factor in functional disorders, depression and life satisfaction [20]. This could be attributed to varying health risks between men and women due to physiological differences in reproductive power and hormonal composition. In fact, previous studies [16] reported that women's life satisfaction is affected by ADL disorders, whereas men's life satisfaction is affected by IADL disorders [16].

However, it was difficult to find studies that verified the mediating effect of life satisfaction and depression in the relationship between cognition and ADL among older men. In particular, in Korea, which will enter a super-aged society, research is essential to explore potential relationships between cognition, ADL, depression and life satisfaction in older men.

In the context of the aging population, successful aging could be defined as older adults comprehending and embracing the aging process while actively pursuing a satisfactory life and high subjective well-being. Identifying the groups at higher risk of disability is essential for establishing effective prevention and rehabilitation strategies. This study aimed to determine whether life satisfaction and depression mediate the relationship between cognition and ADL in Korean male older adults.

2. Materials and methods

2.1 Study design

This was a secondary analysis of data from the 2020 Elderly Survey. This descriptive study aimed to identify the mediating effect of life satisfaction and depression on the relationship between cognition and ADL in older adult men.

2.2 Participants

This study used data from the 2020 Elderly Survey. The survey on the condition of older adults is a statutory survey conducted by the Ministry of Health and Welfare based on Article 5 of the Elderly Welfare Act. It was conducted to improve the quality of life of older adults by identifying their living conditions, characteristics and needs. In 2020, a survey was conducted targeting older adults aged 65 years or older in 969 survey districts, according to the designed sampling method. The final survey was completed by 10,097 individuals. The present study focused on a cohort of 4035 male older adults.

2.3 Study variables

2.3.1 Cognition

Cognitive function was assessed using the Korean version of the Mini-Mental State Examination for Dementia Screening (MMSE-DS). This tool was standardized by Kim *et al.* [21] using the Mini-Mental State Examination (MMSE) tool developed by Folstein *et al.* [22]. The MMSE-DS consists of 19 questions regarding orientation, memory, concentration, language ability, execution ability, shape simulation, judgment and problem-solving ability. The scores range from 0–30 points. In this study, the total MMSE-DS score among older adult survey data was used. The higher the score, the better the cognitive function. At the time of development of the Korean version, Cronbach's $\alpha = 0.83$. In this study, Cronbach $\alpha = 0.90$.

2.3.2 ADL

Korean Activities of Daily Living (K-ADL), developed by Won *et al.* [23], were used to assess ADL. This instrument consists of seven items: bathing, dressing, toilet use, moving, bowel and bladder control, eating and face washing. Scores ranged from 7 to 21 on a 3-point scale (1 point for complete independence, 2 points for partial assistance, and 3 points for complete assistance), with higher scores indicating lower ADL. In Kim *et al.*'s [24] study, Cronbach $\alpha = 0.80$. In this study, Cronbach $\alpha = 0.94$.

2.3.3 Life Satisfaction

Life satisfaction was measured using seven items (health status, economic status, spouse relationship, child relationship, social activity, social relationship and overall satisfaction) drawn from a survey of older adults [25]. Participants were asked to gauge their satisfaction with various facets of life on a 5-point Likert scale, ranging from "very dissatisfied" (1 point) to "very satisfied" (5 points). Higher scores indicated higher life satisfaction. In Kim [25]'s study, Cronbach's $\alpha = 0.85$. In this study, Cronbach $\alpha = 0.83$.

2.3.4 Depression

Depression was measured using the Korean Short Form of the Geriatric Depression Scale (SGDS-K) developed by Yesavage *et al.* [26] and standardized by Kee [27]. This scale comprises 15 dichotomous questions answered with "yes" (1 point) or "no" (0 points). Reverse coding was applied to five items with inverted content. Total scores ranged from 0 to 15, with higher scores indicating more severe depression. At the time of development of the Korean version of the tool, Cronbach's $\alpha = 0.88$. In this study, Cronbach $\alpha = 0.88$.

