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Resilience for activity engagement among frail older adults: moderated mediation effect of social support

Eunna Oh[1], Nayoung Kim[2], Lkhagvajav Gansukh[3] and Rhayun Song[4*]

Abstract

Background Frailty in older adults increases vulnerability to stressors, contributing to adverse outcomes such as falls, hospitalizations, and disability. Resilience has been identified as a protective factor that supports physical function, cognitive health, and independence in daily activities. This study aimed to examine the direct and indirect effects of resilience on daily activity engagement, with subjective cognition as a mediator and social support as a moderator.

Methods A secondary data analysis was conducted with a convenience sample of 397 frail, community-dwelling older adults drawn from a national survey. A moderated mediation model was tested using SPSS and the PROCESS macro (Model 14, version 4.3). Age (treated as a continuous variable) and sex (dummy-coded, with male as the reference group) were included as covariates due to their previously established associations with daily activity engagement.

Results A total of 212 women and 185 men participated in this study with a mean age of 73.51 years (SD = 6.48). Resilience has a significant direct effect on daily activity engagement (β = 0.57, t = 4.99, $p < 0.001$). The standardized regression coefficient decreased from 0.57 to 0.41 (t = 3.51, $p < 0.001$) when subjective cognition was included in the model, confirming the partial mediating effect. In the moderation model, resilience (β = 0.34), subjective cognition (β = 0.38), and social support (β = 0.29) were significant predictors of daily activity engagement. The interaction effect between subjective cognition and social support was significant (β = 0.04, BootCI 0.01, 0.08), showing that subjective cognition significantly predicts daily activity engagement only when specific levels of social support are present. The moderated mediation index was small but significant (β = 0.02, BootCI [0.001, 0.03]), even after controlling for age and sex.

Conclusion This study identified resilience, subjective cognition, and social support as essential factors in promoting daily activity engagement among frail older adults. The role of social support as moderator was confirmed in helping older adults maintain their independence through enhanced resilience and subjective cognition. Further research should explore the broader aspects of social support to fully understand its impact on active aging dynamics.

Keywords Older adults, Resilience, Daily activity, Social support, Conditional analysis

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Background

Life expectancy has increased rapidly over the past few decades due to economic prosperity, improvements in living standards, and advancements in medical science. It is estimated that by 2050, 1.5 billion people will be aged 65 or older [1]. Aging is accompanied by a greater vulnerability to stressors and a reliance on physiological reserves, which can compromise the body's ability to maintain homeostasis—a condition known as frailty [2]. A few decades ago, geriatricians began conceptualizing frailty as a key target for future interventions [3]. Frail individuals are at increased risk of morbidity and mortality due to the cumulative effects of biological deterioration [4]. Frailty in older adults is associated with a range of health problems, including falls, hospitalizations, emergency care visits, dependency, disability, and even death [5].

In light of the psychological and physical challenges faced in later life, including the loss of a spouse or irreversible health problems, there is a need for new strategies to support older adults. The activity-based theory of aging has been proposed as a framework to address these challenges, particularly as the number of older adults with frailty increases [6, 7]. According to this perspective, maintaining an optimal quality of life and health in older age can be achieved by engaging in continuous physical, cognitive, and social activities [8]. Activity-based strategies are essential not only for preserving autonomy [9] but also for promoting psychological stability [10]. Engaging in daily activities is central to achieving an independent and socially active lifestyle, as these activities significantly impact both physical and mental health [11]. However, frail older adults often avoid such activities due to fear of falling, which can restrict social participation and lower quality of life [12–15]. Daily activities—defined as essential tasks performed independently to maintain personal care and well-being—require not only physical capacity but also psychological resources such as resilience and subjective cognition.

Resilience has emerged as an important factor in adapting to age-related changes and promoting favorable outcomes in frail older adults. It is defined as the ability to effectively manage, adapt to, or recover from significant stress or trauma [16]. Aging-related resilience theory conceptualizes resilience as a dynamic capacity that allows individuals to cope with age-related decline by drawing on available resources and strategies [17]. Those with sufficient intrinsic capacity can recover from internal or external stressors with fewer complications [18]. Frail older adults with higher levels of resilience are better able to recover or maintain function in the face of age-related challenges, which in turn supports a more active lifestyle and better health outcomes [19, 20].

Previous research has demonstrated that higher resilience is positively associated with both functional and cognitive outcomes, suggesting a complex interplay between resilience and subjective cognition. In our study, we proposed that subjective cognition acts as a mediator in the relationship between resilience and an active lifestyle, based on two main considerations. First, resilience plays a key role in shaping self-perceptions of cognitive ability among frail older adults. Greve and Staudinger [21] emphasized that coping appraisal is a critical component of resilience and a determinant of both physical and mental well-being. From the perspective of positive psychology, the Broaden-and-Build Theory [22] posits that positive emotions expand an individual's momentary thought-action repertoire, encouraging exploratory behavior and the development of lasting personal resources such as resilience. This process enhances subjective cognitive appraisals and fosters greater confidence in engaging in meaningful activities.

Second, longitudinal evidence suggests that baseline resilience is associated with higher levels of cognition at follow-up among middle-aged adults [15]. Frail older adults frequently experience depressive symptoms, often accompanied by neuropsychological deficits such as impaired memory. However, a sense of purpose in life has been found to promote resilience even in the presence of cognitive impairment, allowing individuals to maintain cognitive performance despite neurological challenges [13]. Given the strong association between cognition and activity engagement demonstrated in previous studies [23], subjective cognition was incorporated as a mediator in our conceptual framework. Understanding the role of subjective cognition in the relationship between resilience and daily activity is essential for developing interventions aimed at maintaining or improving functional independence among frail older adults.

