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Association between health literacy and successful aging among older Korean adults

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With the rapid advancement of information and communication technology, health-related information has become increasingly accessible, making health literacy—the ability to access, understand, and use health information—more important than ever. This study aimed to investigate the relationship between health literacy and successful aging in a Korean population. We analyzed cross-sectional data from 70,626 participants in the 2021 Korean Community Health Survey. Verbal and written health literacy were assessed. Successful aging was operationalized using five criteria capturing physical, cognitive, social, and psychological dimensions: no disability, high cognitive function, no depressive symptoms, active social engagement, and psychological well-being. Adjusted multivariable logistic regression was used to examine association between health literacy and successful aging. Compared with participants with high verbal health literacy, those with low verbal health literacy had significantly lower odds of successful aging (OR = 0.72, 95% CI = 0.68–0.76). Compared with participants with high written health literacy, those with low written literacy (OR = 0.78, 95% CI = 0.73–0.83) and those uninterested in written health information had lower odds of successful aging (OR = 0.69, 95% CI = 0.65–0.74). Low health literacy was significantly associated with lower odds of successful aging. These findings underscore the importance of promoting health literacy as a potential target for intervention to support successful aging and to inform future health policies and intervention efforts.

Keywords Health literacy, Successful aging, Healthy aging, Information literacy

As health remains a fundamental goal across various fields, the rapid advancement of information and communication technology in recent years has facilitated the creation and dissemination of health-related information, leading to an overwhelming influx of such content¹. Consequently, the ability to effectively select and utilize relevant information has become increasingly important. In this context, health literacy, defined as the ability to obtain, process, and understand basic health information and services necessary for making appropriate health decisions—serves as a crucial determinant of health and well-being². The Institute of Medicine and the US Department of Health and Human Services have identified health literacy as a priority for disease prevention and health promotion³. As a result, health literacy is now recognized as a key factor in both clinical risk management and personal health assets⁴.

Recently, successful aging has emerged as a key concept in response to demographic shifts toward an aging population. As of 2024, South Korea has become a super-aged society, with adults aged 65 and older accounting for more than 20% of the population; this proportion is projected to reach 25% by 2030, underscoring the growing importance of successful aging^{5–7}. Successful aging refers to maintaining a positive aging experience despite the inevitable losses and gradual decline associated with aging⁸. It reflects both life satisfaction and the ability to preserve desirable physical, mental, and social functions throughout life⁹. Generally, successful aging is characterized by maintaining high levels of physical, mental, and social functions¹⁰.

The impact of health literacy on health outcomes begins with the ability to seek and comprehend health information. Various factors, including demographic, cultural, and psychosocial influences, general literacy levels, and aspects of the healthcare system, shape health literacy¹¹. Individuals with low health literacy may face barriers when accessing and utilizing health information, which can negatively influence their health-related

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behaviors and self-management skills¹². This issue is particularly concerning, as limited health literacy has been associated with lower awareness of health services, reduced use of preventive healthcare, poorer adherence to medical instructions, and increased mortality¹³. Given these risks, adopting a lifelong approach to healthy aging is essential, as maintaining a healthy and active lifestyle provides long term benefits¹⁴.

Therefore, to highlight the importance of managing health literacy, it is essential to assess health literacy levels and their impact on health-related outcomes among older adults. In this study, we hypothesize that individuals with low health literacy are less likely to achieve successful aging, indicating a potential association between health literacy and successful aging. Accordingly, this study aimed to examine the relationship between verbal and written health literacy levels and successful aging using a nationally representative sample of community-dwelling older adults in South Korea (Table 1).

Results

The general characteristics of the study participants are presented in Table 2. Overall, 43.3% of older adults were classified as successfully aging. A total of 65.2% had high verbal health literacy, while 41.7% had high written health literacy. Among the 70,626 participants, 49.9% of those with high verbal health literacy achieved successful aging. Additionally, 54.8% of individuals with high written health literacy were classified as successfully aging, whereas the proportion was notably lower at 30.5% among those uninterested in written health literacy.

