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Physical and Sociopsychological Characteristics of Older Community Residents With Mild Cognitive Impairment as Assessed by the Japanese Version of the Montreal Cognitive Assessment

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Abstract

Background: Although mild cognitive impairment (MCI) criteria are disputable, characterizing various aspects of operational MCI (O-MCI) may lead to a better understanding of potential modulators of cognitive decline and contribute to more effective public health strategies. The aim of the study is to examine characteristics of community-dwelling elderly people with MCI assessed using Japanese version of Montreal Cognitive Assessment (MoCA-J). **Methods:** A total of 913 community-dwelling Japanese (65-84 years) participated in health examinations in Tokyo, 2011. The MoCA-J, Mini-Mental State Examination (MMSE), and other physical and mental tests were conducted. Excluded were those with <24 MMSE scores. Those with <26 in MoCA-J were divided into 2 subgroups, (A) participants independent of instrumental activities of daily living (IADL) and no memory complaints and (B) participants independent of IADL with memory complaints or partially dependent on IADL with/without memory complaints. Those with ≥26 in MoCA-J and subgroup (A) of MCI were the normal controls (NCs, 57.4%), and subgroup (B) of MCI was O-MCI, 36.5%. We compared each variable between NC and O-MCI, using logistic regression analysis, adjusted for gender and age. **Results:** The majority of all the groups were independent of IADL. The O-MCI characteristics were increased depressive symptom, worse self-rated health, lower systolic blood pressure, poorer intellectual activities, no hobbies, weaker grip strength, and slower than usual walking speed compared to the NC group. **Conclusions:** Older persons with O-MCI defined by MoCA-J have partially decreased cognition and physical and sociopsychological functions.

Keywords

Japanese version of the Montreal Cognitive Assessment, mild cognitive impairment, community-dwelling elderly people, physical function, sociopsychological function

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Introduction

Cognitive impairment is a major health issue, as it threatens the independence and activity levels of the elderly individuals. Although care services for older people with dementia have been promoted by the Public Long-Term Care Insurance System and medical services in Japan, difficulties encountered by those elderly individuals who experience mild cognitive decline are left unaddressed. Mild cognitive impairment (MCI) is a gray zone status that exists between dementia and normal aging. Previous longitudinal studies showed that older persons with MCI developed dementia at a rate of 10% to 15% per year, compared with a rate of 1% to 2% in control participants,[1]

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implying that MCI is a transient phase with a high risk of developing dementia. Unfortunately, those with MCI tend to be overlooked or classed as low risk, as they appear to be functioning, healthy, and capable members of their communities. In reality, older persons with cognitive decline, who are socially isolated and frail, can become easily overwhelmed in a disaster or in situations such as being swindled. Therefore, it is important to screen older persons in order to promptly distinguish those with MCI, not only in terms of cognitive function but also in terms of physical and sociopsychological functions, in order to provide them with appropriate intervention and services.

Since Reisberg and his colleagues introduced the term MCI into the literature in 1988,[2] MCI criteria have undergone a series of redefinitions as a result of rigorous testing and research. The recent international consensus on MCI criteria consists of 2 subtypes, amnestic (including memory impairment) and nonamnestic (impaired nonmemory cognitive domains) with the subtypes of single and multiple domain classification.[3] Diagnosis of MCI requires practical assessment through a series of semistructured interviews with proxies, using tools such as the clinical dementia rating.[4] However, it is actually difficult to screen for MCI according to information from family members or proxies, as the number of older persons living alone has rapidly increased over a very short period of time. In a community setting, the present geriatric health screening system does not cover detection of MCI. Therefore, brief and effective screening tests for older participants are needed for community settings. Among a number of screening tools for assessing dementia, the Mini-Mental State Examination (MMSE)[5] and the revised version of Hasegawa's Dementia Scale[6] are the 2 most commonly used scales in Japan. However, it is argued that they are not adequate as screening tests for MCI, because their sensitivity is too low to detect early stages of cognitive impairment.[7]

The Montreal Cognitive Assessment (MoCA)[8] is a brief cognitive screening tool for the detection of MCI in older people. We translated the MoCA into Japanese Version of the MoCA (MoCA-J)[7] and examined the reliability and validity of MoCA-J. The MoCA-J demonstrated a sensitivity of 93.0% and a specificity of 87.0% in screening MCI.

Previous Japanese studies using MoCA were conducted in a clinical setting[7,9,10] and a few community-based studies reported the prevalence of MCI when assessed using MoCA.[11,12,13] However, these studies mainly focused only on cognitive function and did not highlight aspects of physical and sociopsychological functions of older persons with MCI.

The first aim of the study was to examine the prevalence of operational MCI (O-MCI) based on epidemiological data using the MoCA-J to assess older Japanese persons from an urban community population. The second aim was to more clearly understand and define the sociodemography, psychology, physical, and social aspects of O-MCI. Although MCI criteria are disputable, characterizing various aspects of O-MCI may lead to a better understanding of potential modulators of cognitive decline and contribute to more effective public health strategies.