Frailty-related activity limitations are also associated with social isolation and living alone [24]. Without adequate support, frail older adults may fear leaving their homes, avoiding opportunities to engage in physical and social activities. A retrospective longitudinal study found that cognitive components are associated with daily activities, and that the effect of cognition on activity disability was associated with social interaction [25]. This suggests that social support or interaction may buffer the negative effects of cognitive decline, helping to maintain activity engagement. Stronger social networks can mitigate physical, psychological, and behavioral problems associated with aging [26]. Social support also promotes emotional stability [27], engagement in daily activities, and overall well-being [28]. For frail older adults, daily activity engagement can be encouraged through simple interactions, such as talking with neighbors, friends, and family, or going for walks with others. Such a supportive

environment fosters the continuation of daily activities [24]. Notably, social interaction has also been shown to offset the impact of depression on cognitive decline, accounting for 46.3% of the variance in the relationship between subjective cognition and daily activity [25]. Social support may influence physical activity by offering encouragement, emotional reinforcement, financial assistance, or the transfer of valuable knowledge [29]. Despite these findings, the complex relationships between cognition, social engagement, and daily activity in older adults remain underexplored.

To address these gaps, we propose an integrated moderated mediation model of resilience. In this model, resilience influences engagement in daily activities both directly and indirectly through subjective cognition, with social support acting as a moderator. This framework aims to clarify how psychological and social resources interact to support daily activity engagement in frail older adults (Fig. 1).

Purpose

The study aimed to identify factors influencing the active aging of community-dwelling frail older adults, using the activity-based theory of aging as a framework. By examining activity engagement as a key indicator of active aging, the study sought to explore the direct and indirect effects of resilience on activity engagement, considering subjective cognition as a mediator and social support as a moderator.

The following hypotheses were formulated:

H1. Resilience is positively associated with activity engagement directly and indirectly through subjective cognition among frail older adults. (*Mediation*)

H2. Social support moderates the relationship between subjective cognition and activity engagement among frail older adults. (*Moderation*)

H3. Resilience and the interaction of subjective cognition and social support have a positive correlation with activity engagement among frail older adults. (*Moderated mediation*)

Methods

Participants and procedures

The participants in this secondary data analysis were drawn from a national survey conducted in Korea [30] based on the following inclusion criteria: (1) aged 65 years or older; (2) responded 'yes' to two or more items on the Korean FRAIL scale [31]; (3) able to communicate effectively to complte the questionnaire; and (4) had no limitations in daily activities due to dementia or other illnesses. As the study focused on frail older adults, data were collected through face-to-face interviews conducted at apartment complexes, senior centers, shopping malls, and regional terminals across the country [30]. For the purpose of this secondary analysis, only participants living with their families were included, in order to examine the moderating role of social support. The original national survey received approval from the Institutional Review Board at Chungnam National University (No. 202210-1-SB-139-01).

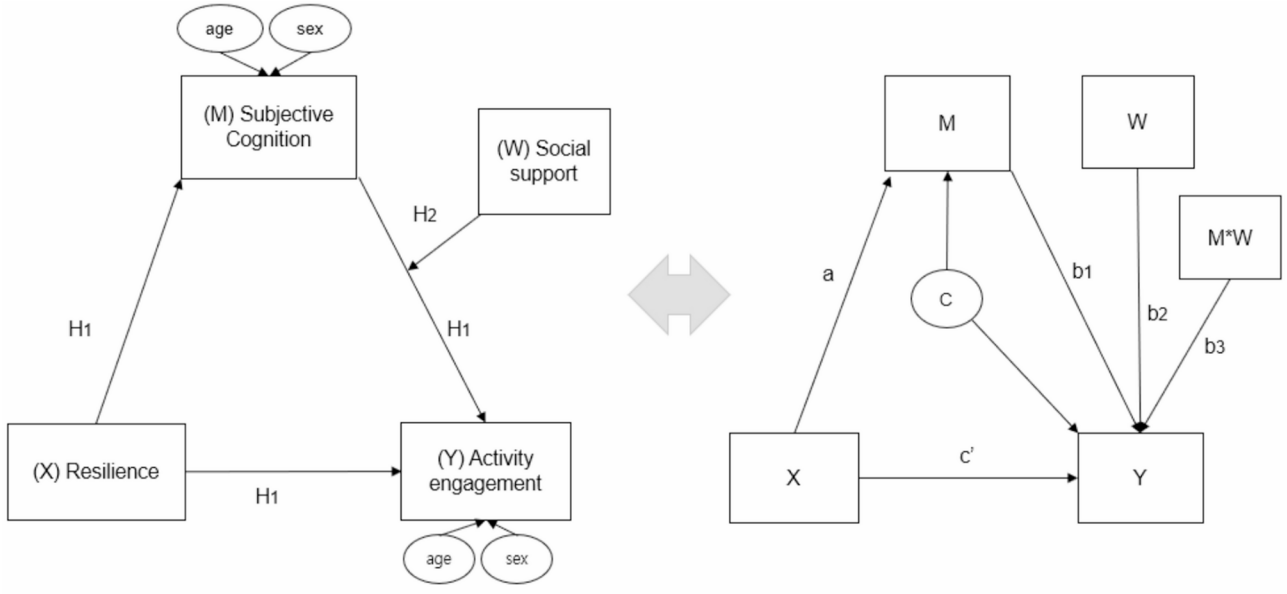

Fig. 1 The hypothetical and statistical models of the study. Conditional indirect effect of X on Y through M = a*(b1 +b3W). Regression Y = c'X + (b1+b3W) M + b2W + e. Mediator (M), Moderator (W), Interaction (M*W), Covariates (C)

Measures

General characteristics

In this study, sociodemographic characteristics such as age, gender, level of education, cohabitation status, economic status, and relative health status were assessed.