Table 3 presents the logistic regression results examining the association between health literacy and successful aging. Compared to individuals with high verbal literacy, those with low verbal literacy had significantly lower odds of successful aging (OR=0.72, 95% CI=0.68–0.76). Regarding written health literacy, participants who were uninterested had the lowest odds of successful aging (OR=0.69, 95% CI=0.65–0.74), followed by those with low health literacy (OR=0.78, 95% CI=0.73–0.83), compared to individuals with high written health literacy. Additionally, compared to those unaware of their blood pressure or blood sugar levels, individuals aware of their blood pressure (OR=1.09, 95% CI=1.03–1.14) and blood sugar levels (OR=1.13, 95% CI=1.08–1.19) had higher odds of successful aging.

Subgroup analyses of the association between health literacy and successful aging, stratified by health awareness level, were presented in Table 4. In both awareness strata, lower levels of verbal and written health literacy were associated with lower odds of successful aging compared with high health literacy. Among individuals who were aware of their blood pressure or blood sugar levels, those with low verbal health literacy had significantly lower odds of successful aging than those with high verbal health literacy (blood pressure: OR=0.71, 95% CI=0.67–0.76; blood sugar: OR=0.71, 95% CI=0.64–0.78). Similarly, in the aware group, participants uninterested in written health literacy had lower odds of successful aging compared with those with high written health literacy (blood pressure: OR=0.70, 95% CI=0.65–0.75; blood sugar: OR=0.67, 95% CI=0.60–0.74). Among individuals who were unaware of their blood pressure or blood sugar levels, low verbal health literacy was also associated with lower odds of successful aging (blood pressure: OR=0.72, 95% CI=0.66–0.79; blood sugar: OR=0.72, 95% CI=0.67–0.77). Likewise, participants uninterested in written health literacy had lower odds of successful aging than those with high written health literacy (blood pressure: OR=0.68, 95% CI=0.62–0.76; blood sugar: OR=0.71, 95% CI=0.65–0.76).

Discussion

This study aimed to investigate the relationship between health literacy and successful aging among older adults in South Korea. Our findings indicate that individuals with low verbal health literacy had significantly lower odds of achieving successful aging compared to those with high verbal literacy. Health literacy is a modifiable factor that influences self-management and health outcomes in older populations¹⁵. In Korea, more than one-third of adults have limited health literacy, a rate comparable to that observed among American adults¹³. Accordingly, older adults require both an accurate understanding of their health status and the ability to access and utilize necessary health information—highlighting the importance of improving health literacy¹⁶.

Conceptually, frailty is often viewed as the opposite of successful aging. While frailty is primarily relevant in clinical contexts, successful aging encompasses broader determinants, including environmental health^{17,18}. Frailty refers to a state of significant physiological decline associated with aging and is linked to adverse health outcomes such as falls, hospitalization, reduced quality of life, and mortality. Prior studies have reported that approximately 32% and 16% of individuals with limited health literacy fall into the categories of pre-frail and frail, respectively¹⁹. Notably, both high individual-level and community-level health literacy have been associated with a low prevalence of frailty among community-dwelling older adults²⁰. These findings are consistent with our study, which revealed a similar relationship between health literacy and successful aging. This highlights health

Domain	Variables	Successful aging	Usual aging
Absence of disability	Limitations in motor ability, self-management, and daily activities	No = 0	Yes = 1–6
High cognitive function	Experience of cognitive impairment	No = 0	Yes = 1
High mental function	Symptoms of Depression (PHQ-9)	PHQ-9 score < 10	PHQ-9 score ≥ 10
Active social engagement	Factors influencing the Social and Physical Environment	Fully Satisfied with the factors	Dissatisfied with one or more factors
Psychologically well-adapted in later life	Satisfaction with life	≥ 7	0–6

Table 1. Definition of the successful aging based on a multidimensional approach. *PHQ* Patient Health Questionnaire.