2.4 Ethical considerations

The 2020 Elderly Survey was conducted through one-on-one interviews between 14 September and 20 November 2020. The raw data of the 2020 Elderly Survey were downloaded with permission from the website of the Korea Institute for Health and Social Affairs.

2.5 Analysis

The analysis of the study data was performed using SPSS/WIN v.25.0 (IBM Corp., Armonk, NY, USA), and the significance level was set at 0.05. Descriptive statistics were used for general characteristics and the degree of major variables, and *t*-tests and ANOVA (Analysis of Variance) were used for differences in ADL, according to general characteristics. Scheffé's test was performed for *post-hoc* analyses. Correlations among cognition, ADL, life satisfaction and depression were analyzed using Pearson's correlation coefficient. To ascertain the mediating effect of life satisfaction and depression on the relationship between cognition and ADL, Model 6 of Hayes [28]'s PROCESS Macro for SPSS v.4.0 was used, with age as a covariate. Bootstrapping (10,000) validated the significance of the mediating effect. All variable results are score-based.

3. Results

3.1 General characteristics according to ADL

There were significant differences in ADL scores according to age, education level, National Basic Livelihood Security recipient, subjective health, spouse's health, fall experience in the past year, frequency of contact with friends, and suicidal ideation ($p < 0.05$). ADL scores were notably lower among individuals aged 75 years or older, those with middle school education or less, and recipients of national basic livelihood security. Moreover, participants who regarded their own and their spouses' health as poor exhibited lower ADL scores in contrast to those perceiving good health. Those who experienced falls in the past year had lower ADL scores than those who did not, and those who engaged in weekly interactions with friends demonstrated higher ADL scores than those without such interactions. Participants with suicidal ideation had lower ADL scores than their non-ideating counterparts (Table 1).

3.2 Correlation between ADL, cognition, life satisfaction and depression

ADL and cognition scores were negatively correlated ($r = -0.46, p < 0.001$). There was a positive correlation between ADL and life satisfaction scores ($r = 0.25, p < 0.001$), and between ADL and depression scores ($r = 0.24, p < 0.001$). Cognition scores were negatively correlated with life satisfaction ($r = -0.23, p < 0.001$) and depression scores ($r = -0.24, p < 0.001$). There was a positive correlation between life satisfaction and depression scores ($r = 0.39, p < 0.001$) (Table 2).

3.3 Mediating effect of life satisfaction and depression on the relationship between cognition and ADL

To analyze the mediating effect of life satisfaction and depression scores on the relationship between cognition and depression scores, Model 6 of PROCESS Macro for SPSS v.4.0, was applied and analyzed.

The results of the analysis showed that each model was statistically significant, as shown in Table 3 and Fig. 1. In Stage

TABLE 1. Differences in ADL according to general characteristics.

Characteristics	Categories	N (%)	ADL	
			M ± SD	t/F (p) Scheffé
Age (yr)				
	65–74	2538 (62.9)	7.12 (0.94)	–5.36 (<0.001)
	≥75	1497 (37.1)	7.33 (1.55)	
Education level				
	≤Middle school	2166 (53.7)	7.27 (1.43)	4.53 (<0.001)
	≥High school	1869 (46.3)	7.10 (0.88)	
Recipients of National Basic Livelihood Security				
	Yes	180 (4.5)	7.65 (2.14)	5.11 (<0.001)
	No	3855 (95.5)	7.17 (1.14)	
Subjective health				
	Healthy ^a	2270 (57.2)	7.01 (0.41)	200.03 (<0.001) c > a, b
	Normal ^b	1158 (29.2)	7.05 (0.39)	
	Not healthy ^c	543 (13.7)	7.98 (2.60)	
Spouse's health				
	Healthy ^a	1986 (61.0)	7.07 (0.74)	66.69 (<0.001) c > a, b
	Normal ^b	854 (26.2)	7.20 (1.14)	
	Not healthy ^c	415 (12.7)	7.84 (2.54)	
Fall experience in the past year				
	Yes	195 (4.8)	7.97 (2.65)	9.30 (<0.001)
	No	3840 (95.2)	7.15 (1.07)	
Frequency of contact with friends				
	≥1/week ^a	2785 (68.4)	7.10 (0.82)	49.41 (<0.001) c > a, b
	1–3/month ^b	668 (16.6)	7.19 (1.19)	
	<1–3/month ^c	609 (15.1)	7.63 (2.20)	
Suicidal ideation				
	Yes	54 (1.4)	7.72 (2.05)	3.83 (<0.001)
	No	3917 (98.6)	7.15 (1.06)	