Resilience

Resilience was measured using the Resilience Scale for Frail Older Adults, which was developed and validated among community-dwelling frail older adults in Korea [30]. The scale consists of eight items rated on a 4-point Likert scale, ranging from 1 ('not at all') to 4 ('very much so'), with higher scores indicating greater resilience (Supplementary). In the original validation study, the scale demonstrated a Cronbach's α of 0.66, which is considered acceptable for newly developed instruments and short scales with fewer than 10 items [32]. In the present study, the Cronbach's α was 0.65.

Subjective cognition

Subjective cognition was assessed using the Korean version of the Mild Cognitive Impairment Questionnaire (MCQ), originally developed to evaluate cognition-related quality of life in individuals with cognitive impairment [33]. In this study, subjective cognition was conceptualized as emotional and practical concerns regarding memory-related problems. The scale uses a 4-point Likert format ranging from 1 ('almost never') to 4 ('always'). Items were reverse-coded so that higher scores reflect better subjective cognition. The Korean version of the MCQ demonstrated strong reliability, with a Cronbach's α of 0.93 in a previous study [34], and 0.88 in the present study.

Daily activity engagement

Daily activity engagement was measured using the Korean version of the Falls Efficacy Scale-International (FES-I) [35], which assesses individuals' confidence in performing daily and social activities without falling. This study employed a 4-point Likert scale ranging from 1 ('not confident at all') to 4 ('very confident'), covering both indoor and outdoor activities. Higher scores indicate greater confidence and engagement in daily activities. The Korean version of the FES-I has been validated with a Cronbach's α of 0.97 [35], and showed a Cronbach's α of 0.90 in the present study.

Social support

Social support was assessed using a revised version of Social Support Survey of Medical Outcomes Study (MOS-SSS) [36]. MOS-SSS includes 19 items divided into four subscales: emotional/informational support, tangible support, affectionate support, and positive social interaction. Based on their relevance to community-dwelling frail older adults in Korea, five nursing and gerontology experts selected the final 10 items, representing emotional, informational, and instrumental support. This study used a 10-item social support scale on a Likert scale from 1 (not at all) to 5 (very much), with higher scores indicating greater social support. The Cronbach's α of this revised scale was 0.816.

Data analysis

Descriptive statistics were used to analyze the study variables and demographic characteristics of the participants. To explore the associations between these variables and identify covariates, ANOVA, correlational analysis, and t-tests were employed. Conditional analysis was conducted to investigate the moderated mediation effect using SPSS and the PROCESS macro (Model 14), following the guidelines of Igartua and Hayes [37]. In this analysis, 'subjective cognition' was proposed as a mediator between resilience and daily activity engagement, with 'social support' as a moderator. Bootstrapping was applied to compute robust 95% confidence intervals (CI) for each regression coefficient. Age and sex were included as covariates, as they have shown significant associations with daily activity engagement in the prelimary analysis. Sex was dummy-coded (reference = male), while age was treated as a continuous variable.

Results

Sociodemographic characteristics of the participants

A total of 212 women (53.4%) and 185 men (46.6%) participated in the study, with a mean age of 73.51 years (SD = 6.48). Most of them (69.3%) believe that they are living at a middle-class economic status and were educated from elementary to middle school (M = 8.55, SD = 3.95). Among participants, 25.4% felt they had excellent/very good health compared to 36.3% who felt they were fair or poor (Table 1).

Descriptive and correlation analysis

Table 2 displays the item mean and bivariate correlation coefficients for the study variables with the score range. Daily activity engagement, the dependent variable, was significantly correlated with resilience ($r = 0.27$, $p < 0.01$), subjective cognition ($r = 0.34$, $p < 0.001$), and social support ($r = 0.22$, $p < 0.01$). Significant positive correlations were found between resilience and subjective cognition ($r = 0.29$, $p < 0.01$). There was a small, but significant correlation between social support and subjective cognition ($r = 0.15$, $p < 0.01$).

Testing the mediation model

In the mediation analysis, resilience was used as the independent variable, daily activity engagement as the dependent variable, and subjective cognition as the

Table 1 Sociodemographic characteristics of the participants (*N* = 397)

Catetories	Variables	*N* (%)	Mean ± SD
Age, years			73.51 ± 6.48
	65 ~ 69	141(35.6)	(range: 65 ~ 89)
	70 ~ 79	172(43.3)	
	80 ~ 89	84(21.1)	
Sex	Male	185(46.6)	
	Female	212(53.4)	
Education, years			8.55 ± 3.95
	No formal education	31(7.8)	
	Primary school	128(32.2)	
	Middle school	81(20.4)	
	High school	131(33)	
	College or above	26(6.5)	
Economic status	High	7(1.8)	
	Middle	275(69.3)	
	Low	115(29.0)	
Perceived health	Excellent	1(3.0)	
	Very good	89(22.4)	
	Good	163(41.1)	
	Fair	133(33.5)	
	poor	11(2.8)	

Table 2 Mean and correlation coefficients among study variables

Variables	Item mean (SD)	Range	Resilience	Cognition	Social support
Resilience	3.06 (0.32)	1.63–3.75	1		
Subjective Cognition	3.33 (0.44)	1.70 ~ 3.90	0.29**	1	
Social support	3.80 (0.42)	1.90 ~ 4.80	0.19**	0.15**	1
Activity engagement	3.27 (0.52)	1.92 ~ 4.00	0.27**	0.34**	0.22**

** $p < 0.01$

Table 3 Analysis of the mediation effect (*N* = 397)

Step	Model pathways	R^2	β	SE	t	95%CI
1	Resilience → Activity	0.13	0.57	0.12	4.99	[0.35, 0.80]
2	Resilience → Cognition	0.12	0.47	0.08	5.71	[0.31, 0.63]
3	Cognition → Activity	0.19	0.36	0.07	5.20	[0.22, 0.49]
	Resilience → Activity		0.41	0.12	3.51	[0.18, 0.64]
	Age → Activity		0.10	0.03	3.23	[0.03, 0.16]
	Female → Activity		0.63	0.42	1.50	[-0.19, 1.46]