Variables	Total		successful aging				P-value
			Yes		No		
	N	(%)	N	(%)	N	(%)	
Verbal health literacy							< 0.0001
High	46,042	(65.2)	22,997	(49.9)	23,045	(50.1)	
Low	24,584	(34.8)	7590	(30.9)	16,994	(69.1)	
Written health literacy							< 0.0001
High	29,451	(41.7)	16,134	(54.8)	13,317	(45.2)	
Low	19,605	(27.8)	7079	(36.1)	12,526	(63.9)	
Uninterested	21,570	(30.5)	7374	(34.2)	14,196	(65.8)	
Age (years)							< 0.0001
65–69	20,549	(29.1)	10,846	(52.8)	9703	(47.2)	
70–79	32,413	(45.9)	14,415	(44.5)	17,998	(55.5)	
≥ 80	17,664	(25.0)	5326	(30.2)	12,338	(69.8)	
Sex							< 0.0001
Male	29,768	(42.1)	14,820	(49.8)	14,948	(50.2)	
Female	40,858	(57.9)	15,767	(38.6)	25,091	(61.4)	
Marital status						< 0.0001	
Married	44,226	(62.6)	21,661	(49.0)	22,565	(51.0)	
Separated or divorced	25,962	(36.8)	8777	(33.8)	17,185	(66.2)	
Unmarried	438	(0.6)	149	(34.0)	289	(66.0)	
Household income level							< 0.0001
Low	25,534	(36.2)	8619	(33.8)	16,915	(66.2)	
Middle	36,855	(52.2)	17,693	(48.0)	19,162	(52.0)	
High	8237	(11.7)	4275	(51.9)	3962	(48.1)	
Region							< 0.0001
Metropolitan	13,872	(19.6)	5743	(41.4)	8129	(58.6)	
City	11,715	(16.6)	4666	(39.8)	7049	(60.2)	
Rural	45,039	(63.8)	20,178	(44.8)	24,861	(55.2)	
Alcohol status							< 0.0001
Never	27,699	(39.2)	11,099	(40.1)	16,600	(59.9)	
Ever	42,927	(60.8)	19,488	(45.4)	23,439	(54.6)	
Smoking status							< 0.0001
Never	47,400	(67.1)	19,758	(41.7)	27,642	(58.3)	
Ever	23,226	(32.9)	10,829	(46.6)	12,397	(53.4)	
Self-reported health status							< 0.0001
High	18,599	(26.3)	12,025	(64.7)	6574	(35.3)	
Middle	28,383	(40.2)	13,633	(48.0)	14,750	(52.0)	
Low	23,644	(33.5)	4929	(20.8)	18,715	(79.2)	
Blood pressure awareness							< 0.0001
Yes	44,706	(63.3)	21,013	(47.0)	23,693	(53.0)	
No	25,920	(36.7)	9574	(36.9)	16,346	(63.1)	
Blood sugar awareness							< 0.0001
Yes	22,994	(32.6)	10,926	(47.5)	12,068	(52.5)	
No	47,632	(67.4)	19,661	(41.3)	27,971	(58.7)	
Total	70,626	(100.0)	30,587	(43.3)	40,039	(56.7)	

Table 2. General characteristics of Study Population.

literacy as a critical factor influencing not only frailty but also successful aging, underscoring the importance of health literacy promotion and management.

