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Subjective Difficulty with Higher-Level Functional Capacity in Community-Dwelling Older People withMild Cognitive Impairment

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Subjective Difficulty with Higher-Level Functional Capacity in Community-Dwelling Older People with Mild Cognitive Impairment

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Abstract

Background and Purpose : Mild cognitive impairment (MCI) is a predictor of future age-related dementia. We herein investigated associations of MCI with higher-level functional capacities, as well as with subjective difficulty regarding these functions, in community-dwelling older people, to identify a simple method for early MCI detection.

Method : We administered a test battery to 118 community-dwelling older people living in an urban area. The battery consisted of three tests ; the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC), the Touch Panel-type Dementia Assessment Scale (TDAS), and the Geriatric Depression Scale-15. We then excluded participants with possible dementia or depression symptoms, and divided the remainder (n = 67) into an MCI group (n = 16) and a non-MCI group (n = 51), according to TDAS performance.

Results : Logistic regression analysis with the MCI and non-MCI groups as dependent variables indicated that TMIG-IC was a significant variable. Male sex and the perception that preparing meals and filling out pension forms had become more difficult were significantly associated with MCI, each independently increasing the probability of MCI.

Conclusions : Subjective difficulty with higher-level functions and impairment in higher-level functional capacity may serve as indices for mass screening for MCI.

Key words : mild cognitive impairment, instrumental activities of daily living, geriatric depression, dementia risk screening, age-related dementia

Introduction

Currently, 27.7% of Japanese citizens are aged ≥ 65 years, and this percentage is expected to continue to increase at least until the year 2050[1)]. This demographic change is likely to pose various social and medical challenges, including an increase in the prevalence of age-related dementia. Among those aged ≥ 65 years, 4.3 million (15%) and 3.8 million (13%) have been diagnosed with dementia and mild cognitive impairment (MCI), respectively[2)]. Approximately 10-15% of individuals with MCI are reported to eventually develop Alzheimer's disease (AD)[3)], compared to only 1-2% in those with normal cognitive function, indicating that MCI is a major risk factor for subsequent dementia. Thus, early detection of MCI is necessary to effectively implement interventions aimed at slowing its progression to AD.

However, there are no standard diagnostic cri-

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teria for MCI have yet to be established. Although MCI has been diagnosed in previous studies in Japan, using various assessment methods, such as the Japanese version of the Montreal Cognitive Assessment[7], Mini-Mental State Examination[8], Five Cognitive Test[9], and Clinical Dementia Rating, these tests must be administered by specialists and are time-consuming, particularly when the subjects have physical or mental disabilities. Thus, it would be helpful to develop a simple objective MCI screening tool that screens the older population for diverse physical and mental conditions, thereby facilitating early interventions aimed at preventing dementia.

Memory impairment is less prominent in the MCI stage, but minor problems occur concerning Instrumental Activities of Daily Living (IADLs)[10]. It has also been reported that older adults with MCI require more instructions when performing IADLs than those without MCI[11]. These findings suggest that people with MCI may experience a decline in IADLs and other daily living functions before their disability becomes apparent. The decline in these capacities may be more easily noticed by family, friends, or neighbors, who may suggest initiation of treatment. On the other hand, there is no correlation between scales developed to objectively measure functional abilities for independent living in MCI and informant questionnaires on cognitive decline in older people[12]. In addition, behavioral impairment in patients with MCI may be more significant than perceived by caregivers, or MCI patients may consider their cognitive impairment to be milder and less significant than their caregivers perceive[13]. In other words, the functional status of older people reported by their family members or caregivers may underestimate or overestimate their functional decline. High levels of subjective memory impairment despite normal objective cognitive function may identify a subset of individuals who are at high risk of developing dementia[14]. If people with mild cognitive decline were aware of, and could report difficulties in, higher-order activities such as IADLs, similar to the way that older adults are aware of and complain about memory impairment, the likelihood of early detection of cognitive decline would be greater and the disadvantage of delayed initiation of treatment might be lessened. Therefore, the present study aimed to examine the associations between MCI and both functional capacity scores and subjective difficulty with higher-level daily activities in community-dwelling older people.

