Research Article

Subjective Memory Complaints Predict Decline in Memory, Instrumental Activities of Daily Living, and Social Participation in Older Adults: A Fixed-Effects Model

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Importance: Although subjective memory complaints (SMCs) have been suggested to be associated with future memory impairment, limitations in instrumental activities of daily living (IADLs), and social participation restriction, these associations are still inconclusive.

Objective: To determine whether changes in SMCs over time predict decline in memory, IADLs, and social participation in older adults.

Design: Longitudinal study.

Setting: Community.

Participants: Sample 1 included 2,493 community-dwelling older adults drawn from the Health and Retirement Study (HRS) data collected between 2004 and 2018. Sample 2 included 1,644 community-dwelling older adults drawn from the HRS data collected between 2008 and 2018.

Outcomes and Measures: Self-reported SMCs, memory function, self-reported IADL performance, and self-reported social participation.

Results: The mean age of Sample 1 at baseline was 70.16 yr; 1,468 (58.88%) were female. In Sample 1, immediate and delayed memory (all ps < .001) and IADL performance (p < .01) declined over time. Increases in SMCs over time significantly predicted future immediate and delayed memory declines (p < .01 and p < .001, respectively) and future IADL performance decline (p < .001), after controlling for depressive symptoms. The mean age of Sample 2 at baseline was 71.52 yr; 928 (56.45%) were female. In Sample 2, social participation declined over time (all ps < .001). Increases in SMCs over time significantly predicted future social participation decline (p < .05), after controlling for depressive symptoms.

Conclusions and Relevance: Increases in SMCs predict future decline in memory, IADL performance, and social participation after accounting for depressive symptoms.

What This Article Adds: SMCs can be used as an early indicator of future memory impairment, IADL limitations, and social participation restrictions in older adults. Furthermore, interventions that minimize SMCs may help older adults achieve successful aging.

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Subjective memory complaints (SMCs) refer to one's perception of a decline or deterioration in cognitive performance that occurs regardless of objective impairment found by neuropsychological testing or in daily functioning (Abdulrab & Heun, 2008; Stewart, 2012). The prevalence of SMCs varies between 11.7% and 84.2% among older adults ages 65 and older (Jonker et al., 2000; Mitchell et al., 2014). This wide range in

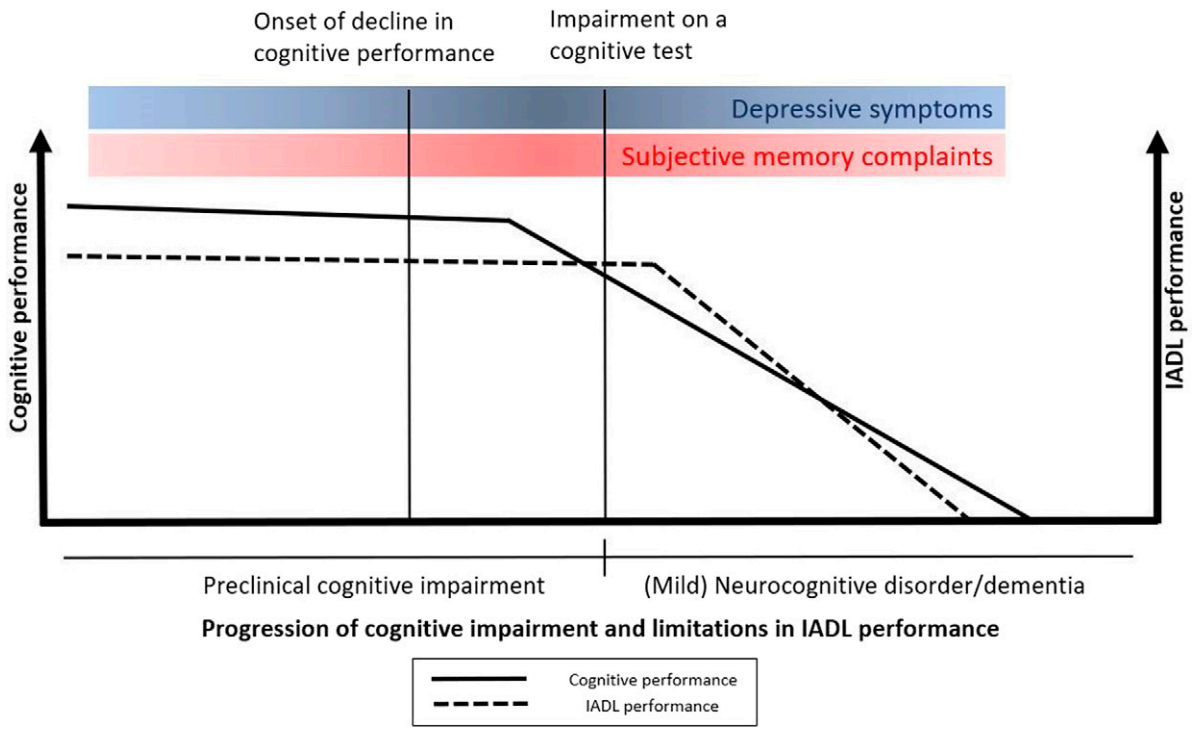
prevalence may be because SMCs are determined by self-assessment and influenced by mood and so may develop and disappear over time and in various situations (Centers for Disease Control and Prevention, 2019; Vlachos et al., 2019). SMCs are a particular concern among older adults, because they are associated with poor functional outcomes, particularly cognitive impairment, limitations in instrumental activities of daily living (IADLs), and social participation restrictions (Burmester et al., 2016; Cordier et al., 2019; Lee et al., 2021).