Limited health literacy not only results in poor recognition and management of one's health conditions, but also serves as a barrier to effective communication with health professionals and access to appropriate medical treatment¹⁹. This, in turn, can lead to reduced utilization of preventive care, increased dependence on emergency services, higher hospitalization rates, and poorer overall health outcomes²¹. Among individuals with chronic illnesses, adequate health literacy is essential for accessing, comprehending, and applying health information necessary for disease management and informed decision-making²². Previous research has shown that low health literacy is associated with poorer blood pressure control among patient with hypertension^{21,23}. Similarly, our findings indicate that among individuals who are aware of their blood pressure or blood sugar levels, those

Variables	Successful aging			
	Adjusted OR	95% CI		
Verbal health literacy				
High	1.00			
Low	0.72	(0.68	–	0.76)
Written health literacy				
High	1.00			
Low	0.78	(0.73	–	0.83)
Uninterested	0.69	(0.65	–	0.74)
Age (years)				
65–69	1.40	(1.30	–	1.49)
70–79	1.32	(1.24	–	1.40)
≥ 80	1.00			
Sex				
Male	1.27	(1.19	–	1.36)
Female	1.00			
Marital status				
Married	1.00			
Separated or divorced	0.74	(0.70	–	0.78)
Unmarried	0.60	(0.46	–	0.78)
Household income level				
Low	0.64	(0.59	–	0.69)
Middle	0.84	(0.79	–	0.90)
High	1.00			
Region				
Metropolitan	1.00			
City	0.96	(0.90	–	1.03)
Rural	1.47	(1.40	–	1.56)
Alcohol status				
Never	1.04	(0.99	–	1.10)
Ever	1.00			
Smoking status				
Never	1.33	(1.24	–	1.43)
Ever	1.00			
Self-reported health status				
High	5.88	(5.53	–	6.25)
Middle	3.03	(2.87	–	3.21)
Low	1.00			
Blood pressure awareness				
Yes	1.09	(1.03	–	1.14)
No	1.00			
Blood sugar awareness				
Yes	1.13	(1.08	–	1.19)
No	1.00			

Table 3. Factors associated with successful aging.

with low verbal health literacy had significantly lower odds of achieving successful aging compared to those with high literacy. Furthermore, a lack of interest in written health literacy was also associated with reduced odds of successful aging in this group.

There are several limitations to this study. First, health literacy was measured using a single self-reported question for both verbal and written health literacy, rather than a comprehensive health literacy scale. Due to data limitations, we were unable to employ established assessment tools such as the Rapid Estimate of Adults Literacy in Medicine (REALM), or the Test of Functional Health Literacy in Adults (TOFHLA)²⁴. However, the health literacy items used in this study were developed based on the BRFSS health literacy framework and have been utilized in prior epidemiological studies to identify health literacy disparities indicating their practical usefulness for research despite limited validation^{25–29}. Second, the cross-sectional nature of the study design precludes any causal inference, and the findings should therefore be interpreted with caution. Third, participants with missing data were excluded from the analytic sample, which may have introduced selection bias if excluded

Variables	Verbal Health Literacy			Written Health Literacy				
	High	Low		High	Low		Uninterested	
	Adjusted OR	Adjusted OR	95% CI	Adjusted OR	Adjusted OR	95% CI	Adjusted OR	95% CI
Blood pressure awareness								
Yes	1.00	0.71	(0.67 – 0.76)	1.00	0.77	(0.71 – 0.82)	0.70	(0.65 – 0.75)
No	1.00	0.72	(0.66 – 0.79)	1.00	0.81	(0.73 – 0.91)	0.68	(0.62 – 0.76)
Blood sugar awareness								
Yes	1.00	0.71	(0.64 – 0.78)	1.00	0.77	(0.70 – 0.85)	0.67	(0.60 – 0.74)
No	1.00	0.72	(0.67 – 0.77)	1.00	0.79	(0.73 – 0.85)	0.71	(0.65 – 0.76)

Table 4. Subgroup Analysis of the association between Health Literacy and Successful Aging, stratified by Health Awareness level.

individuals differed systematically from those included. In addition, dichotomizing the successful aging score may have resulted in some loss of information; thus, the findings should be interpreted with this consideration in mind. Lastly, although national representativeness was ensured in our study sample, the findings may only be generalizable to the relatively homogenous Korean population and not to populations in other countries. Despite these limitations, a major strength of our study is that, to the best of our knowledge, it is the first to examine the influence of health literacy on screening for successful aging in a large scale survey of older Korean adults. Furthermore, the use of a nationally representative dataset was achieved through multistage stratified sampling from all regions in Korea³⁰.