ADL: Ability of Daily Living, M: Mean, SD: Standard deviation, t: t value of t-test, F: F value of ANOVA, Scheffe: post-hoc analyses. In subjective health and spouse's health, ^a means healthy, ^b means normal, and ^c means not healthy. And in frequency of contact with friends, ^a means more than once a week, ^b means 1–3 times a month, and ^c means less than 1–3 times per month.

TABLE 2. Correlation between ADL, cognition, life satisfaction and depression.

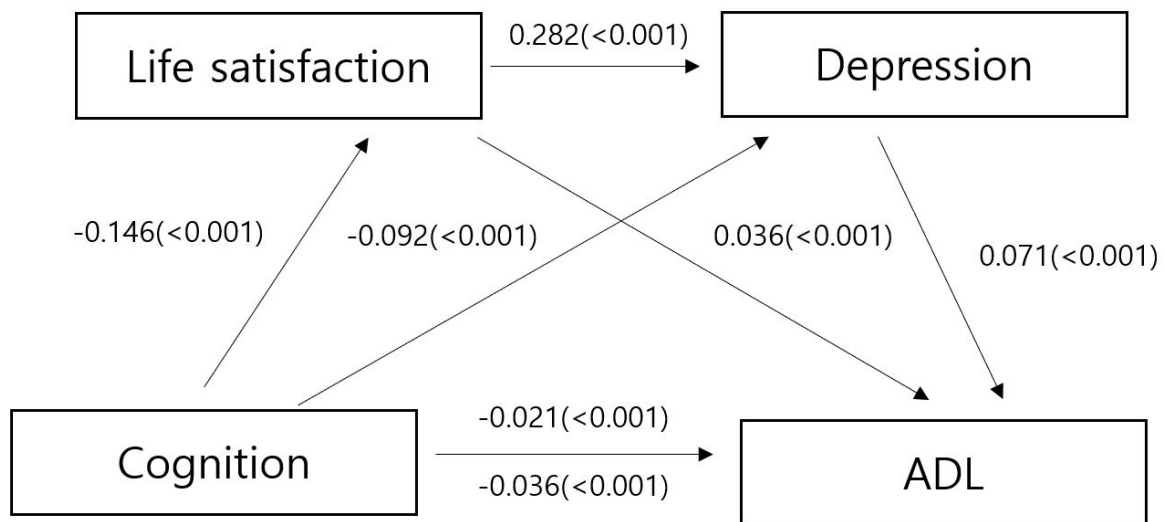
Variables	ADL	Cognition	Life satisfaction	Depression
	r (p)	r (p)	r (p)	r (p)
ADL	1.00			
Cognition	–0.46 (<0.001)	1.00		
Life satisfaction	0.25 (<0.001)	–0.23 (<0.001)	1.00	
Depression	0.24 (<0.001)	–0.24 (<0.001)	0.39 (<0.001)	1.00

ADL: Ability of Daily Living.

TABLE 3. Mediating effect of life satisfaction and depression on the relationship between cognition and ADL in older adults.

