



Effects of Cognition, Daily-living Stress, and Health-promotion Behavior on Subjective Memory Complaints by Community-dwelling Elders

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Purpose: This study aimed to examine factors influencing subjective memory complaints (SMC) among elders living in local communities. **Methods:** From February to May, 2016, 126 elders from three cities completed a structured questionnaire composed of SMC, cognition, daily-living stress (DS), and health-promotion behavior (HB). Data were analyzed using the SPSS 25.0 program for descriptive statistics, Pearson correlations, and multiple regression. **Results:** The average age of participants was 73.7 ± 6.71 years, and SMC was 5.82 ± 2.87 . SMC was significantly different according to education ($F=8.33, p<.001$), presence of a spouse ($t=4.99, p<.001$); economic status ($F=10.10, p<.001$); type of living arrangements ($F=7.88, p=.001$); family relationships ($F=9.43, p<.001$); perceived health status ($F=17.62, p<.001$). There was a significant negative correlation between SMC and cognition ($r=-.39, p<.001$); DS and HB ($r=-.52, p<.001$). Cognition and DS were positively correlated ($r=.47, p<.001$). Presence of a spouse, economic status, cognition, and DS were significantly associated with and accounted for 30.8% of the variance in SMC. **Conclusion:** Cognition and stress are important factors related to SMC and should be considered along with the presence of a spouse and economic status. Efforts to improve cognitive, psychological and physical health will help prevent memory impairment and further improve the quality of life for elders.

Key Words: Aged; Memory disorder; Cognition; Stress, psychological; Health promotion

INTRODUCTION

1. Background

Cognitive impairment has a significant negative impact on the lives of elders and their families. When it develops, at present, considerable attention is paid to the prevention of cognitive impairment in healthy elders due to the inability to treat. The subjective perception of memory loss in elders has been reported to predict dementia, main kind of cognitive impairment, which has been highlighted in the clinical field of dementia. There is also a great interest in Korea, where dementia population is increasing dramatically with rapid aging. Although the mechanism is not clear, the association between subjective

memory complaint (SMC) and mild cognitive impairment (MCI) has been reported. Especially, Objective memory impairment (OMI) is a distinctive feature of MCI that allows early diagnosis to be considered [1]. Additionally, SMC in healthy older adults is associated with depression, which has been related with cognitive impairment, such as dementia, and it is known that it is prominent in healthy elders living in the community [2]. Therefore, identifying SMC in older adults is expected to enable healthy senile stage with prevention of cognitive impairment.

Subjective memory complaint is known to be influenced by personal and environmental factors of older population. Daily-living stress is a type of stress that occurs cumulatively in one's daily life, continuing to impact

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his/her health and well-being negatively, and as people grow older, they go through a variety of stress-evoking events such as deterioration of physical functions, risks of chronic ailments, death of spouse, decline in financial strength, social isolation and loneliness, loss of job following retirement, and so on [3]. If not effectively controlled, daily-living stress leads to negative mental/physical disorders, with adverse impact on the health, well-being of the elderly population [4].

As the perceived stress is higher, health-promotion activities decrease, and depending on counter-stress strategy, old adults either engage in behaviors to maintain and/or promote their healthy or unhealthy practices, which changes the quality of life consequently [5]. If older adults maintain health-promotion behaviors well, they can reduce the duration of functional disorder and extend healthy life span by preventing diseases and improving health status to engage meaningful endeavors independently. Furthermore, health-promotion behavior is an important variable that impacts the life of elders whose chronic ailment morbidity rate is high with old age, and therefore it is a significant variable in improving the quality of life of older adults who are supposed to keep their ailments under control for the rest of their life [6]. Hence, to bolster the quality of life of elders, attention needs to be paid to health-promotion behaviors to maintain/promote one's health in ordinary times along with shift in awareness of disease and health, and renewed perception of health-promotion behaviors, etc.

Although previous studies on SMC have been conducted as leading factors of cognitive impairment represented by dementia, it is only to confirm the association between biomarkers and emotional factors such as depression which have already been identified [2,7]. There is a limit to accessibility in the prevention of cognitive impairment of healthy older populations living in the community. Therefore, it is time to identify the influencing factors that can be practiced before cognitive impairment occurs in daily life such as daily stress or health-promotion behaviors.