Conclusion

The current study identified a significant relationship between health literacy and successful aging among older adults in South Korea. Our results suggest that individuals with low verbal or written literacy had significantly lower odds of achieving successful aging compared to those with higher literacy levels. These results highlight the importance of promoting health literacy as a means to support successful aging throughout the life course. We believe that this study offers valuable insights for healthcare professionals in designing interventions aimed at improving health literacy among older populations. Recent research has shifted the focus of health literacy from individual capacities alone to the interaction between individuals’ skills and the demand of health systems⁴. This shift underscores the need for a national-level approach to health literacy enhancement. Raising awareness of the role of health literacy may inform health policy efforts focused on promoting successful aging and advancing literacy through targeted, evidence-based strategies.

Methods
Participants

This study utilized data from the 2021 Korean Community Health Survey (KCHS), a nationwide health interview survey conducted by the Korean Centers for Disease Control and Prevention (KCDC). The KCHS data were analyzed using complex sample analysis with a multi-stage stratified cluster sampling design, accounting for sampling weights, strata, and cluster³¹. Stratified cluster sampling was used to select sample areas, followed by systematic sampling to select households. Trained interviewers conducted survey with adults aged 19 and older residing in the selected households³². The KCHS aims to inform future health policies by assessing the population’s health status and key sociodemographic and economic characteristics²⁶. The analytic sample for this study was restricted to individuals aged 65 years and older, as successful aging was defined and measured specifically for older adults^{33–35}. Of the 74,492 eligible participants aged ≥ 65 years, we excluded 3,866 participants due to missing data on the exposure, outcome, or key covariates; details and the number of excluded participants at each step are presented in Fig. 1. All analyses incorporated the KCHS sampling weights and design variable to account for the complex survey design and to produce population-representative estimates. The final analytic sample consisted of 70,626 individuals.

Variables

Successful aging, based on a multidimensional approach encompassing physical capability, cognitive function, and social and psychological health, was assessed according to five major criteria: absence of disability, high cognitive function, high mental function (no depressive symptoms), active social engagement, and psychological well-being in later life³³. Successful aging is achievable even in the presence of chronic disease, as aging without any illness is unrealistic^{33,36}. Each criterion was coded as 0 if met and 1 if not met, and scores were summed to yield an overall successful aging score ranging from 0 to 5, with lower scores indicating more successful aging. For analyses, the overall score was dichotomized at the median to facilitate interpretability and to support logistic regression modeling with approximately balanced group sizes. Table 1 presents the operational definitions of successful aging.

Absence of disability was assessed using three questions regarding limitations or difficulties in mobility (walking), self-care (bathing, dressing), and daily activities (work, housework, and leisure). High cognitive function was evaluated by asking participants about their experience of cognitive impairment with the question: “In the past year, have you experienced confusion or poor memory?”. High mental function was measured using the Patient Health questionnaire-9 (PHQ-9), a well-established screening tool for depression and assessing its