Note. Activity = daily activity engagement, cognition = subjective cognition

Standardized indirect effects of subjective cognition = 0.17 (BootCI 0.10, 0.25)

mediator along with age and sex as covariates (Hypothesis 1). The results are summarized in Table 3; Fig. 2-A. Resilience has a significant direct effect on daily activity engagement (β = 0.57, t = 4.99, $p < 0.001$) in Step 1. The standardized regression coefficient decreased from 0.57 to 0.41 (t = 3.51, $p < 0.001$) when subjective cognition was included in the model (Step 3), confirming the partial mediating effect. Subjective cognition also showed a significant association with resilience (β = 0.47, t = 5.71, $p < 0.001$) and daily activity engagement (β = 0.36, t = 5.20, $p < 0.001$). Among the covariates, age was significant influencing factor (t = 3.23, $p < 001$). The standardized indirect effect of subjective cognition was 0.17 with a 95% confidence interval of [0.10, 0.25], supporting Hypothesis 1.

Testing the moderation model

Figure 2-B shows the moderating effect of social support (W) on resilience (X) and daily activity engagement (Y). Resilience, subjective cognition, and social support together explained 23% of the variance in daily activity engagement (F = 22.55. $p < 0.001$). In the moderation model, resilience (β = 0.34), subjective cognition (β = 0.38), and social support (β = 0.29) were significant predictors of daily activity engagement even after controlling for age and sex. The interaction effect between

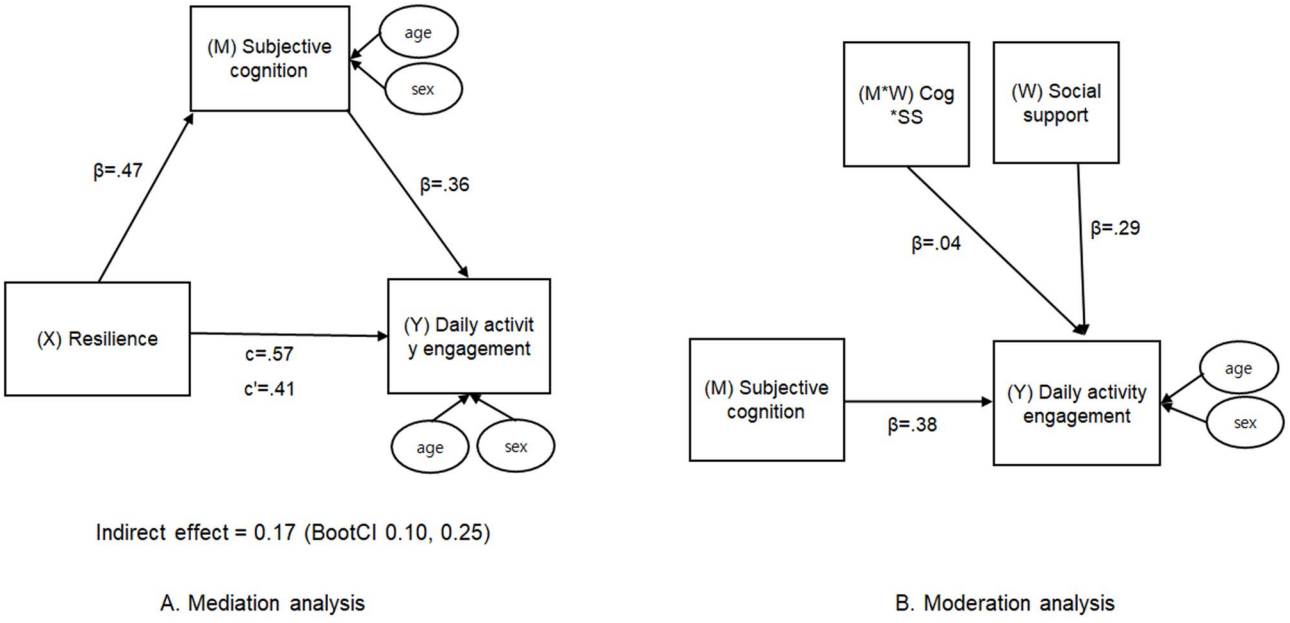

Fig. 2 Mediation and Moderation analysis. Note. Cog*SS = Interaction of subjective cognition and social support

Table 4 Conditional effects of subjective cognition on activity engagement according to the levels of social support

Social support	Effect		95% CI	
	B	t	LL	UL
Low (-4.23)	0.21	2.63	0.05	0.37
Mean	0.38	5.48	0.26	0.51
High (+4.23)	0.56	5.30	0.34	0.77

subjective cognition and social support explained an additional 2% of the variance in daily activity engagement, supporting Hypothesis 2.

Given the significant interaction effect, the Johnson-Neyman Analysis was applied to explore the conditional effect of subjective cognition on daily activity engagement across low, medium, and high levels of social support (Fig. 3). At high levels of social support, subjective cognition has a significant positive effect on daily activity engagement ($\beta = 0.56$, $t = 5.30$, $p < 0.001$). However, this positive effect diminishes as social support levels decrease, becoming insignificant at a social support level of -5.13 ($\beta = 0.17$, $t = 1.97$, $p = 0.05$) or lower. This suggests that subjective cognition significantly predicts daily activity engagement only when specific levels of social support are present (Fig. 3).

Moderated mediation analysis of the proposed model

The moderated mediation analysis of the model was conducted by Model 14 in PROCESS Macro (Hypothesis 3). Age and sex (reference = male) were included as covariates to analyze the moderated mediation model after controlling for the covariates (Table 5). The bootstrap confidence interval for the direct effect, indirect effect, and interaction effect remained significant even after including covariates in the model. The moderated mediation index was small but significant ($\beta = 0.02$, BootCI [0.001, 0.03]), supporting Hypothesis 3. The study findings with covariates are presented in Fig. 4.