Methods

1. *Participants (Figure)*

Participants were recruited from older residents in A City, K Prefecture, through community pamphlets. These pamphlets were distributed door-to-door to the homes of those who wished to receive them and were delivered via newspaper inserts. The pamphlets were also made available at approximately 90 public locations in and around the city, including train stations, banks, post offices, convenience stores, and community centers. The city had a population of approximately 130,000 people, about 30,000 (23%) of whom were aged ≥ 65 years.

A total of 144 candidates applied for the study. Applicants with a definitive diagnosis of dementia, those receiving support for age-related disabilities, and those requiring long-term care were excluded. As a result, 118 participants were enrolled in this study, where demographic characteristics, cognitive function, and depression tendencies were assessed.

In addition, those suspected of having dementia, as evidenced by a score of ≥ 14 points on the Touch Panel-type Dementia Assessment Scale (TDAS)[15], and those with depression symptoms, as evidenced by a score of ≥ 5 points on the Geriatric Depression Scale-15 (GDS-15)[16], were excluded from the analyses. Therefore, a final total of 67 participants were analyzed and divided into the MCI and non-MCI groups.

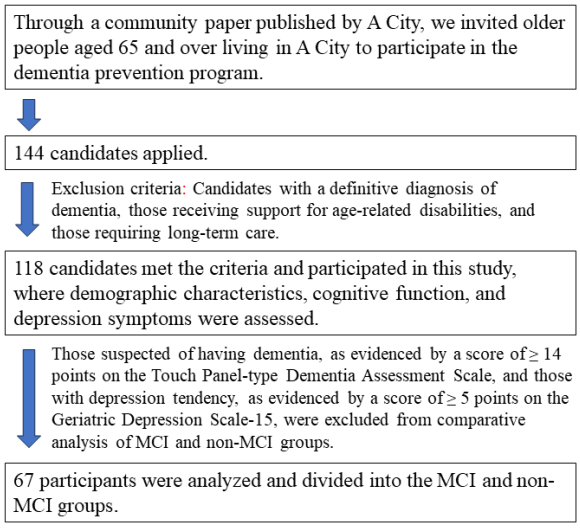

Fig. Diagram showing the participant selection and analysis process

2. Measurements

First, a mail survey on demographic characteristics was conducted, followed by assessments of higher-level functional capacities, depression symptoms, and cognitive function, all of which were conducted at our facility. The demographic characteristics were used in surveys conducted via mail to reduce the time spent at the facility as well as the burden on the participants.

i. Demographic characteristics

The characteristics collected were age, sex, and educational background (1. elementary school or equivalent ; 2. junior high school or equivalent ; 3. high school or equivalent ; or 4. university/junior university/vocational school or equivalent).

ii. Higher-level functional capacities

Higher-level functional capacities were assessed using a 13-item questionnaire called the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC)[17]. The score range was 0-13, with higher scores indicating higher capacity. The TMIG-IC results were also used to calculate scores for instrumental self-maintenance (score range 0-5), intellectual activities (score range 0-4), and social roles (score range 0-5). In addition, we asked about the participants' subjective difficulty regarding each of these activities, with the following response options : "about the same as five years ago," "slightly more difficult than five years ago," or "much more difficult than five years ago."

iii. Depression symptoms

Depression symptoms were measured using the GDS-15[16], a 15-item measure of depression for older people. The scores ranged from 0-15, with 0-4 rated as normal, 5-9 as having depressive tendencies, and ≥ 10 as having depression.

iv. Cognitive function

We used the TDAS test, which is a touchscreen assessment of cognitive function based on the widely used Alzheimer's Disease Assessment Scale[15]. It consists of nine tasks : word recognition, following commands, orientation, visual-spatial perception, naming fingers, object recognition, the accuracy of the order of a process, money calculation, and clock time recognition (non-digital) ; with ≤ 6 considered normal, 7-13 considered indicative of MCI, and ≥ 14 considered indicative of the possible presence of dementia[18]. We then classified participants with TDAS scores of 6 or less as the non-MCI group and those with scores of 7 to 13 as the MCI group. This tool detects dementia with a sensitivity of 96% and a specificity of 97%[15,19].

v. Statistical analyses

We divided the participants into two groups according to their TDAS scores. As stated previously, those with scores of ≥ 14 were excluded. Their demographic characteristics were compared using univariate analyses, the independent-samples t-test, or Fisher's exact test. The frequencies of impairments in, and subjective difficulty with, higher-level functional capacities were compared using Fisher's exact test, and those who responded "slightly more difficult than five years ago" and "much more difficult than five years ago" were defined as having subjective difficulty with these functions.