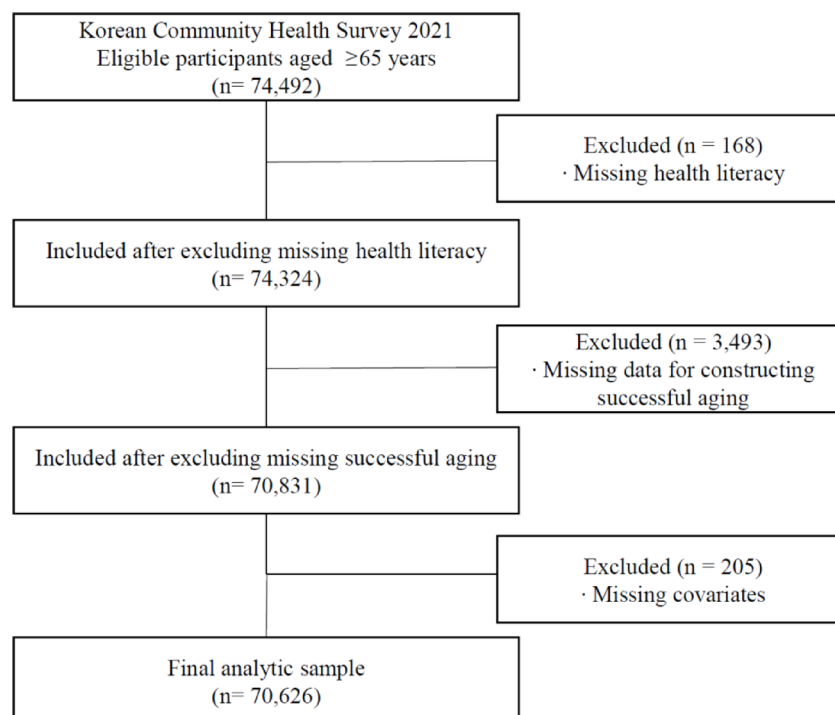


Fig. 1. Flowchart of participant selection.

severity³⁷. Each question is scored from 0 to 3, resulting in a total score ranging from 0 to 27. A score of 10 or higher is considered the threshold for detecting major depression in this study. Active social engagement was assessed based on factors influencing the social and physical environment. This assessment included responses to the following statements: “Do you trust people in your neighborhood?”, “Do neighbors help each other during family events?”, as well as overall satisfaction with neighborhood safety, the natural and living environment, public transportation, and medical services. Psychologically well-being in later life was assessed based on overall life satisfaction.

Both verbal and written health literacy were assessed in this study. Verbal health literacy was categorized as high or low based on the ability to comprehend spoken health information, such as explanations provided by clinicians. Written health literacy was assessed using self-reported responses regarding understanding of and attention to written health information from sources such as the internet or brochures. These health literacy items used in the KCHS were adapted from the BRFSS health literacy framework²⁸. Participants were classified into three groups: high literacy, low literacy, and uninterested. The “uninterested” group referred to individuals who indicated that they do not pay attention to written health information²⁶. This category reflects limited engagement with written health information rather than impaired reading comprehension. Covariates controlled for in the analysis included age, sex, marital status, household income level, region, alcohol consumption, smoking status, self-reported health status, blood pressure awareness, and blood sugar awareness.

Statistical analysis

Descriptive characteristics of the study population were compared using survey-weighted chi-square tests accounting for sampling weights, strata, and clusters (PROC SURVEYFREQ). The association between health literacy levels and successful aging was examined using survey logistic regression accounting for the complex sampling design and adjusting for potential confounders (PROC SURVEYLOGISTIC). Results were reported as odds ratio (OR) and confidence interval (CI). Differences were considered statistically significant with a p -value < 0.05 . All analyses were conducted using SAS 9.4 software.

Data availability

The raw data from KCHS were downloaded from the KCHS website (<https://chs.kdca.go.kr/chs>) after obtaining permission from the administrator.

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References

- Jeong, S. H. & Kim, H. K. Health literacy and barriers to health information seeking: A nationwide survey in South Korea. *Patient Educ. Couns.* **99**, 1880–1887 (2016).
- Peterson, P. N. Health literacy and outcomes among patients with heart failure. *JAMA* **305**, 1695–1701 (2011).