Lee's (2021) conceptual framework can help explain the association of SMCs with cognitive impairment, IADL limitations, and social participation restrictions. As demonstrated in the framework model (see Figure 1), SMCs and depressive symptoms can co-occur before or after the onset of decline in cognitive performance and often exist across the stages of neurocognitive disorder or dementia or across IADL limitations and social participation restrictions (Jessen et al., 2014; Yates et al., 2017). As this framework model depicts, and as reported in previous studies, SMCs and depressive symptoms are generally accepted to be cross-sectionally associated with cognitive impairment, IADL limitations, and social participation restrictions (Burmester et al., 2016; Connolly et al., 2017; Lee et al., 2021). However, whether SMCs predict future cognitive impairment, IADL limitations, and social participation restrictions is still inconclusive.

Many studies have reported that SMCs are associated with cognitive impairment and predict future cognitive impairments, including mild neurocognitive disorder, dementia, or Alzheimer's disease (Burmester et al., 2016; Cherbuin et al., 2015; Hays et al., 2018; Hohman et al., 2011; Jessen et al., 2014; Jonker et al., 2000; Mitchell et al., 2014; Treves et al., 2005), whereas other studies have shown no such associations (Pearman et al., 2014; Reid & MacLullich, 2006; Rönnlund et al., 2011; Shmotkin et al., 2013). These inconsistencies may be due to the state-like nature of SMCs in that, as mentioned earlier, they may develop and disappear over time and in various situations. For example, people who have reported SMCs for years may stop complaining because they have lived with memory decline for a while and have adapted to it (Lee, 2021; Pearman et al., 2014). They may report SMCs again if they experience a noticeable change in cognitive performance. In this case, the outcome of whether SMCs predict cognitive impairment will vary depending on when it is measured. Therefore, to obtain a better understanding of the relationship between SMCs and cognitive impairment, this study used longitudinal analysis to measure changes in SMCs and examine whether these changes in SMCs would predict future cognitive, especially memory, decline in older adults.

There are very few studies that have investigated the longitudinal relationship between SMCs and IADL performance in older adults, and the results have been inconsistent. For example, Cordier et al.'s (2019) study concluded that SMCs may be a risk factor for IADL

Figure 1. Conceptual framework.