Number	Variables		B (Coefficient)	SE	p	95% CI		R ²
						LLCI	ULCI	
1	Cognition	Life satisfaction	-0.146	0.014	<0.001	-0.174	-0.117	0.094
2	Cognition	Depression	-0.092	0.011	<0.001	-0.113	-0.070	0.179
	Life satisfaction	Depression	0.282	0.013	<0.001	0.255	0.308	
3	Cognition	ADL	-0.021	0.004	<0.001	-0.029	-0.013	0.108
	Life satisfaction	ADL	0.036	0.005	<0.001	0.026	0.047	
	Depression	ADL	0.071	0.006	<0.001	0.058	0.084	
4	Cognition	ADL	-0.036	0.004	<0.001	-0.044	-0.028	0.036

ADL: Ability of Daily Living, SE: Standard error, CI: Confidence interval, LLCI: Lower limit confidence interval, ULCI: Upper limit confidence interval.

**FIGURE 1. Mediating effect of variables.** ADL: Ability of Daily Living.

1, cognition scores had a significant effect on life satisfaction scores ($B = -0.146$, $p < 0.001$), and in Stage 2, cognition ($B = -0.092$, $p < 0.001$) and life satisfaction scores ($B = 0.282$, $p < 0.001$) had a significant effect on depression scores. In Stage 3, cognition ($B = -0.021$, $p < 0.001$), life satisfaction ($B = 0.036$, $p < 0.001$), and depression scores ($B = 0.071$, $p < 0.001$) significantly affected ADL scores. In Stage 4, cognition scores had a significant effect on ADL scores ($B = -0.036$, $p < 0.001$). The total effect between cognition and depression scores increased from -0.044 to -0.028 ($p < 0.001$) when two parameters, life satisfaction and depression scores, were added (Table 4). Therefore, life satisfaction and depression scores were found to have positive effects on ADL scores, suggesting a dual mediating effect, that is, an indirect mediating effect.

To determine the significance and influence of the double mediation effect, a comparison was made among three pathways: the path with only the first parameter input, the path with only the second parameter, and the effect for the path with both the first and second parameter inputs. To verify the

significance of the mediating effect, a bootstrapping method was used and 10,000 samples were resampled. Statistical significance was tested using 95% confidence intervals.

As shown in Table 5, cognitive path to ADL scores through life satisfaction scores ($B = -0.023$, 95% CI (Confidence Interval): -0.034 – -0.015), cognitive path to ADL scores through depression scores ($B = -0.029$, 95% CI: -0.042 – -0.018), and cognitive path to ADL scores via life satisfaction and depression scores ($B = -0.013$, 95% CI: -0.018 – -0.008), both 95%. As the confidence interval did not include 0, the indirect effects of life satisfaction and depression scores, which are mediating variables, were statistically significant.

4. Discussion

Among the key findings of this study, in relation to participants' general characteristics, those who maintained communication with friends and exhibited no suicidal ideation had higher ADL scores. A previous study of social activities and

TABLE 4. Total effect, direct and indirect effect.

	Effect	SE	<i>p</i>	95% CI	
				LLCI	ULCI
Total effect	-0.036	0.004	<0.001	-0.044	-0.028
Direct effect	-0.021	0.004	<0.001	-0.029	-0.013

SE: Standard error, CI: Confidence interval, LLCI: Lower limit confidence interval, ULCI: Upper limit confidence interval.

TABLE 5. Validation of mediating effect (bootstrapping).

Variables	Effect	Boot SE	95% CI	
			LLCI	ULCI
Indirect 1 Cognition → Life satisfaction → ADL	-0.023	0.004	-0.034	-0.015
Indirect 2 Cognition → Depression → ADL	-0.029	0.006	-0.042	-0.018
Indirect 3 Cognition → Life satisfaction → Depression → ADL	-0.013	0.002	-0.018	-0.008

SE: Standard error, ADL: Ability of Daily Living, CI: Confidence interval, LLCI: Lower limit confidence interval, ULCI: Upper limit confidence interval.