As the shift in demographic composition resulting from the aging of society leads public attention toward the senile stage of life, cognition represented by dementia is particularly being highlighted. Since memory complaint is detected prior to cognitive impairment, identifying factors contributing to memory impairment and using appropriate nursing intervention to address such factors will be effective in preventing and controlling cognitive impairment that may have drastic impact on the quality of life of old adults.

2. Purposes

This study was done to identify the relationship between SMC and its related variables including cognition, daily-living stress, and health-promotion behaviors; and to understand how these variables impact SMC in a bid to provide basis for nursing intervention that can be performed in nursing sites for elders prior to the development of cognitive impairment with the following concrete objectives:

- To understand cognition, daily-living stress, health-promotion behavior and the intensity of SMC of applicable participants.
- To identify the intensity of SMC of applicable participants in relation to their general characteristics.
- To identify the correlations between cognition, daily-living stress, health-promotion behavior and SMC of applicable participants.
- To identify the impact that cognition, daily-living stress, and health-promotion behavior may have on SMC.

METHODS

1. Design

The aim of this descriptive correlational study was to understand how cognition, daily-living stress, and health-promotion behavior of older adults impact their SMC.

2. Participants

Older adults living in three different urban communities were recruited with the inclusion criteria, over 65 years of age, and without diagnosis of cognitive disorders. G*power program 3.1.9.2 was used and the minimum number of samples was calculated to be 118 persons on the assumption of multiple regression analysis, medium effect size ($f^2=0.15$), testing power of .80, significance level of .05, and 10 test variables. Questionnaires were distributed to 130 persons randomly sampled and considering a 20% drop rate and 126 persons were finally selected, excluding those whose responses were insufficient.

3. Instruments

1) Cognition

Cognition of the participants was measured by 19 items in the Mini-Mental State Examination-Dementia Screening (MMSE-DS) developed by Folstein, Folestein,

and McHug (1975) and standardized to meet Korean needs by Seoul National University Bundang Hospital (2009) [8,9]. MMSE-DS has seven subdomains, they are time orientation (5 items), place orientation (5 items), attention (1 item), memory (2 items), speech ability (3 items), construction ability (1 item), and judgment ability (2 items). The range of total scores is 0~30 points and the higher the score is, the better cognition is. Cutoff point varies, depending on gender, age, and duration of education.

2) Daily-living stress

Daily-living stress was measured by an instrument modified/updated by Kim (2008) based on Seo's Elderly Stress Scale (SESS) of Seo and Ha (1997) [10,11]. It contains 23 items with a 5-point Likert scale from Point 1 indicating 'Never exposed to stress' to Point 5 meaning 'Very much exposed to stress'. This scale consists of three subdomains, economic stress (6 items), health-related stress (8 items), and family-related stress (9 items). The higher the score is, the more applicable senior respondent is aware of daily-living stress. Cronbach's α was .91 in Seo and Ha (1997)'s study, .88 in Kim (2008)'s study [10, 11], and .88 in this study.

3) Health-promotion behavior

Health-promotion behavior was measured by 28 items modified/updated by Ko (2008) based on the health promotion lifestyle scale developed by Walker (1987) [12, 13]. This 4-point Likert scale was composed with six subdomains - health diagnosis and consulting (3 items), nutrition and eating habit (6 items), daily-living management (7 items), exercise and activities (4 items), drinking and smoking (3 items), and stress-coping (5 items). Scores range from Point 1 indicating 'Never engaged in health-promotion' to Point 4 meaning 'Always engaged in health-promotion'. The higher the score, the more the applicable respondent is engaged in health-promotion behavior. Cronbach's α was .82 when the tool was developed [12], and .87 in this study.

4) Subjective memory complaint

Subjective memory complaint (SMC) was measured by 7 items translated/reverse-translated by Song (2018) [14] from the Memory Complaint Scale type A (MCS-A) developed by Vale, Balieiro-Jr. and Silva-Filho (2012) [7]. Each item is assigned 0~2 points and the higher the score, the more serious the memory complaint is. Total score of 0~2 points is normal; 3~6 points to mild memory complaint; 7~10 points to moderate memory complaint; and 11~14 points to severe memory complaint. Cronbach's α

was .85 when the tool was developed [7], and .75 in this study.