Next, logistic regression analysis was used as a multivariate analysis, controlling for potentially confounding variables. Independent variables were those variables that were significantly different between the non-MCI and MCI groups in the univariate analysis described above. The dependent variable was set to 0 for the non-MCI group and 1 between the MCI groups. For variable selection, we used the variable incremental method, which tests the addition of variables based on the probability of the likelihood ratio statistic.

All statistical analyses were conducted using IBM SPSS Statistics ver. 22 for Windows (IBM Corp., Armonk, NY, USA), and two-tailed p-values of < 0.05 were considered statistically significant for all tests.

3. Ethical considerations

All participants were informed orally and in writing of the study's aims and content as well as the management of personal information, after which they provided informed written consent. All research procedures were approved by the Research Ethics Committee of Kitasato University (approval number : 2015-003).

Results

1. Demographic characteristics of participants and comparison of higher-level functional capacities by sex

The participant characteristics are summarized in Table 1. The cohort was predominantly female, and there was no significant difference between the sexes regarding mean age. The TMIG-IC scores were significantly higher in the women than in the men, despite a significant difference between the sexes regarding the distribution of education levels, with the most common education backgrounds being

Table 1. Basic attributes of the study participants

Variables		Male (n = 32)	Female (n = 86)	Total (n = 118)	p	Mean difference	95% confident interval for mean difference	
							lower	upper
Age (years)		75.7±5.3	73.9±5.3	74.3±5.3	0.10	1.81	−0.35	3.97
TMIG-IC (/13 items)		11.4±1.8	12.3±1.0	12.0±1.3	<0.01*a	−0.83	−1.36	−0.30
Educational background	Junior high school equivalent	4 (12.5)	18 (20.9)	22 (18.6)	<0.01*b			
	High school equivalent	11 (34.4)	54 (62.8)	65 (55.1)				
	University/Junior university/ Vocational school equivalent	17 (53.1)	14 (16.3)	31 (26.3)				

TMIG-IC, Tokyo Metropolitan Institute of Gerontology Index of Competence
Values are presented as n (%).
Statistical test ; *a Independent t-test, *b Fisher's exact test.

university-level among the men and high school-level among the women.

The results of the GDS-15 and TDAS by sex are shown in Table 2. Among the total cohort of 118 participants, 47 scored ≥ 5 on the GDS-15, indicating depressive symptoms/depression. On the TDAS, 10 participants scored ≥ 14, which is indicative of possible dementia, whereas 22 scored 7-13, which is indicative of MCI. There were no significant differences between the sexes regarding the GDS-15 and TDAS scores.

The demographic characteristics of the participants who had both depressive symptoms/depression or possible dementia (n = 51) and those who did not (n = 67) were compared (Table 3), revealing no significant differences regarding age, sex ratio, or educational background. However, a comparison of TMIG-IC scores between those with depressive symptoms and those without showed that the latter

Table 2. Results of the GDS-15 and TDAS

Variables		Male (n = 32)	Female (n = 86)	Total (n = 118)	p
GDS-15	< 5	20 (45.5)	51 (59.3)	71 (60.2)	0.83
	≥ 5	12 (37.5)	35 (40.7)	47 (39.8)	
TDAS	≥ 7	19 (59.4)	67 (77.9)	86 (72.9)	0.09
	7-13	10 (31.3)	12 (14.0)	22 (18.6)	
	≥ 14	3 (9.4)	7 (8.1)	10 (8.5)	