Discussion

This study proposed a moderated mediation model to explain daily activity engagement among frail older adults living in the community, conceptualized as an indicator of active aging. According to our findings, resilience is associated with greater engagement in daily and social activities, and this association is mediated by subjective cognition. Notably, the mediation pathway is contingent upon perceived social support—demonstrating that subjective cognition facilitates engagement only when sufficient social support is present.

Resilience has long been recognized as a key determinant of health maintenance and daily functioning in older adults [38, 39]. A nationwide longitudinal study of 11,112 older adults in China found that resilience protects against the onset of disability that limits daily activity participation [40]. According to a cross-sectional survey [41], resilience and cognition are strongly related and crucial to promoting active aging in older adults [42, 43]. Life adversities can lead to depression and cognitive

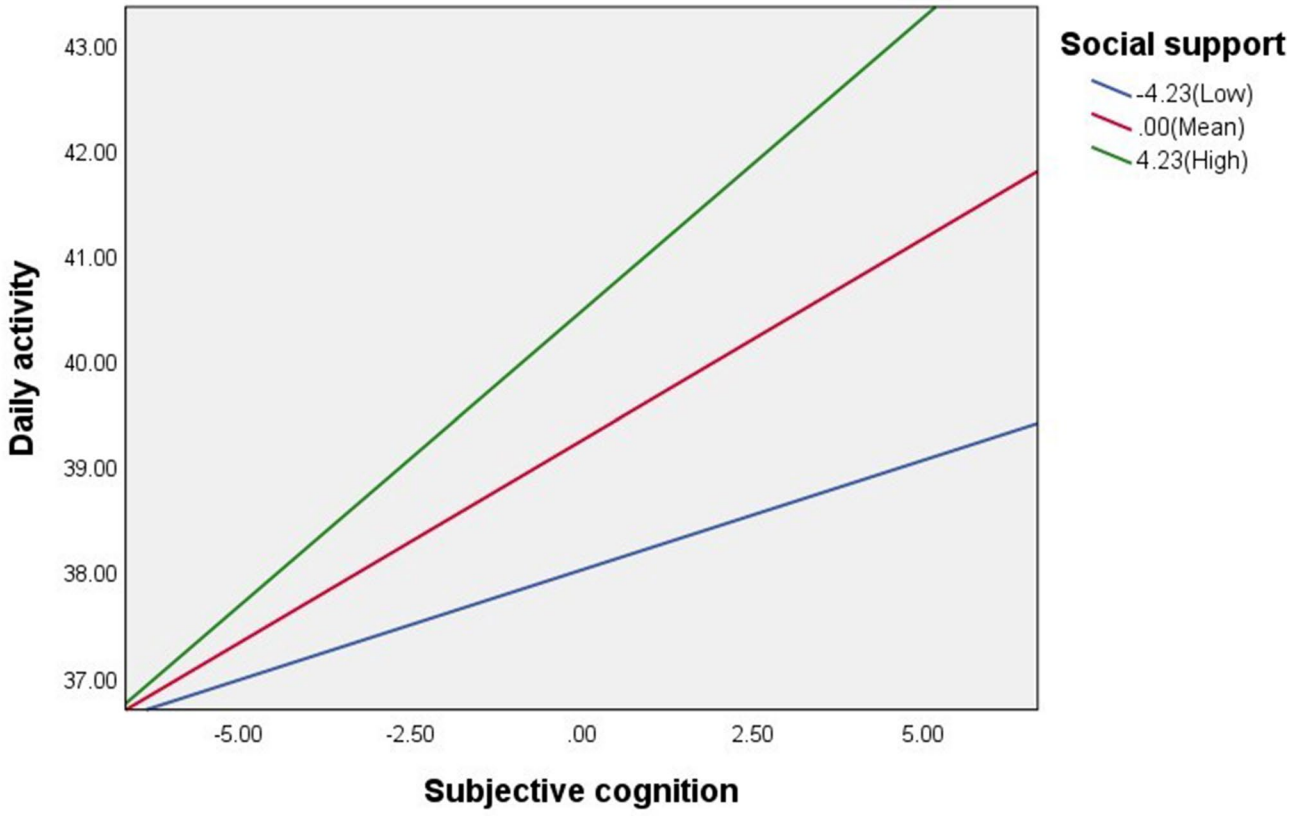

Fig. 3 Subjective cognition and activity engagement based on social support

Table 5 Moderated-mediation model analysis with covariates ($N = 397$)

Dependent variables	Label	Independent variables	coeff	SE	t	LLCI	ULCI
Subjective cognition	a	Resilience	0.47	0.08	5.57	0.30	0.63
Daily activity engagement	c′	Resilience	0.34	0.11	3.02	0.12	0.56
	b_1	Subjective cognition	0.38	0.06	6.01	0.26	0.51
	b_2	Social support	0.29	0.07	4.23	0.16	0.42
	b_3	Cog*SS	0.04	0.02	2.41	0.01	0.08
	covariates	Age	-0.18	0.04	-3.94	-0.26	-0.09
		Sex	-1.48	0.55	-2.66	-2.57	-0.39
Moderated mediation index (M) a*b3			0.02	0.01		0.001	0.03

Note. Cog*SS = Interaction of subjective cognition and social support; sex is dummy coded (ref = male)

decline, reducing the ability to perform daily activities [44]. However, some individuals maintain cognitive and functional health despite such adversity, reflecting the protective role of resilience [21]. Resilience supports adaptive coping strategies and may contribute to building cognitive reserve, which helps preserve activity engagement with age [41]. Our mediation analysis confirmed that subjective cognition mediated the relationship between resilience and daily activity engagement with age and sex as covariates.