Note. From *Do Subjective Memory Complaints Predict Cognitive Impairment and Instrumental Activities of Daily Living Limitations in the Oldest-Old?* by C. D. Lee (Publication No. 28416195) [Doctoral dissertation, New York University], ProQuest Dissertations and Theses Global, 2021. Adapted with permission. IADL = instrumental activities of daily living.

limitations, whereas Lee (2021) reported that SMCs do not predict future IADL limitations. However, these studies use nonoverlapping samples that do not span older adulthood, with Cordier et al. (2019) using only women ages 70 to 75 yr and Lee (2021) using only the "oldest-old" adults (ages 80 and older), so it is still unclear whether SMCs predict IADL limitations in the general older adult population. Thus, this study examines whether SMCs predict future IADL decline across the range of older adulthood.

Another important potential outcome of SMCs is social participation restrictions. SMCs may predict future social participation restrictions in older adults because people's increased concern about their memory may trigger fear of embarrassing situations that may occur because of memory issues during interpersonal interactions. This fear may then lead to an attempt to prevent embarrassing moments by avoiding circumstances that demand memory, such as social activities (Lee et al., 2021). Only one study has investigated the association between SMCs and social participation restrictions, and it found that SMCs are associated with social participation after controlling for demographic, health-related, and environmental factors in older adults, yet it is unknown whether SMCs predict social participation restrictions (Lee et al., 2021). Therefore, to identify the aforementioned potential implications of SMCs for social participation, this study examined whether SMCs predict future social participation decline.

The purpose of this study is to examine whether changes in SMCs over time predict future decline in memory, IADL performance, and social participation in older adults. This study investigates the aforementioned longitudinal relationships in a large, nationally representative sample of older adults across the span of older adulthood.

Method

Data Source

This study used Health and Retirement Study (HRS) data, panel data from a survey of a nationally representative sample of the adult population (ages 50 and older) and their spouses of any age in the United States (Sonnega, 2015). The HRS is the largest and most comprehensive panel study that collects extensive information regarding demographics, family structure, housing, pension, financial status, health, cognition, psychosocial biomarkers, lifestyle, employment, and disability (Sonnega et al., 2014). The HRS has collected data every 2 yr beginning in 1992, some from people who have previously taken the survey (generally, participants are asked to complete the survey every 4 yr) and some from new participants (Sonnega, 2015).

Study Samples

This study used two samples consisting of community-dwelling older adults ages 65 and older, because the variables of interest (memory, IADL performance, and social participation) started to be collected at different time points (waves). Sample 1 was drawn from the data collected between 2004 and 2018 (eight waves) to examine the association of SMCs with memory and IADL performance. The HRS followed up with participants every 4 yr, so the 2004 and 2006 data were combined as Time Point 0 (T0); the 2008 and 2010 data, as Time Point 1 (T1); the 2012 and 2014 data, as Time Point 2 (T2); and the 2016 and 2018 data, as Time Point 3 (T3). Sample 2 was drawn from the data collected between 2008 and 2018 (six waves) to examine the association between SMCs and social participation. As with Sample 1, the 2008 and 2010 samples were combined as T0; the 2012 and 2014 data, as T1; and the 2016 and 2018 data, as T2.

Respondents who did not respond to any of the questions measuring the independent (i.e., subjective memory), dependent (i.e., memory function and IADL performance for Sample 1; social participation for Sample 2), or control (i.e., depressive symptoms) variables were excluded. To increase reliability of the measured outcomes, this study also excluded respondents who may have been unaware of their memory decline because of significant cognitive impairment; respondents whose immediate and delayed word recall test scores were below −2 *SD* from the sample means were removed. Thus, Sample 1 comprised a total of 2,493 older adults, and Sample 2 comprised 1,644 older adults (Figure 2).