GDS-15 ; Geriatric Depression Scale-15
TDAS ; Touch Panel-type Dementia Assessment Scale
Values are presented as n (%)
Statistical test ; Fisher's exact test

Table 3. The demographic characteristics of the participants having both depression symptoms/depression and possible dementia and those having neither depression nor possible dementia

Variables		Participants with depression tendency/ depression or possible dementia (n = 51)	Participants without depression tendency/ depression or possible dementia (n = 67)	p	Mean difference	95% confidence interval for mean difference	
						Lower limit	Upper limit
Age		74.8±5.2	74.0±5.4	0.47*a	0.72	−1.24	2.61
Sex	Male	14 (27.5)	18 (26.9)	1.00*b			
	Female	37 (72.5)	49 (73.1)				
TMIG-IC (/13 items)		11.5±1.3	12.4±1.2	<0.01*a	−0.90	−1.37	−0.44
Educational background	Junior high school equivalent	13 (25.5)	9 (13.4)	0.27*b			
	High school equivalent	26 (51.0)	39 (58.2)				
	University/Junior university/Vocational school equivalent	12 (23.5)	19 (28.4)				

TMIG-IC ; Tokyo Metropolitan Institute of Gerontology Index of Competence
Values are mean ± SD or n (%).
Statistical test ; *a Independent t-test, *b Fisher's exact test

scored significantly higher than the former.

2. Comparison of demographic characteristics between the MCI and non-MCI groups

The 67 participants without depressive symptoms or possible dementia were divided into an MCI group (n = 16) and a non-MCI group (n = 51), as described previously. The mean age of the MCI group was significantly higher than that of the non-MCI group and included a significantly greater proportion of males. The TMIG-IC scores and instrumental self-maintenance were lower in the MCI group than in the non-MCI group. There were no significant differences in intellectual activities, social roles, or educational background between the groups (Table 4).

3. Comparisons of higher-level functional capacity scores between the MCI and non-MCI groups

Comparisons of each variable (Table 5) showed a significant difference in the proportion of negative responses ("no") to one of the questions about social roles ("Are you sometimes called on for advice?"), which was higher in the MCI group compared to the non-MCI group.

4. Comparison of subjective difficulty with higher-level functions between the MCI and non-MCI groups

Table 6 shows the rates of subjective difficulty with higher-level functions compared to five years earlier in the MCI and non-MCI groups. Significant differences were observed in two variables, with higher rates in the MCI group : "Are you able to prepare meals by yourself?" and "Are you able to fill out forms for your pension?".

5. Logistic regression analysis

Logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age, and TMIG-IC as independent variables, revealed that the only significant variable was TMIG-IC (p = 0.03), with an odds ratio of 0.59 (95% confidence interval [CI] : 0.37-0.94), indicating that a 1-point higher TMIG -IC score is associated with an approximately 0.6-fold increase in the likelihood of MCI (Table 7).

In a logistic regression analysis using sex, age, and TMIG instrument self-maintenance score as independent variables, sex was a significant variable (p = 0.02). The odds ratio was 0.24, and the 95% CI was 0.07-0.81. Being female increased the odds of developing MCI by 0.25 times (Table 8).

The results of the logistic regression analysis using the TMIG sub-item "Are you sometimes called on for advice? "as the independent variable, with 0 for "no" and 1 for "yes" revealed that the only significant variable was the TMIG sub-item (p = 0.04). The odds ratio was 0.09 (95% CI : 0.01-0.90), indicating that a participant who was called on for advice had a lower probability of having MCI (Table 9).

The independent variable was TMIG's sub-item

Table 4. Comparison of basic attributes between MCI and non-MCI groups

Variables		MCI (n = 16)	non-MCI (n = 51)	p	Mean difference	95% confidence interval for mean difference	
						Lower limit	Upper limit
Age (years)		76.6±5.0	73.2±5.4	0.03*a	−0.33	−6.34	−0.31
Sex	Male	8 (50.0)	10 (19.6)	0.03*b			
	Female	8 (50.0)	41 (80.4)				
TMIG-IC (/13 items)		11.8±2.1	12.6±0.6	0.01*a	0.90	0.23	1.56
	Instrumental self-maintenance (/5 items)	4.8±0.8	5.0±0.0	0.02*a	0.25	0.04	0.46
	Intellectual activity (/4 items)	3.6±0.7	3.9±0.3	0.08*a	0.23	−0.03	0.50
	Social role (/4 items)	3.4±1.2	3.8±0.5	0.06*a	0.40	−0.02	0.84
Education background	Junior high school equivalent	3 (18.8)	6 (11.8)				
	High school equivalent	7 (43.8)	32 (62.7)	0.42*b			
	University/Junior university/ Vocational school equivalent	6 (37.5)	13 (25.5)				