IADL in 14,956 Japanese older adults revealed fewer subjects with poor IADL among those engaged in social activities [29]. Another study [30] identified a relationship between ADL disability and suicidal ideation was, suggesting that there is a relationship between the physical function of older adults, represented by ADL, and the negative psychological state of suicidal ideation. These results are consistent with the findings of this study. In other words, the friendships forged among older adults provide not only psychological support, but also physical benefits. In previous studies [6], depressive symptoms were reported as a risk factor for disability in both male and female older adults, which is similar to the results of this study. However, in older males, a history of stroke and slowing of the sit-and-stand test were risk factors, and a good result on the MMSE, which measures cognition, acted as a protective factor. In contrast, women had a significant history of arthritis, and good grip strength was a protective factor. These results confirmed the differences in detailed factors according to sex. To mediate problems such as depression, activities such as ADL, which is the variable of this study or disability, which is a factor that interferes with ADL, older adult male and female sex differences should be taken into consideration.

The results of a study on the correlation between ADL, cognition, life satisfaction and depression showed that the higher the ADL score, the lower the subject's ability to perform activities of daily living, the lower the cognitive score, and the lower the cognitive function. In previous studies [31] on the relationship between cognitive function and ADL, cognitive function was a factor that predicted or altered ADL in both sexes, and differences in detailed factors were reported according to sex. Cognitive function predicted ADL better in women than in men; therefore, the sensitivity between the variables was lower in men than in women. Women depend on language learning and memory, whereas men depend on visual memory and learning, demonstrating different characteristics. These results are supported by previous studies showing poor cognitive function in subjects with low ADL abilities [32]. The poorer the cognitive function, the higher the risk of IADL

problems, which could be used as a predictor [33]. Therefore, it can be expected that subjects with deteriorating cognitive function can be classified and observed, their problems can be predicted in advance, and their problems can be reduced, or the rate of deterioration can be reduced through individual interventions suitable for the subject's condition. Moreover, depression was found to be higher among those with low ability to perform daily life activities. In a study that followed depression in older adults for eight years, ADL problems were found to be significantly related to depressive symptoms [34], which is consistent with the results of this study. In addition, previous studies have reported that ADL problems can significantly increase the risk of depressive symptoms [34]. In previous studies involving Chinese older adult individuals, health and economic conditions were reported as the most influential factors in life satisfaction [35]. Therefore, it is necessary to conduct a study that considers the economic status and health status of the older adult, which are variables that have not been identified in this study. Although it is difficult to establish a definite causal relationship, these consistent results can affirm the validity of an approach through ADL, among other methods, to control depression, which is a very important component of mental and psychological problems in older adults.

In contrast, the results of the present study showed a positive correlation between life satisfaction and depression. In other words, the higher the life satisfaction, the higher the depression. Previous studies [36, 37] showed a negative correlation between life satisfaction and depressive symptoms, which differs from the results of this study. In previous studies [38], life satisfaction and depression experienced by the older adult were found to be strongly associated with individual subjective life perceptions, such as family relationship satisfaction and self-esteem. Furthermore, variables such as gender, religion, pension receipt and existence of livelihood support services were also significant factors [38]. It is noteworthy that this particular study exclusively encompassed male older adult individuals, thus precluding the assessment of gender-specific influencing factors. In Eastern cultures, including Korea, the significance

of family relationships becomes pronounced in the intricate relationship between life satisfaction and depression among the older adult [39]. Previous research [40] has reported that depressive symptoms increased even when life satisfaction was maintained. To investigate these inconsistent research results and discrepancies, it is necessary to conduct repeated studies on related variables identified in previous studies, including gender comparisons between the older adult.