3. Wright, J. P. et al. Association of health literacy with postoperative outcomes in patients undergoing major abdominal surgery. *JAMA Surg.* **153**, 137–142 (2018).
4. Liu, Y.-B., Liu, L., Li, Y.-F. & Chen, Y.-L. Relationship between health literacy, health-related behaviors and health status: A survey of elderly Chinese in. *Int. J. Environ. Res. Public Health* **12**, 9714–9725 (2015).
5. Chung, K. Aging and social welfare policies: Health care and income maintenance programs in *International Symposium on Population and Development Policies in Low Fertility Countries*. Korean Institute of Health and Social Affairs (1998).
6. Shin, H.-Y. Current status of family physicians' practices in geriatric medicine and associated factors in the Republic of Korea: A cross-sectional study. *Medicine* **105**, e47142 (2026).
7. Statistics Korea Elderly Statistics. *Statistics Korea* https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_1BPA002&conn_p ath=12 (2026).
8. Kim, S.-H., Park, S. & Park, K.-S. Correlates of successful aging in South Korean older adults: A meta-analytic review. *Asia Pac. J. Public Health* **29**, 544–559 (2017).
9. Kim, Y. J. & Lee, C. S. Effects of grit on the successful aging of the elderly in Korea. *Indian J. Sci. Technol.* **8**, 373–378 (2015).
10. Kim, S.-H. & Park, S. A meta-analysis of the correlates of successful aging in older adults. *Res. Aging* **39**, 657–677 (2016).
11. Kolcu, M., Bulbul, E., Celik, S. & Anataga, G. The relationship between health literacy and successful aging in elderly individuals with type 2 diabetes. *Prim. Care Diabetes* **17**, 473–478 (2023).
12. Shieh, C., Rose, M., Anna, M. & Yu, J. Health literacy and its association with the use of information sources and with barriers to information seeking in clinic-based pregnant women. *Health Care Women Int.* **30**, 971–988 (2009).
13. Lee, H. Y., Lee, J. & Kim, N. K. Gender differences in health literacy among Korean adults: Do women have a higher level of health literacy than men? *Am. J. Mens. Health* **9**, 370–379 (2014).
14. Szychowska, A. & Drygas, W. Physical activity as a determinant of successful aging: A narrative review article. *Aging Clin. Exp. Res.* **34**, 1209–1214 (2022).
15. Kulakçı-Altıntaş, H. & Ayaz-Alkaya, S. Health literacy and successful aging in older adults: A predictive correlational design. *Geriatr. Nurs.* **61**, 408–413 (2025).
16. Kim, Y. E., Han, O. & Moon, C. S. Factors associated with health literacy in older adults aged 65 and over: A secondary data analysis of the 2021 Korea Health Panel applying the Andersen behavioural model. *BMJ Open* **15**, e085696 (2025).
17. Di Ciaula, A. & Portincasa, P. The environment as a determinant of successful aging or frailty. *Mech. Ageing Dev.* **188**, 111244 (2020).
18. Woo, J. Frailty, successful aging, resilience, and intrinsic capacity: A cross-disciplinary discourse of the aging process. *Curr. Geriatr. Rep.* **8**, 67–71 (2019).
19. Shin, H.-R., Choi, E.-Y., Kim, S.-K., Lee, H.-Y. & Kim, Y.-S. Health literacy and frailty in community-dwelling older adults: Evidence from a nationwide cohort study in South Korea in. *Int. J. Environ. Res. Public Health* <https://doi.org/10.3390/ijerph18157918> (2021).
20. Uemura, K., Tsukasa, K., Watanabe, A., Okamoto, H. & Yamada, M. Association between community-level health literacy and frailty in community-dwelling older adults. *Aging Clin. Exp. Res.* **35**, 1253–1261 (2023).
21. Song, I. Relationship between health literacy and health-related quality of life in Korean adults with chronic diseases. *PLoS ONE* **19**, e0301894 (2024).
22. Kim, S. H. & Youn, C. H. Efficacy of chronic disease self-management program in older Korean adults with low and high health literacy. *Asian Nurs. Res.* **9**, 42–46 (2015).
23. Aboumatar, H. J., Carson, K. A., Beach, M. C., Roter, D. L. & Cooper, L. A. The impact of health literacy on desire for participation in healthcare, medical visit communication, and patient reported outcomes among patients with hypertension. *J. Gen. Intern. Med.* **28**, 1469–1476 (2013).