MCI ; mild cognitive impairment, TMIG-IC ; Tokyo Metropolitan Institute of Gerontology Index of Competence
Values are mean ± SD or n (%).
*a Independent t-test. *b Fisher's exact test.

Table 5. Comparison of higher-level functional capacities between MCI and non-MCI groups

Variables		MCI (n = 16)		non-MCI (n = 51)		p
(1) Can you use public transportation (bus or train) by yourself?	Yes	16	(100.0)	51	(100.0)	NA
	No	0	(0.0)	0	(0.0)	
(2) Are you able to shop for daily necessities?	Yes	16	(100.0)	51	(100.0)	NA
	No	0	(0.0)	0	(0.0)	
(3) Are you able to prepare meals by yourself?	Yes	14	(87.5)	51	(100.0)	0.05
	No	2	(12.5)	0	(0.0)	
(4) Are you able to pay bills?	Yes	15	(93.8)	51	(100.0)	0.24
	No	1	(6.2)	0	(0.0)	
(5) Can you handle your own banking?	Yes	15	(93.8)	51	(100.0)	0.24
	No	1	(6.2)	0	(0.0)	
(6) Are you able to fill out forms for your pension?	Yes	15	(93.8)	51	(100.0)	0.24
	No	1	(6.2)	0	(0.0)	
(7) Do you read newspapers?	Yes	14	(87.5)	45	(88.2)	1.00
	No	2	(12.5)	6	(11.8)	
(8) Do you read books or magazines?	Yes	14	(87.5)	50	(98.0)	0.14
	No	2	(12.5)	1	(2.0)	
(9) Are you interested in news stories or programs dealing with health?	Yes	15	(93.8)	51	(100.0)	0.24
	No	1	(6.2)	0	0.0	
(10) Do you visit the homes of friends?	Yes	12	(75.0)	43	(84.3)	0.46
	No	4	(25.0)	8	(15.7)	
(11) Are you sometimes called on for advice?	Yes	13	(81.2)	50	(98.0)	0.04
	No	3	(18.8)	1	(2.0)	
(12) Are you able to visit sick friends?	Yes	16	(100.0)	51	(100.0)	NA
	No	0	(0.0)	0	(0.0)	
(13) Do you sometimes initiate conversations with young people?	Yes	13	(81.2)	49	(96.1)	0.08
	No	3	(18.8)	2	(3.9)	

MCI ; mild cognitive impairment
Values are presented as n (%)
NA ; not applicable
Statistical test ; Fisher's exact test

"Are you able to prepare meals by yourself?" with the answers 0 for "About the same as 5 years ago" and 1 for "Slightly more difficult than 5 years ago" or "Much more difficult than 5 years ago". The results of the logistic regression analysis revealed that the significant variables were subjective difficulty level (p = 0.01) and sex (p = 0.02). The odds ratios were 12.67 (95% CI : 2.06-77.96) and 0.18 (95% CI : 0.04-0.74), indicating that participants who had increased subjective difficulty preparing meals for themselves had a 12-fold higher probability of having MCI. Moreover, being female increased a participant's odds of developing MCI by 0.20 times (Table 10).

Logistic regression was performed using the TMIG sub-item "Are you able to fill out the pension form" as the independent variable, with 0 being "about the same as 5 years ago" and 1 being "a little more difficult than 5 years ago" or "much more difficult than 5 years ago". The results of the analysis showed that the significant variables were subjective difficulty level ($p < 0.01$) and sex (p = 0.01). The odds ratios were 13.87 (95% confidence interval 2.38-80.71) and 0.17 (95% confidence interval 0.04-0.69), meaning that those with increased subjective difficulty in filling out documents had an approximately 14-fold increased probability of MCI. Furthermore, being female was a factor that increased the likelihood of developing MCI by approximately 0.20 times (Table 11).