Measures

Independent Variable: SMCs

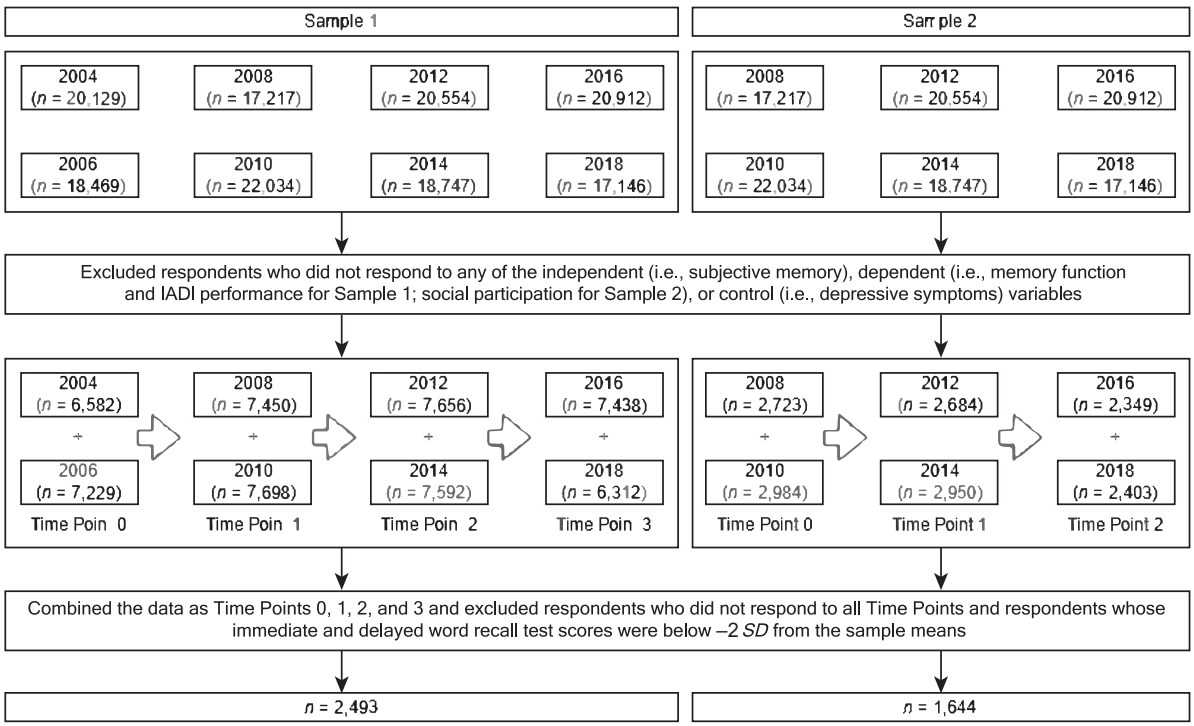
The HRS uses a single question to measure respondents' subjective memory: "How would you rate your memory at the present time? Would you say it is *excellent* (5), *very good* (4), *good* (3), *fair* (2), or *poor* (1)?" (Ofstedal et al., 2005).

Dependent Variable

Memory function. Immediate and delayed word recall tests were used to measure memory function. The tests included four sets of words (10 words for each list), and one of the four lists was randomly assigned to a respondent. For the immediate memory test, the HRS interviewer read the 10 words to the respondent, and the respondent immediately recalled as many words as possible in any order. For the delayed memory test, approximately 5 min after the immediate memory test, the respondent again recalled the same words in any order. Scores ranged from 0 (*worst*) to 10 (*best*) for each test; higher scores indicate better memory performance (Ofstedal et al., 2005).

IADL performance. A self-reported questionnaire was used to measure IADL performance. The respondents answered "yes (0)" or "no (1)" to whether they had any difficulty performing six IADLs: meal preparation, grocery shopping, using the phone, taking

Figure 2. Study sample.



Note. IADL = instrumental activities of daily living.

medications, managing finances, and using maps. Answers to each question were summed to yield a score ranging from 0 to 6, with higher scores indicating better IADL performance (Fonda & Herzog, 2004).

Social participation. Self-reported frequency of involvement in eight activities—caregiving; volunteering; charity work; sport, social, or other club activities; nonreligious organization (political, community, or other interest groups) activities; using a computer; playing games; and physical activities—was used to assess social participation (Smith et al., 2017). The questions were answered on 7-point Likert scales (1 = *never or not relevant*, 2 = *not in the past month*, 3 = *at least once a month*, 4 = *several times a month*, 5 = *once a week*, 6 = *several times a week*, and 7 = *daily*) and summed to yield a total score ranging from 8 (*worst*) to 56 (*best*).