Among the various factors affecting cognitive reserve and functional independence, the Canadian longitudinal study on aging over three years [45] suggested that social support plays a significant role. As a result of the moderation model proposed in our study, social support significantly moderated the association between subjective cognition and activity engagement. This relationship remained significant even after controlling for age and sex, highlighting the robustness of the interaction. Specifically, the positive association between subjective cognition and activity engagement was only significant when older adults perceived adequate social support. This aligns with prior research demonstrating the importance of social support in maintaining functional abilities [46] and the interplay between social engagement and cognitive health [47].

Our moderated mediation model offers several theoretical and clinical implications. First, resilience plays a

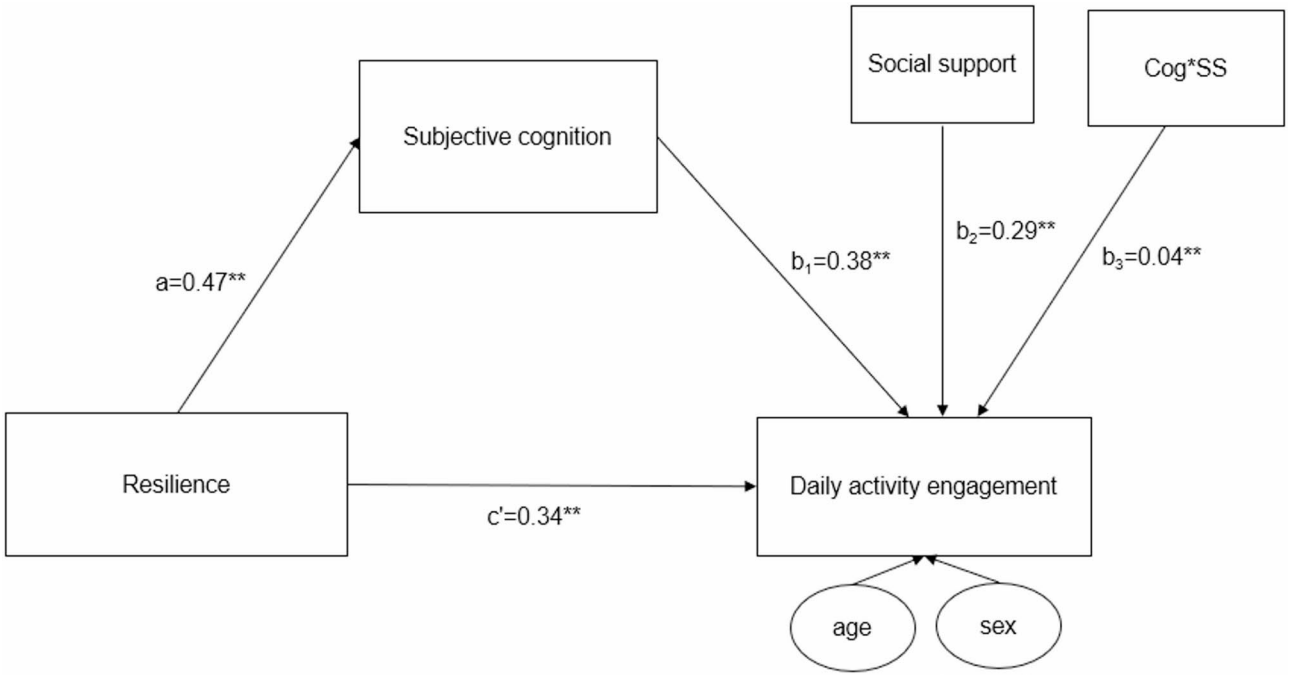

Fig. 4 The moderated mediation effect on daily activity engagement. $^{**}p < 0.001$; Cog*SS = Interaction of subjective cognition and social support; sex is dummy-coded (ref = male)

central role in supporting daily activity engagement in frail older adults, contributing to their ability to live independently. Second, subjective cognition acts as a pathway through which resilience promotes activity engagement. Although this mechanism warrants further exploration, our findings suggest that fostering resilience may indirectly strengthen cognitive reserve and functional independence. Third, social support enhances the effect of subjective cognition on activity engagement. Notably, the positive relationship was not significant when perceived social support scores fell below −4.92 (on a centered scale ranging from −19.02 to 9.98), reinforcing the need for adequate support systems.

Social support encompasses the perceived or actual availability of emotional, informational, and tangible resources within personal networks [48]. Age-related challenges, such as relationship losses, medical morbidities, and functional declines, contribute to social disconnections. Older adults are much more likely to suffer from social isolation and loneliness because they lose social support and experience social disconnections, which increases their risk of dementia by 50% and all-cause mortality by 26% [49]. The Surgeon General's Advisory highlighted the critical problem of social isolation among older adults and called for solutions [50]. Social connections are not just a matter of combining the quantity or quality of human relationships; instead, it is essential to build a culture of connection by providing emotional support, access to various resources, cognitive stimulation, motivation for choice of healthy lifestyle, and guidance toward a purpose in life [50, 51].

Resilience, according to aging-related resilience theory, is not a fixed characteristic but rather a dynamic process that can be modified or enhanced throughout life [17]. In older people, resilience is defined as the combination of available resources and positive behaviors [52], which can be enhanced by social connections or supportive networks. Furthermore, age and gender are important factors to consider since cognition, social participation, and daily activity engagement differ by gender and age [46, 47]. Our study found a small but significant moderated mediation effect, indicating that resilience influences activity engagement indirectly through subjective cognition. However, this positive association is evident only when frail older adults perceive adequate social support. Therefore, interventions should focus on strengthening both resilience and social support system from family and friends, especially for frail older adults with low subjective cognition.