24. Kirk, J. K. et al. Performance of health literacy tests among older adults with diabetes. *J. Gen. Intern. Med.* **27**, 534–540 (2012).
25. Lee, H. & Chu, H. S. Moderating effect of health literacy on the relationship between diabetes self-management education and self-care monitoring activities among individuals with type 2 diabetes mellitus. *BMC Public Health* **25**, 2530 (2025).
26. Nari, F., Jun, J. K., Oh, K. H. & Jeong, W. The association between health literacy and screening for disease-specific complications among community-dwelling adults with diabetes. *Front. Public Health* **12**, 1418828 (2024).
27. Office of the Associate Director for Communication Centers for Disease Control and Prevention A Health Literacy Report: Analysis of 2016 BRFSS Health Literacy Data. *US Centers for Disease Control and Prevention* (2016).
28. Korea Community Health Survey Korea Community Health at a Glance. *Korea Disease Control and Prevention Agency*. <https://ch s.kdca.go.kr/chs/stats/statsMain.do>. (2021).
29. Kim, E. Exploring the relationship between health literacy and depression among individuals with chronic conditions: Insights from the KCHS in. *Healthcare* **12**, 1927 (2024).
30. Park, M., Nari, F., Kang, S. H., Jang, S.-I. & Park, E.-C. Association between living with patients with dementia and family caregivers' depressive symptoms—Living with dementia patients and family caregivers' depressive symptoms in. *Int. J. Environ. Res. Public Health* <https://doi.org/10.3390/ijerph18084372> (2021).
31. Kang, S., Sagong, H. & Lee, J. Impact of dietary habits, physical activity, and perceived health status on health-related quality of life by household characteristics of patients with chronic diseases: The Korea Community Health Survey (KCHS). *Public Health Nurs.* **42**, 1182–1191 (2025).
32. Kim, S. H., Park, M., Jeong, S. H., Jang, S. I. & Park, E. C. Association between cohabitation status and sleep quality in families of persons with dementia in Korea: A cross-sectional study. *J. Prev. Med. Public Health* **54**, 317–329 (2021).
33. Kim, B. Individual and environmental factors associated with successful aging among Korean older adults: Multilevel analysis of cross-sectional nationwide survey data. *Arch. Gerontol. Geriatr.* **113**, 105062 (2023).
34. Shi, W. H. et al. The status and associated factors of successful aging among older adults residing in longevity areas in China. *Biomed. Environ. Sci.* **29**, 347–355 (2016).
35. Dahany, M. M. et al. Factors associated with successful aging in persons aged 65 to 75 years. *Eur. Geriatr. Med.* **5**, 365–370 (2014).
36. Strawbridge, W. J., Wallhagen, M. I. & Cohen, R. D. Successful aging and well-being: Self-rated compared with Rowe and Kahn. *Gerontologist* **42**, 727–733 (2002).
37. Kim, H. et al. Sex differences in type of exercise associated with depression in South Korean adults. *Sci. Rep.* **10**, 18271 (2020).

Author contributions

Wonjeong Jeong and Soo Hyun Kang conceived and designed the study. Wonjeong Jeong developed the methodology and conducted the formal analysis. Fatima Nari and Wonjeong Jeong drafted the initial versions of the manuscript, while Soo Hyun Kang, Soo Young Kim, and Eun-Cheol Park contributed to the subsequent drafting and revision. Wonjeong Jeong served as the corresponding author and supervised the entire manuscript. All authors read and approved the final manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethical approval

This study adhered to the tenets of the Declaration of Helsinki and was based on the routinely collected data. This study was reviewed and approved by the Institutional Review Board of the National Cancer Center (IRB number: NCC2025-0076), and the requirement to obtain any informed consent was waived by KCHS ethics committee because the data provided by the KCHS were anonymized in compliance with confidentiality guidelines.

Additional information

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