Controlling Variable: Depressive Symptoms

The HRS uses the eight-item Center for Epidemiologic Studies Depression Scale to assess respondents' depressive symptoms (Steffick, 2000). The respondents reported whether, during the past week, they (1) felt depressed, (2) felt that everything they did was an effort, (3) felt that their sleep was restless, (4) were happy, (5) felt lonely, (6) enjoyed life, (7) felt sad, or (8) could not get going. The respondents answered "yes (1)" or "no (0)," the scoring of positive items (happy and enjoyed life) was reversed, and item scores were summed. Scores ranged from 0 to 8, with lower scores indicating fewer depressive symptoms (Steffick, 2000).

Statistical Analyses

We used descriptive statistics to analyze demographic characteristics. Pearson's correlation coefficient was used to examine the relationships of SMCs with immediate and delayed memory, IADL performance, and social participation at baseline. Fixed-effects models were used to examine whether changes in SMCs over time predict future decline in memory, IADL performance, and social participation. The relationships of SMCs with memory and IADL performance were examined in Sample 1, and the relationship between SMCs and social participation were examined in Sample 2. Fixed-effects models were generally used to examine the effect of variables that vary over time (i.e., time-varying variables such as SMCs and depressive symptoms) on dependent variables (i.e., memory function, IADL performance, and social participation). The fixed-effects model has the strength that it can control for the effect of time-invariant variables (i.e., less affected by time; for example, gender, marital status, and employment status in older adults) and other unobserved variables (e.g., educational level and net income; Allison, 2009). All statistical analyses were performed using Stata (Version 13.1).

Results

Demographics and descriptive characteristics for study variables—including independent (i.e., SMCs and depressive symptoms), dependent (i.e., memory function, IADL performance, and social participation), and controlling (i.e., gender, marital status, and employment

Table 1. Sample Characteristics at Time Point 0 (Baseline)

Characteristic	Sample 1 (*N* = 2,493)	Sample 2 (*N* = 1,644)
Age, *M* (*SD*), range	70.16 (4.36), 65–92	71.52 (4.78), 65–92
Female	1,468 (58.9)	928 (56.5)
Marital status *n* (%)		
Married	1,682 (67.5)	1,121 (68.2)
Separated	25 (1.0)	10 (0.6)
Divorced	250 (10.0)	165 (10.0)
Widowed	470 (18.9)	303 (18.5)
Never married	64 (2.6)	43 (2.6)
Missing	2 (0.0)	2 (0.1)
Employment status *n* (%)		
Working	633 (25.4)	374 (22.7)
Unemployed	21 (0.8)	13 (0.8)
Disabled	46 (1.9)	22 (1.3)
Retired	1,559 (62.5)	1,118 (68.0)
Homemaker	222 (8.9)	112 (6.8)
Missing	12 (0.5)	5 (0.3)
Subjective memory, *M* (*SD*), range	2.08 (0.85), 1–5	2.08 (0.82), 1–5
Depressive symptoms, *M* (*SD*), range	0.91 (1.52), 0–8	0.79 (1.42), 0–8
Social participation		16.21 (6.64), 0–56

status) variables—are shown in Table 1. The mean age of Sample 1 at T0 was 70.2 yr ($SD = 4.4$; range = 65–92), and 58.9% ($n = 1{,}468$) were female. The mean age of Sample 2 at T0 was 71.5 yr ($SD = 4.8$; range = 65–92), and 56.5% ($n = 928$) were female. In both samples, the majority of respondents reported that they were married (67.5% and 68.2%, respectively) and retired (62.5% and 68.0%, respectively).

In Sample 1, SMCs were significantly correlated with immediate memory ($r = .19$, $p < .001$) and delayed memory ($r = .20$, $p < .001$), IADL performance ($r = .14$, $p < .001$), and depressive symptoms ($r = -0.16$, $p < .001$) at T0 (baseline). Also, in Sample 2, SMCs were significantly correlated with social participation ($r = .20$, $p < .001$) and depressive symptoms ($r = -.18$, $p < .001$) at T0 (baseline).