The limitations of this secondary analysis should be considered when interpreting the findings. First, the cross-sectional nature of this secondary analysis limits the ability to infer causal relationships or fully unpack the underlying mechanisms. Second, while the Resilience Scale for frail older adults demonstrated initial construct validity through exploratory factor analysis, its relatively low internal consistency (Cronbach's α) may reflect the limited number of items or the presence of multiple underlying dimensions. Further psychometric evaluation,

including confirmatory factor analysis and testing across diverse populations, is warranted to strengthen the scale's validity and reliability. Third, because the study focused on the effect of social support on activity engagement, individuals who lived alone or had weak social support were excluded. This exclusion may have introduced selection bias and limited the generalizability of the findings. Future research should consider a broader conceptualization of social support—such as social connectedness or social networks—to better understand its association with active aging. Lastly, individuals with dementia or other chronic illnesses that cause dependency in daily activities were not included in this analysis. Further research should explore the broader dimensions of social support to fully comprehend its influence on active aging dynamics.

Conclusion

This study identified resilience, subjective cognition, and social support as essential factors in promoting daily activity engagement among frail older adults. The moderated mediation model reveals that resilience indirectly fosters engagement through subjective cognition, and this pathway is strengthened by adequate social support. These findings suggest the need for comprehensive, tailored strategies—accounting for age and gender differences—that enhance resilience and reinforce social support networks. Future research should further explore the multidimensional nature of social support to better understand its influence on active aging.

Abbreviations

CVI	Content validity index
RS_frail	Resilience scale for frail older adults
MCQ	Mild cognitive impairment questionnaire
MOS-SSS	Social support survey of medical outcome study
Boot CI	Boot strapping 95% confidence level

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40359-025-02854-2.

Supplementary Material 1

Author contributions

EO and RS designed the study and received funding to conduct the study. EO and NK involved data collection. EO, NK, and LG conducted analysis and prepared the tables and figures which were validated by Rthe S. All authors involved in writing and revising the main manuscript text. All authors meet authorship criteria and have read and approved the final manuscript.

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Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. Data are located in controlled access data storage at the research center secured website at Chungnam National University.

Declarations

Ethics approval and consent to participate

This study is a secondary analysis of data from a primary study conducted in accordance with the Declaration of Helsinki. The original study protocol was approved by the Institutional Review Board of Chungnam National University (Approval No. 202210-SB-139-01). All procedures were explained to participants, and written informed consent was obtained. Participants were informed of their right to withdraw from the study at any time without penalty, and confidentiality of their information was fully assured.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. United Nations, Departmenht of Economic and Social Affairs, Population Division. World population ageing 2019 (ST/ESA/SER.A/444). United Nations;2020.
2. Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. J Gerontol Biol Sci Med Sci. 2004;59(3):255–63.
3. Cesari M, Nobili A, Vitale G. Frailty and sarcopenia: from theory to clinical implementation and public health relevance. Eur J Intern Med. 2016;35:1–9.
4. Morley JE, Vellas B, van Kan GA, Anker SD, Bauer JM, Bernabei R, Cesari M, Chumlea WC, Doehner W, Evans J, et al. Frailty consensus: a call to action. J Am Med Dir Assoc. 2013;14(6):392–7.
5. Junius-Walker U, Onder G, Soleymani D, Wiese B, Albaina O, Bernabei R, Marzetti E. group AJW: The essence of frailty: A systematic review and qualitative synthesis on frailty concepts and definitions. Eur J Intern Med 2018;56:3–10.
6. Havighurst RJ. Successful Aging1. Gerontologist. 1961;1(1):8–13.
7. Rowe JW, Kahn RL. Successful aging. Gerontologist. 1997;37(4):433–40.
8. Marzo RR, Khanal P, Shrestha S, Mohan D, Myint PK, Su TT. Determinants of active aging and quality of life among older adults: systematic review. Front Public Health. 2023;11:1193789.
9. Verghese J, Lipton RB, Katz MJ, Hall CB, Derby CA, Kuslansky G, Ambrose AF, Sliwinski M, Buschke H. Leisure activities and the risk of dementia in the elderly. N Engl J Med. 2003;348(25):2508–16.
10. Glass TA, de Leon CM, Marottoli RA, Berkman LF. Population based study of social and productive activities as predictors of survival among elderly Americans. BMJ. 1999;319(7208):478–83.
11. Langhammer B, Bergland A, Rydwik E. The Importance of Physical Activity Exercise among Older People. Biomed Res Int 2018:7856823.
12. Kempen GI, van Haastregt JC, McKee KJ, Delbaere K, Zijlstra GA. Socio-demographic, health-related and psychosocial correlates of fear of falling and avoidance of activity in community-living older persons who avoid activity due to fear of falling. BMC Public Health. 2009;9:170.
13. Lewis NA, Hill PL. Sense of purpose promotes resilience to cognitive deficits attributable to depressive symptoms. Front Psychol. 2021;12:698109.
14. Mlinac ME, Feng MC. Assessment of activities of daily living, Self-Care, and independence. Arch Clin Neuropsychol. 2016;31(6):506–16.
15. Yang JS, Jeon YJ, Lee GB, Kim HC, Jung SJ. The association between psychological resilience and cognitive function in longitudinal data: results from the community follow-up survey. J Affect Disord. 2021;290:109–16.
16. Hale M, Shah S, Clegg A. Frailty, inequality and resilience. Clin Med (Lond). 2019;19(3):219–23.
17. Feliciano E, Feliciano A, Palompon D, Boshra A. Aging-related resiliency theory development. Belitung Nurs J. 2022;8(1):4–10.