This study revealed that the life satisfaction score and the depression score had a positive effect on the ADL score, indicating a dual mediating effect and that there was an indirect mediating effect. The indirect mediating effects were statistically significant. By confirming the mediating effect of depressive symptoms on the association between cognitive function and IADL disability, depression was confirmed to have a mediating effect between these variables, which is consistent with the results of this study [41]. In another study [42], cognitive impairment, including memory deficits, was evident in depressed patients, and IADL ability was reduced, showing results similar to those of this study. Depression in the older adult progresses brain aging and increases the risk of cognitive impairment [43], and the decline in cognitive function in the older adult suffering from depression can further lead to functional limitations and disabilities [44]. In other words, depression mediates the relationship between cognition and ADL as a mechanism that causes brain function deterioration. It is crucial to prevent the synergistic effect of cognitive decline and depression on ADL decline [45]. Therefore, it would be effective to provide interventions for the older adult with depression and depressive symptoms together with the protection of cognitive function to prevent ADL disorders.

In this study, life satisfaction mediated the relationship between cognition and ADL. Nonetheless, a limitation arises from the absence of studies verifying this specific mediation effect, preventing a direct comparison of findings. A systemic review targeting Asian older adult participants revealed that cognitive ability yields a positive impact on life satisfaction [46]. Moreover, an exploration of factors influencing life satisfaction among Korean older adult disclosed that those with compromised cognition experienced diminished life satisfaction relative to their cognitively intact counterparts [47]. Life satisfaction encompasses cognitive dimensions, reflecting a self-evaluation process [48]. Therefore, alterations in cognitive ability inherently entail changes in the evaluation of life satisfaction. In previous studies [49], it was reported that there was a significant relationship between physical activity and life satisfaction of the older adult. Older adult with cognitive decline may encounter difficulty in recognizing life satisfaction that includes cognitive aspects. The psychological state of those experiencing reduced life satisfaction leans toward negative emotions over positive ones, leading to a greater likelihood of experiencing depression rather than joy. This, in turn, negatively impacts their physical activities and ADL. The verification of the mediating effect of depression and life satisfaction in the relationship between cognition and ADL highlights their significance in influencing the older adult's ADL, steering it toward a positive direction. Therefore, it is apparent that interventions should not only encompass efforts to improve cognitive ability but also account for the mediating

factors of depression and life satisfaction.

The strength of this study is that it contributes to expanding knowledge in the public health field by investigating the factors influencing ADL among the older adult, a demographic whose autonomy in ADL is gradually decreasing. Moreover, the investigation sheds light on the intricate interplay between cognitive function, a pivotal mental health determinant that profoundly impacts older adult individuals' quality of life and ADL, a cornerstone of physical well-being. By probing the mediating influence of depression and life satisfaction, this study introduces a novel perspective. It holds profound implications for mental health management among older adult males within the public health domain. However, several limitations warrant consideration. The variable of depressive symptoms, central to this study, relied on self-reported, regardless of whether depression was diagnosed. Therefore, a diagnosis of depression was not included as a variable in this study. Furthermore, because the data of this study were cross-sectional, a causal relationship cannot be inferred; therefore, future research using longitudinal data is necessary. However, as this study was conducted using data managed by the government, the reliability of the data is high. In addition, as a study with a large sample size, it can be used as basic data when developing an intervention strategy for individuals using cognitive, psychological and physical variables, rather than a single variable.

5. Conclusions

This study found that life satisfaction and depression have a positive effect on ADL, suggesting a dual mediating effect, that is, an indirect mediating effect, on older adult men. The results of this study contribute to expanding the literature on the relationship between cognition and ADL in the older adult population, prompting further investigation into interventions involving mediating variables.

AVAILABILITY OF DATA AND MATERIALS

The data of 2020 elderly survey is publicly available at <https://data.kihasa.re.kr/kihasa/main.html> after consent to use for research purposes.

AUTHOR CONTRIBUTIONS

MK, WHM and SAK—designed the research study. SAK—performed the research. MK—analyzed the data. All authors wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The 2020 Elderly Survey (2020) was carried out with approval from the Korea Institute for Health and Social Affairs Bioethics Committee IRB (No. 2020-36). Written informed consent was obtained from all participants in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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