The fixed-effect model results are shown in Table 2. Cognitive function (i.e., immediate and delayed memory), IADL performance, and social participation all declined over time (all ps < .001, except for the decline in IADL performance between T0 and T1, $p < .01$). Change in SMCs was a significant predictor for future immediate ($B = 0.06$, $SE = 0.23$, $p < .01$) and delayed memory decline ($B = 0.10$, $SE = 0.03$, $p < .001$) after controlling for depressive symptoms), explaining, respectively, 46.2% of the variance, $F(5, 7432) = 168.84$, and 48.7% of the variance, $F(5, 7432) = 159.32$. Change in SMCs was also a significant predictor for future IADL decline ($B = 0.03$, $SE = 0.01$, $p < .001$) and social participation decline ($B = 2.61$, $SE = 0.13$, $p < .05$) after controlling for depressive symptoms, and these models explain, respectively, 40.8% of the variance, $F(5, 7432) = 110.28$, and 70% of the variance, $F(4, 3270) = 133.87$.

Discussion

This study examined the relationships of SMCs with memory, IADL performance, and social participation. We found that changes in SMCs over time predict future decline in memory, IADL performance, and social participation in older adults after controlling for depressive symptoms.

The finding that increases in SMCs predict future memory decline is consistent with previous findings (Cherbuin et al., 2015; Hohman et al., 2011; Jessen et al., 2014; Jonker et al., 2000; Mitchell et al., 2014; Treves et al., 2005). Although it is generally accepted that SMCs predict memory impairment, as mentioned earlier, some studies have argued that there is no association. However, our study takes into account the state-changing nature of SMCs, which may be an essential factor for understanding the relationship of SMCs with cognitive impairment. Thus, our findings may help clear up some inconsistencies in the previous literature regarding the longitudinal relationships between SMCs and cognitive impairment.

This study also found that increases in SMCs predict future IADL decline in older adults. This result is consistent with the work of Cordier et al. (2019), which found that SMCs predict changes in

Table 2. Fixed-Effects Model Results

Variable	*B*	*SE*	*t*	*p*
Immediate memory[a]				
Subjective memory	0.06	0.23	2.66	.00**
Depressive symptoms	0.01	0.01	0.96	.34
T1	−0.25	0.03	−7.59	.00***
T2	−0.55	0.03	−16.75	.00***
T3	−0.87	0.03	−26.42	.00***
Intercept	5.65	0.05	103.32	.00***
Delayed memory[b]				
Subjective memory	0.10	0.03	3.61	.00***
Depressive symptoms	−0.01	0.01	−0.75	.46
T1	−0.30	0.03	−7.92	.00***
T2	−0.60	0.03	−15.47	.00***
T3	−1.00	0.03	−25.59	.00***
Intercept	4.64	0.06	71.76	.00***
IADLs[c]				
Subjective memory	0.03	0.01	3.23	.00***
Depressive symptoms	−0.04	0.00	−8.83	.00***
T1	−0.04	0.01	−2.81	.00**
T2	−0.08	0.01	−5.89	.00***
T3	−0.23	0.01	−18.11	.00***
Intercept	5.87	0.02	273.90	.00***
Social participation[d]				
Subjective memory	2.61	0.13	2.07	.04*
Depressive symptoms	−0.23	0.06	−3.52	.00***
T1	−2.00	0.14	−14.79	.00***
T2	−2.92	0.14	−21.28	.00***
Intercept	7.84	0.29	27.42	.00***

Note. IADLs = instrumental activities of daily living; T = time point.
[a]$N = 2{,}493$; $F(5, 7432) = 168.84$; $p < .001$; adjusted $R^2 = .4619$.
[b]$N = 2{,}493$; $F(5, 7432) = 159.32$; $p < .001$; adjusted $R^2 = .4869$.
[c]$N = 2{,}493$; $F(5, 7432) = 110.28$; $p < .001$; adjusted $R^2 = .4078$.
[d]$N = 1{,}644$; $F(5, 3270) = 133.87$; $p < .001$; adjusted $R^2 = .7034$.
*$p < .05$. ** $p < .01$. *** $p < .001$.