18. Chhetri JK, Xue QL, Ma L, Chan P, Varadhan R. Intrinsic capacity as a determinant of physical resilience in older adults. J Nutr Health Aging. 2021;25(8):1006–11.
19. Seong H, Lashley H, Bowers K, Holmes S, Fortinsky RH, Zhu S, Corazzini KN. Resilience in relation to older adults with Multimorbidity: A scoping review. Geriatr Nurs. 2022;48:85–93.
20. Beard JR, Si Y, Liu Z, Chenoweth L, Hanewald K. Intrinsic capacity: validation of a new WHO concept for healthy aging in a longitudinal Chinese study. J Gerontol Biol Sci Med Sci. 2021;77(1):94–100.
21. Greve W, Staudinger UM. Resilience in later adulthood and old age: resources and potentials for successful aging. Wiley; 2015.
22. Fredrickson BL. The broaden-and-build theory of positive emotions. Philos Trans R Soc Lond B Biol Sci. 2004;359(1449):1367–78.
23. Lee MT, Jang Y, Chang WY. How do impairments in cognitive functions affect activities of daily living functions in older adults? PLoS ONE. 2019;14(6):e0218112.
24. Duppen D, Lambotte D, Dury S, Smetcoren AS, Pan H, De Donder L. Social participation in the daily lives of frail older adults: types of participation and influencing factors. J Gerontol B Psychol Sci Soc Sci. 2020;75(9):2062–71.
25. Li Q, Wu C. Social interaction, lifestyle, and depressive status: mediators in the longitudinal relationship between cognitive function and instrumental activities of daily living disability among older adults. Int J Environ Res Public Health 2022;19(7).
26. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. PLoS Med. 2010;7(7):e1000316.
27. Chen Y, Feeley TH. Social support, social strain, loneliness, and well-being among older adults: an analysis of the health and retirement study**. J Soc Pers Relatsh. 2014;31(2):141–61.
28. Menec VH. The relation between everyday activities and successful aging: a 6-year longitudinal study. J Gerontol B Psychol Sci Soc Sci. 2003;58(2):S74–82.
29. Ma T, Liao J, Ye Y, Li J. Social support and cognitive activity and their associations with incident cognitive impairment in cognitively normal older adults. BMC Geriatr. 2024;24(1):38.
30. Seo J, Joo K, Li Y, Kim N, Oh E, Gansukh L, Song R. Healthy aging in frail older adults: active aging project of a National survey. Int J Nurs Stud Adv. 2025;8:100302.
31. Jung HW, Kim S, Won CW. Validation of the Korean frailty index in community-dwelling older adults in a nationwide Korean frailty and aging cohort study. Korean J Intern Med. 2021;36(2):456–66.
32. Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. Res Sci Educ. 2018;48(6):1273–96.
33. Dean K, Jenkinson C, Wilcock G, Walker Z. The development and validation of a patient-reported quality of life measure for people with mild cognitive impairment. Int Psychogeriatr. 2014;26(3):487–97.
34. Song R, Gang M, Park M, Park M, Jang M, Hwang IO, Kim JL. Validity and reliability of K-MCQ to assess quality of life of older adults with mild cognitive impairment. J Kor Gerontol Nurs. 2021;23(2):164–75.
35. Park G, Cho B, Kwon IS, Park BJ, Kim T, Cho KY, Park UJ, Kim MJ. Reliability and validity of Korean version of falls efficacy Scale-International (KFES-I). Ann Rehabil Med. 2010;34(5):554–9.
36. Sherbourne CD, Stewart AL. The MOS social support survey. Soc Sci Med. 1991;32(6):705–14.
37. Igartua JJ, Hayes AF. Mediation, moderation, and conditional process analysis: concepts, computations, and some common confusions. Span J Psychol. 2021;24:e49.
38. MacLeod S, Musich S, Hawkins K, Alsgaard K, Wicker ER. The impact of resilience among older adults. Geriatr Nurs. 2016;37(4):266–72.
39. Windle G. What is resilience? A review and concept analysis. Rev Clin Gerontol. 2011;21(2):152–69.
40. Yang Y, Wen M. Psychological resilience and the onset of activity of daily living disability among older adults in China: A nationwide longitudinal analysis. J Gerontol B Psychol Sci Soc Sci. 2015;70(3):470–80.
41. Jung SJ, Lee GB, Nishimi K, Chibnik L, Koenen KC, Kim HC. Association between psychological resilience and cognitive function in older adults: effect modification by inflammatory status. Geroscience. 2021;43(6):2749–60.
42. Rantanen T, Saajanaho M, Karavirta L, Siltanen S, Rantakokko M, Viljanen A, Rantalainen T, Pynnönen K, Karvonen A, Lisko I. Active aging–resilience and external support as modifiers of the disablement outcome: AGNES cohort study protocol. BMC Public Health. 2018;18:1–21.
43. Siltanen S, Tourunen A, Saajanaho M, Palmberg L, Portegijs E, Rantanen T. Psychological resilience and active aging among older people with mobility limitations. Eur J Ageing. 2021;18(1):65–74.
44. Brewster GS, Peterson L, Roker R, Ellis ML, Edwards JD. Depressive symptoms, cognition, and everyday function among Community-Residing older adults. J Aging Health. 2016;29(3):367–88.
45. Tomaszewski Farias S, Cahn-Weiner DA, Harvey DJ, Reed BR, Mungas D, Kramer JH, Chui H. Longitudinal changes in memory and executive functioning are associated with longitudinal change in instrumental activities of daily living in older adults. Clin Neuropsychol. 2009;23(3):446–61.
46. Avlund K, Lund R, Holstein BE, Due P. Social relations as determinant of onset of disability in aging. Arch Gerontol Geriatr. 2004;38(1):85–99.
47. Hwang J, Park S, Kim S. Effects of participation in social activities on cognitive function among Middle-Aged and older adults in Korea. Int J Environ Res Public Health 2018;15(10).
48. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychol Bull. 1985;98(2):310–57.
49. Donovan NJ, Blazer D. Social isolation and loneliness in older adults: review and commentary of a National academies report. Am J Geriatr Psychiatry. 2020;28(12):1233–44.
50. Advisory USSGs. Our epidemic of loneliness and isolation. In.; 2023.
51. Bakhshandeh Bavarsad M, Stephens C. Social network type contributes to purpose in life among older people, mediated by social support. Eur J Ageing. 2024;21(1):5.
52. Lima GS, Figueira ALG, Carvalho EC, Kusumota L, Caldeira S. Resilience in Older People: A Concept Analysis. Healthcare (Basel) 2023;11(18).

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