Table 6. Comparison of subjective decline in higher-level functional capacity between MCI and non-MCI groups

Variables	Compared to 5 years ago	MCI (n = 16)	non-MCI (n = 51)	p
(1) Can you use public transportation (bus or train) by yourself?	About the same	12 (75.0)	45 (88.2)	0.23
	More difficult	4 (25.0)	6 (11.8)	
(2) Are you able to shop for daily necessities?	About the same	12 (75.0)	45 (88.2)	0.23
	More difficult	4 (25.0)	6 (11.8)	
(3) Are you able to prepare meals by yourself?	About the same	10 (71.4)	48 (94.1)	0.03
	More difficult	4 (28.6)	3 (5.9)	
(4) Are you able to pay bills?	About the same	14 (93.3)	50 (98.0)	0.41
	More difficult	1 (6.7)	1 (2.0)	
(5) Can you handle your own banking?	About the same	14 (93.3)	49 (96.1)	0.55
	More difficult	1 (6.7)	2 (3.9)	
(6) Are you able to fill out forms for your pension?	About the same	10 (66.7)	48 (94.1)	0.01
	More difficult	5 (33.3)	3 (5.9)	
(7) Do you read newspapers?	About the same or more often	12 (85.7)	36 (80.0)	0.72
	Less often	2 (14.3)	9 (20.0)	
(8) Do you read books or magazines?	About the same or more often	6 (42.9)	29 (58.0)	0.37
	Less often	8 (57.1)	21 (42.0)	
(9) Are you interested in news stories or programs dealing with health?	About the same or more interested	13 (86.7)	47 (92.2)	0.61
	Less interested	2 (13.3)	4 (7.8)	
(10) Do you visit the homes of friends?	About the same or more often	3 (25.0)	21 (48.8)	0.19
	Less often	9 (75.0)	22 (51.2)	
(11) Are you sometimes called on for advice?	About the same or more often	6 (46.2)	31 (62.0)	0.35
	Less often	7 (53.8)	19 (38.0)	
(12) Are you able to visit sick friends?	About the same	11 (68.8)	44 (86.3)	0.14
	More difficult	5 (31.2)	7 (13.7)	
(13) Do you sometimes initiate conversations with young people?	About the same or more often	6 (46.2)	36 (73.5)	0.09
	Less often	7 (53.8)	13 (26.5)	

MCI ; mild cognitive impairment
Values are presented as n (%).
Inappropriate responses were excluded from analysis.
Statistical test ; Fisher's exact test

Table 7. Logistic regression analysis results with sex, age, and total TMIG-IC score as independent variables

	Odds ratio	95%CI	p-value
TMIG-IC score	0.59	0.37-0.94	0.03

CI : confidence interval.
Statistical test ; logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age and TMIG Index of Competence score as independent variables

Table 8. Logistic regression analysis results with sex, age, and TMIG instrument self-maintenance score as independent variables

	Odds ratio	95%CI	p-value
sex	0.24	0.07-0.81	0.02

CI : confidence interval.
Statistical test ; logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age and TMIG instrument self-maintenance score as independent variables

Discussion

In the present study, we examined impairments in higher-level functional capacities and subjective difficulties with these functions among community-dwelling older adults with or without MCI to develop a convenient method for early detection of MCI. The results reported that higher-order functional

Table 9. Logistic regression analysis results with sex, age, and whether or not the participant is"Are you sometimes called on for advice?" as independent variables

	Odds ratio	95%CI	*p*-value
"Are you sometimes called on for advice?"	0.09	0.01–0.90	0.04

CI : confidence interval.
Statistical test ; logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age and TMIG's sub-item "Are you sometimes called on for advice?" as independent variables

Table 10. Logistic regression analysis results with sex, age, and the comparison of the perception of difficulty in "Are you able to prepare meals by yourself" compared to 5 years ago as independent variables

	Odds ratio	95%CI	*p*-value
sex	0.18	0.04–0.74	0.02
"Are you able to prepare meals by yourself?" (difficult than 5 years ago)	12.67	2.06–77.96	0.01

CI : confidence interval.
Statistical test ; logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age and TMIG's sub-item "Are you able to prepare meals by yourself?"