4. Data Collection

Data was collected from February 2016 to May after Institutional Review Board (IRB) approval (CUPIRB-2016-005). All authors collected data: First, we informed heads of elders' colleges, senior citizen centers, elder welfare centers or nursing homes of the purpose, procedure, and processes of the study in advance, obtained their permission: Second, we posted participant recruitment advertisement and visited applicable institutions as scheduled, and then had consenting participants filled out self-report type questionnaires to collect data. If necessary, we helped the participants answer the questionnaire with reading the items or writing down their answers. Total 130 questionnaire were distributed and the response rate was 96.9%.

5. Data Analysis

Collected data was analyzed as follows, using SPSS/WIN 25.0 program:

- General characteristics of the participants were analyzed with frequency and percentage.
- The degree of cognition, daily-living stress, health-promotion behavior and SMC were analyzed with average and standard deviation.
- Difference in SMC resulting from general characteristics was analyzed by t-test, ANOVA, Scheffé post hoc.
- Correlations among cognition, daily-living stress, health-promotion behavior and SMC were analyzed with Pearson correlation coefficient.
- Influence that cognition, daily-living stress, and health-promotion behavior of the participants may have on the intensity of SMC were analyzed by stepwise multiple regression.

6. Ethical Considerations

For ethical consideration data collection began after approval of the IRB. Before distributing the questionnaire, the authors explained the following: Collected data would be used for research purposes only: All specific gains and losses from participation in the study were presented. After explaining, if the participants agreed to participate in the study, the explanation on the anonymity, confidentiality and freedom of withdrawal from the study, and that all the data would be discarded after the study

was described, the research participation agreement was prepared. After completing the questionnaire, the participants sealed their questionnaire by using an anonymous envelope which was given at the beginning of data collection. Two copies of the written consent were made and one was given to the participant and the other was stored separately from the questionnaire. The results of the questionnaire protected the participant's information during the computation. The collected data after the computational work was stored in the researcher's computer, which is secured with a password, and can be managed only by the author. Three years after the end of the study, all collected data, including questionnaires and computational files, were discarded.

RESULTS

1. General Characteristics

Average age of the participants in this study was 73.7 years; 68.3% of them were female; and 88.9% had graduated from at least elementary school. 21.4% had religious faith and 59.5% lived with spouses. Participants answered the question about their perceived economic status as 'Average' accounted for the biggest share at 55.6% and the share of the households consisting of only a couple was the highest at 46.8%. 27.0% of the respondents lived alone, and 63.0% of the respondents who lived with a spouse or children reported that their family relationship was good. The greatest number of participants answered 'Average' to the question about perceived health status and the participants had 1.06 medical conditions on average (Table 1).

2. Cognition, Daily-living Stress, Health-promotion Behavior, and Subjective Memory Complaint

Cognition, daily-living stress, health-promotion behavior, and subjective memory complaint of home-based older adults are as shown in Table 1. MMSE-DS was 26.24 points on average, 62.02 points on daily-living stress, 76.27 points on health-promotion behavior, and 5.82 points on SMC. To a varying degree, 89.1% of the participants were found to have memory impairment, with 52.4% mild, 28.6% moderate, and 7.9% serious.

3. Differences in Subjective Memory Impairment according to General Characteristics

Difference in SMC of the participants related to their

Table 1. Participants' General Characteristics, Cognition, Daily-living Stress, Health-promotion Behavior, and Subjective Memory Complaint (N=126)

Characteristics	Categories	n (%) or M±SD	Range
Age (year)		73.7±6.71	62~94
Gender	Male	40 (31.7)	
	Female	86 (68.3)	
Education	None	14 (11.1)	
	Elementary school	34 (27.0)	
	Middle school	33 (26.2)	
	High school	35 (27.8)	
	≥ College	10 (7.9)	
Religion	Yes	27 (21.4)	
	No	99 (78.6)	
Spouse	Yes	75 (59.5)	
	No	51 (40.5)	
Perceived economic status	Good	31 (24.6)	
	Fair	70 (55.6)	
	Poor	25 (19.8)	
Living type	Alone	34 (27.0)	
	Couple only	59 (46.8)	
	With children	33 (26.2)	
Family relationship	Good	58 (46.0)	
	Fair	34 (27.0)	
	Have no family	34 (27.0)	
Perceived health status	Good	40 (31.7)	
	Fair	48 (38.1)	
	Poor	38 (30.2)	
Disease	Yes	112 (88.9)	
	No	14 (11.1)	
Number of diseases		1.06±0.58	0~3
MMSE-DS		26.24±4.27	2~30
Daily-living stress		62.02±13.08	23~90
Health-promotion behavior		76.27±12.34	50~108
Subjective memory complaint		5.82±2.87	1~13