independence in IADL performance among older women ages 70 to 75 yr, and extends it to a nationally representative U.S. sample of men and women over age 60. However, this result is inconsistent with the work of Lee (2021), which found that SMCs do not predict IADL limitations among the oldest-old population. This inconsistency may be due to the age range of the samples, as Lee's study only included oldest-old adults over age 80 yr (Lee, 2021). IADL performance among many oldest-old people has already significantly declined, so it may have been difficult to clearly identify the relationship between SMCs and IADL limitations in Lee's study because of a floor effect (Lee, 2021; Millán-Calenti et al., 2010). Another reason is that Lee's study investigated whether the initial state of SMCs predicts IADL limitations. However, oldest-old adults may no longer report SMCs for some reasons; for example, they have already become accustomed to living with limited cognitive function (Lee, 2021). Thus, SMCs may not predict IADL limitation in the oldest-old population because of their specific characteristics rather than the characteristics identified in the general older adult population.

This study, to our knowledge, is the first to identify that increases in SMCs predict future social participation decline in older adults. There are two possible reasons for this relationship. As mentioned earlier, because of the fear of embarrassing moments triggered by SMCs, people may avoid participating in cognitively demanding social activities (Lee et al., 2021).

Another possible reason is that SMCs are actually early indicators of cognitive impairment and may be more sensitive than cognitive tests (Cleary, 1997). In other words, because cognitive function is a determinant of social participation, SMCs predict social participation restrictions (Pinto & Neri, 2017). More studies are required to confirm the relationship between SMCs and social participation restrictions in older adults.

These findings are clinically significant and important to occupational therapists. Many health care providers, including occupational therapists, have overlooked SMCs unless objective cognitive impairment is identified (Adams, 2016). However, our study shows that SMCs independently predict future objective memory impairment, IADL limitations, and social participation restrictions, all of which are considered important outcomes by occupational therapists. Therefore, occupational therapists should pay more attention to SMCs so that clients with SMCs do not miss the opportunity to receive appropriate examination and intervention that address these factors (Adams, 2016). On the basis of our findings, more specifically, occupational therapy interventions can focus on improving SMCs as well as maintaining or improving cognitive function, IADL performance, and social participation.

This study has several limitations. First, because this study used existing data, it could not take into account the effect of other time-varying factors that may affect SMCs, memory, IADL performance, or social participation (e.g., anxiety, neuroticism, and subjective health). Therefore, future research should incorporate additional potentially influential factors to better understand the relationships of SMCs with memory impairment, IADL limitations, and social participation restrictions. Additionally, the measures may not be optimal for our research questions and lack published psychometric properties. Thus, the findings should be interpreted cautiously. Another limitation is that we used two samples instead of one to understand the relationships of SMCs with memory, IADL performance, and social participation. The HRS has been measuring memory in its current form since 2002, whereas the social participation measure was newly added in 2008. A single sample based on social participation data would have resulted in a loss of 4 to 6 yr of data that could have been used to identify the relationships of SMCs with memory and IADL performance. Thus, to avoid a risk of bias caused by data loss, we opted to use two samples.

Implications for Occupational Therapy Practice

This study has the following implications for occupational therapy practice:

- Occupational therapists should consider and evaluate the memory complaints of their clients, especially older adults.
- Addressing SMCs may support future cognitive function, IADL performance, and social participation among older adult clients.

Conclusion

This study found that increases in SMCs predict future decline in memory, IADL performance, and social participation after accounting for depressive symptoms. Our results are consistent with previous findings that SMCs predict memory impairment, and they contribute to understanding the relationships of SMCs with IADL performance and social participation in older adults. They suggest that SMCs can be used as an early indicator of memory impairment, IADL limitations, and social participation restrictions in the older adult population. Furthermore, interventions that minimize SMCs may help older adults achieve successful aging.

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