Table 11. Logistic regression analysis results for sex, age, and the comparison of the perception of difficulty in Are you able to fill out the pension form" compared to 5 years ago as independent variables

	Odds ratio	95%CI	*p*-value
sex	0.17	0.04–0.69	0.01
"Are you able to fill out the pension form?" (difficult than 5 years ago)	13.87	2.38–80.71	<0.01

CI : confidence interval.
Statistical test ; logistic regression analysis, using MCI and non-MCI as dependent variables, and sex, age and TMIG's sub-item "Are you able to fill out the pension form?"

abilities and increased subjective difficulties, such as preparing meals and filling out pension forms, were factors that independently and significantly affected individuals with MCI. It has been reported that memory impairment is less pronounced in the MCI stage, but minor problems occur with IADLs[10], and that older adults with MCI require more instructions when performing IADLs than older adults without MCI[11]. Moreover, people with dementia are typically aware of memory impairment[14]. These findings suggest that people with mild cognitive decline are aware of difficulties with higher-level functional capacities such as IADLs of preparing meals and filling out pension forms, and that assessment of these items in mass screenings may help detect potential MCI and allow for early intervention.

The prevalence of MCI in the present study (TDAS scores 7–13) was 18.6%, which is consistent with the results of a study by Shimada *et al.*, who reported a prevalence of 18.8% in a population of 5,014 community-dwelling older adults[20]. Furthermore, the rate of depressive symptoms (39.8%) is reasonably close to that previously reported by Kuzuya *et al.* (33%)[21], despite the small sample size. Therefore, we believe that our study population reasonably reflects the general community-dwelling older population in Japan.

Previous studies have reported a higher prevalence of IADL impairment in patients with MCI[22,23]. Fujiwara *et al.* reported that higher-level functional capacities in community-dwelling older adults with and without MCI decline in social functioning, social roles, intellectual activities, and IADL, in that order[23]. In the present study, social roles, intellectual activities, and IADL did not have independent effects on the MCI and non-MCI groups. In addition, the increase in perceived difficulty when filling out forms and preparing meals each influenced participants with MCI, but the influence of social role was unclear. This may be because of the recruitment method, which resulted in participation only by those who were literate, interested in local events (i.e., involved in the community), and able to walk independently. In other words, those with severe physical or cognitive disabilities did not or could not participate.

The most important finding in this study is that subjective decline in higher-level functional capacities was reported prior to the detection of such decline through quantitative tests and the occurrence of IADL disability. This finding is consistent with the results of a study by Radakowski *et al.*[11], which showed that older adults with MCI required assistance with shopping, making payments, property management, and medication management, indicating IADL impairment. This leads to speculation that reduced social and intellectual activities are often observed in individuals with early-stage MCI, and that it may be possible to detect MCI onset by analyzing the subjective difficulty ratings of these activities if objective assessment tools are unavailable.

Limitations of this research

One of the limitations of our study is that a greater number of older subjects had a decline in higher-level functional capacities after screening for MCI. Therefore, reducing transportation barriers to participation in future studies is needed to examine the association between impairment of higher-level functional capacities and MCI. Peduzzi[25] reported that in the case of logistic regression analysis, the number of samples in which the smaller event occurs must be 10 times the number of covariates. The MCI group in this study consisted of 16 patients, which would not be a sufficient sample size if two covariates were used. Therefore, large-scale longitudinal surveys are required to clarify the association between the decline in higher-level functional capacities and MCI progression.

The method suggested in the present study is simple to implement and does not require specialists. It may contribute to early detection of MCI and prevention of its progression to dementia, enhancing individual and public health in an increasingly aging society.

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Disclosure statement

On behalf of all the authors, the corresponding author states that there are no conflicts of interest.

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