MMSE-DS=Mini-mental state examination-dementia screening.

general characteristics are as shown in Table 2. Significant difference was found, depending on degree of education ($F=8.33, p<.001$), presence of a spouse ($t=4.99, p<.001$), perceived economic status ($F=10.10, p<.001$), living type ($F=7.88, p=.001$), family relationship ($F=9.43, p<.001$), and perceived health status ($F=17.62, p<.001$). If there was no spouse, SMC score was significantly higher. In the post hoc analysis, SMC score was significantly higher in participants with 'No schooling' and 'Elementary school graduation' backgrounds than in those with 'Middle school grad-

uation' and 'High school graduation'. In terms of economic status, SMC score was significantly higher in the order of 'Good', 'Average', and, 'Poor'. As for living type, SMC score was significantly higher in participants living alone than those living as a couple. In terms of perceived health

status, SMC score was significantly higher in the order of 'Good', 'Average', and 'Poor'.

Table 2. Differences in Subjective Memory Complaint according to General Characteristics (N=126)

Characteristics	Categories	Subjective memory impairment	
		M±SD	t or F (p) Scheffé
Gender	Male	5.30±2.93	1.39
	Female	6.06±2.83	(.168)
Education	None ^a	7.71±3.25	8.33
	Elementary school ^b	7.38±3.13	(< .001)
	Middle school ^c	4.97±2.07	a, b > c, d
	High school ^d	4.49±1.99	
	≥ College ^e	5.30±2.87	
Religion	Yes	5.72±2.79	0.75
	No	6.19±3.18	(.455)
Spouse	Yes	4.85±2.43	4.99
	No	7.24±2.90	(< .001)
Perceived economic status	Good ^a	4.29±1.88	10.10
	Fair ^b	5.89±2.91	(< .001)
	Poor ^c	7.52±2.83	a < b < c
Living type	Alone ^a	7.29±2.85	7.88
	Couple only ^b	4.97±2.55	(.001)
	With children ^c	5.82±2.89	a > b
Family relationship	Good ^a	5.02±2.61	9.43
	Fair ^b	5.50±2.59	(< .001)
	No family ^c	7.50±2.93	a, b < c
Perceived health status	Good ^a	4.15±2.34	17.62
	Fair ^b	5.81±2.79	(< .001)
	Poor ^c	7.58±2.45	a < b < c
Disease	Yes	5.95±2.87	1.43
	No	4.79±2.72	(.154)

4. Correlation among Cognition, Daily-living Stress, Health-promotion Behavior, and Subjective Memory Complaint

Correlations among cognition, daily-living stress, health-promotion behavior, and subjective memory complaint are as shown in Table 3. SMC and cognition ($r = -.39, p < .001$), and daily-living stress and health-promotion behavior ($r = -.52, p < .001$) had significant negative correlations whereas cognition and daily-living stress had a significant positive correlation ($r = .47, p < .001$).

5. Influencing Factors on Subjective Memory Complaint

The results of regression analysis to understand the impact of cognition, daily-living stress, and health-promotion behavior of home-based older adults on SMC are as shown in Table 4. Among the general characteristics, level of education, presence of a spouse, subjective economic status, living type, family relationship, and subjective health status associated with difference in the intensity of SMC were processed with inputs of dummy variables, and independent variables including cognition, daily-living stress, and health-promotion behavior were entered as predictor variables. When multicollinearity was diagnosed to verify the input validity among the variables, Durbin-Watson statistic was not more than 2 and VIF value was not more than 10, indicating absence of multicollinearity issue.

Presence of a spouse (Model 1) was entered in the 1st stage; 'Good' economic status (Model 2) in the 2nd stage; 'Average' economic status (Model 3) in the 3rd stage; daily-living stress (Model 4) in the 4th stage; and MMSE-DS (Model 5) in the 5th stage for analysis. Model 1 explained the

Table 3. Correlation among Cognition, Daily-living Stress, Health-promotion Behavior, and Subjective Memory Complaint (N=126)

Variables	MMSE-DS	Daily-living stress	Health-promotion behavior	Subjective memory complaint
	r (p)	r (p)	r (p)	r (p)
MMSE-DS	1	.47 (< .001)	-.14 (.116)	-.39 (< .001)
Daily-living stress		1	-.52 (< .001)	.47 (< .001)
Health-promotion behavior			1	-.14 (.116)
Subjective memory complaint				1

MMSE-DS: Mini-mental state examination-dementia screening.

Table 4. Factors Influencing Subjective Memory Complaint in Older Adults living in the Community (N=126)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	β (<i>p</i>)				
Spouse (ref='Yes')	.40 (<.001)	.34 (<.001)	.33 (<.001)	.26 (.002)	.19 (.024)
Economic status 'Good' (ref='Bad')		.22 (.010)	.36 (.001)	.18 (.121)	.21 (.069)
Economic status 'Fair' (ref='Bad')			.22 (.041)	.11 (.296)	.14 (.176)
Daily-living stress				.31 (.001)	.25 (.007)
MMSE-DS					.22 (.010)
F (<i>p</i>)	23.05 (<.001)	15.52 (<.001)	12.04 (<.001)	12.69 (<.001)	12.03 (<.001)
Adjusted R ²	.15	.19	.21	.27	.31

MMSE-DS=Mini-mental state examination-dementia screening.

SMC of home-based older adults 15.1% ($F=23.05, p<.001$) whereas Model 2 explained the SMC 19.0% ($F=15.52, p<.001$), implying that economic status explained the SMC by an additional 3.9%. Model 3 explained the SMC 21.1% and 'Poor' economic status explained the SMC by an additional 2.1% than 'Good' economic status ($F=12.04, p<.001$). Model 4 including daily-living stress explained the SMC 27.4% ($F=12.69, p<.001$) by an additional 6.3%. Model 5 including MMSE-DS explained the SMC 30.8% finally ($F=42.92, p<.001$), and significant impact was observed in the order of daily-living stress ($\beta=.25$), MMSE-DS ($\beta=.22$), and presence of a spouse ($\beta=.19$).

DISCUSSION

This study was done to provide basis for improving the quality of life in one's senile stage by preventing cognition impairment, identifying the impacts of cognition, daily-living stress and health-promotion behavior on subjective memory complaint of community-dwelling old adults.

The SMC of the participants was found to be 5.82 points on average, indicating mild memory impairment (3~6 points). This was higher than 4.89 points for the low-income older adults in the community [14] and lower than 6.62 points for older adults with benign prostatic hyper trophy [15]. With SMC as a predictor of mild cognition impairment being studied, KMCS-A used herein was converted on a 100-point scale for comparison with precedent studies using other tools. The conversion score for participants in this study was 41.60 points, lower than 49.00 points of older adults using community health center but higher than 24.30 points of adults aged 50 years or older in the community [16]. This is believed to be a result of differences in general characteristics of the partic-

ipants, which is backed up by a research finding that SMC is higher as age is higher [17]. Yet, given the diversity of tools designed to measure SMC, more studies using the same tool need to be performed.

Significant difference in the SMC of the participants was found, depending on such general characteristics as education, presence of a spouse, perceived economic status, living type, family relationship, and subjective health status. The results of no schooling and elementary school graduation are associated with higher SMC score than middle and high school graduation is similar to the previous research finding that SMC varies significantly according to educational background and SMC is higher as education level is lower [14,18]. Longitudinal study results that SMC allows all types of dementia to be predicted [19], that SMC and objective cognition are related [20], that cognition level was significantly lower in SMC group [21], and the research result that significant difference in the degree of cognitive impairment is observed according to education level [18] also support the above observation. In the cases of older adults without a spouse, SMC score was significantly higher if they lived alone. This is similar to the research result that older adults living alone or without a spouse have lower cognition and their cognition deteriorates faster [22]. It is also similar to the previous research results that older adults' participation in social activities has positive influence on cognition and the influence gets greater as education level is lower [23]. Given the theory that complex household composition as opposed to monotonous one can contribute to decelerating decline of cognition with intellectual stimulus from relations among household members [22], nursing interventions designed for maintaining/improving cognition of older adults needs to be based on family composition and education level. As SMC of the partic-

participants was more serious as their perceived economic status was worse, it was similar to the research result that cognition of old adults living on basic living welfare benefits was significantly lower [24]. The participants of this study were found to have more serious SMC as their perceived health status was poor. This is similar to the precedent study that cognition was higher as perceived health status was better [24]. Meanwhile, given the precedent study [17] reporting SMC on age and the number of diseases for which significant difference was not observed in this study, more studies covering various older adult groups need to be conducted.

When the correlations among cognition, daily-living stress, health-promotion behavior and SMC of the participants were analyzed, cognition was significantly lower as the SMC of home-based older adults was more serious; daily-living stress increased with higher cognition; and health-promotion behavior decreased with higher daily-living stress. These results support the precedent study result that SMC contributes to predicting cognition impairment [19,20,25] and similar to the research result that more dependence on others for daily routines is associated with lower SMC [15]. It is yet different from the research results that SMC had no significant relation with cognition [26], and that higher stress of older adults resulted in more depression, causing decline in cognition [27]. The difference is believed to result from the fact that this study measured daily-living stress of older adults whereas the research of Kim et al. (2019) measured multi-faceted stress from health, finance, family, exclusion, regret, etc [27]. As daily-living stress which arises in small daily routines can cause negative impact on mental/physical health if it becomes chronic [3] and intensive physical activities reduce the risks of mild cognition impairment and dementia [28], more studies on cognition, stress and health-promotion behavior of older adults need to be conducted and intervention techniques that can defer SMI should be developed and applied together.

In this study, daily-living stress, cognition and presence of a spouse were found to be the major elements having impact on home-based older adults, and their explanatory power was 30.8%. This is similar to the research results that perceived stress is a significant factor of SMC [29], that SMC has significant relations with perceived stress, physical symptoms, etc. in high cognition risk groups having dementia, and so forth [25]; and that there are many daily routines and high stress in groups with SMC [25]. Given the prevalence rate of SMI well over 50% and the fact that more than half of older adults with SMC progress to cognition impairment [30], a customized

health control system that incorporates living type, presence of a spouse and daily-living stress of older adults based on impact factors found in this study needs to be implemented to prevent SMC in older adults living in local communities and thereby help them deal with mental/physical challenges in transition to cognition impairment.

There are several limitations in this study. First, convenient sampling from three different regions may limit the generalization of these results. And then this study has specification errors with selection of independent variables. As a matter of fact, in older people without cognitive impairment, SMC and depression are reported as strongly correlated, in addition, depression is an emotional factor that has already been associated with cognitive impairment [1]. Low explanatory power could be explained by specification errors excluding emotional factors, so it should be improved through further research. However, this study is significant in that it has identified factors influencing SMC such as presence of a spouse, daily-living stress, cognition of home-based older adults, providing basic inputs for subsequent intervention development.

CONCLUSION

Presence of a spouse, daily-living stress and cognition have been identified as factors having impact on SMC of community-dwelling older adults, with their explanatory power confirmed to be 30.8% in total. Therefore, to reduce SMC confirmed to be significantly associated with cognition impairment and ensure successful aging, considerations need to be given to older adults living alone and nursing interventions that can reduce daily-living stress need to be developed and applied in combination. Yet, since the explanatory power was only 30.8%, follow-up studies to identify other factors that can impact SMC need to be conducted. Therefore, a customized health control system considering living type, presence of a spouse, daily-living stress and cognition of people needs to be implemented subsequently to prevent subjective memory complaint of community-dwelling older adults and thereby ensure their successful aging.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

AUTHORSHIP

Study conception and design acquisition - HEH and KKH; Data collection - EHH and KKH; Analysis and interpretation of the da-

ta - KKH; Critical revision of the manuscript - HEH and KKH.

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