Methods

Study Area and Participants

This study was conducted in Itabashi ward, in north west Tokyo, Japan. We recruited 7162 residents aged 65 to 84 years living in 9 residential areas surrounding the Tokyo Metropolitan Institute of Gerontology (TMIG). After excluding 463 people who were institutionalized or overlapping participants from previous researches, 6699 invitations for the comprehensive health checkups were sent out. In October 2011, 913 ambulatory elderly residents visited TMIG to undergo checkups. Participants provided written informed consent to participate in the study, which was approved by the institutional review board and ethic committee of the TMIG (Acceptance No. 5, 1, 2011).

Assessment of Cognitive Function

Trained personnel assessed each participant's cognitive function using the MoCA-J and MMSE. Both MoCA-J and MMSE scores ranged from 0 to 30; higher scores indicated a better cognitive performance. One point was added for participants who had 12 years or less formal education for the MoCA-J.[7,8]

The MoCA-J takes 15 minutes on average for older persons with MCI to complete. The MoCA-J assesses 6 domains of cognition: memory; visuospatial abilities; executive functions; attention, concentration, and working memory; language; and time and place orientations.

Details of the specific MoCA items are as follows. The short-term memory recall task involves 2 learning trials of 5 nouns: "face" as a part of the body, "velvet" as a type of fabric, "church" as a type of building, "daisy" as a type of flower, and "red" as a color (5 points). After considering Japanese culture and taking the number of syllables, category, and frequency of linguistic equivalent into consideration, the translation committee changed "velvet," "church," and "daisy," into "silk," "shrine," and "lily," respectively. We administered a delayed recall task after a break of approximately 5 minutes. Visuospatial abilities were tested using a clock-drawing task (3 points) and a 3-dimensional cube copy (1 point). Executive functions were assessed using an alternating Trail Making B test (1 point), a phonemic verbal fluency task (1 point), and a 2-item verbal abstraction task to explain what each pair of words had in common (2 points). We also administered a vigilance-sustained attention task (1 point), a serial subtraction task (3 points), and a digits forward (1 point) and backward (1 point) task to assess attention, concentration, and working memory. Linguistic cognition was evaluated using a naming task with low-familiarity animals (3 points) and a test requiring the repetition of 2 complex sentences (2 points). Additionally, linguistic cognition was also assessed using the aforementioned phonemic verbal fluency task (1 point) in which we paid attention to whether participants maintained an equivalent level of syntactic complexity in their answers. Time and place orientations were also evaluated (6 points).

Table 1. The Tokyo Metropolitan Institute of Gerontology Index of Competence.

Subscales	Questions	
IADL	(1) Can you use public transportation (bus or train) by yourself?	1, yes; 0, no
	(2) Are you able to shop for daily necessities?	1, yes; 0, no
	(3) Are you able to prepare meals by yourself?	1, yes; 0, no
	(4) Are you able to pay bills?	1, yes; 0, no
	(5) Can you handle your own banking?	1, yes; 0, no
Intellectual activity	(6) Are you able to fill out forms for your pension?	1, yes; 0, no
	(7) Do you read newspapers?	1, yes; 0, no
	(8) Do you read books or magazines?	1, yes; 0, no
	(9) Are you interested in new stories or programs dealing with health?	1, yes; 0, no
Social role	(10) Do you visit the homes of friends?	1, yes; 0, no
	(11) Are you sometimes called on for advice?	1, yes; 0, no
	(12) Are you able to visit sick friends?	1, yes; 0, no
	(13) Do you sometimes initiate conversations with young people?	1, yes; 0, no

Abbreviation: IADL, instrumental activities of daily living.

Participants who scored 23 or less in MMSE were classed as moderate to severe cognitive impairment (MSCI) that was equivalent to dementia[14] and were excluded from the participants to be analyzed.

The cognitively normal (CN) group comprised of those with a MoCA-J score of 26 and above We divided those who scored below a clinical cutoff point (<26)[7,8] in MoCA-J into 2 subgroups, MCI-(A)—participants who were independent of instrumental activities of daily living (IADL) without complaints about memory by participants and/or informants; MCI-(B)—participants who were independent of IADL with complaints about memory or who were partially dependent on IADL with/without complaints about memory. We operationally defined CN and subgroup MCI-(A) of MCI as the normal controls (NCs) and subgroup MCI-(B) of MCI as the O-MCI.

Other Interviewed Variables

Questions used in the interview survey were comprised of a wide range of interdisciplinary health-related variables referencing Stuck's review[15] on risk factors for functional decline in older adults.

Sociodemographic Variables. Gender, age, school years, number of family members, and marital status were surveyed.

Psychological Variables

Self-rated health was assessed as excellent, good, fair, and poor. Depressive symptom was assessed using 5-item scores from the depression and suicide screen.[16,17] The response to each item was scored 1 for "yes" and 0 for "no." The total score was designed as the sum of 5 items. Score ranges were 0 to 5, and scores of 2 and above were regarded as depressive.

Medical and Physical Variables

Participants were asked about hospitalization in the past year, medication, chronic medical conditions (hypertension, stroke, heart diseases, diabetes mellitus, and hyperlipidemia), and certification of long-term care insurance. They were also asked about functional limitations in each of 5 basic activities of daily living (BADL) (transferring, eating, toileting, dressing, and bathing; partially or completely dependent), and hearing and visual abilities. Body mass index was calculated using measured height and body weight. Participants reported whether they had lost more than 2 to 3 kg in body weight in the past 6 months. Blood pressure was measured using the arm after 5 minutes of seated rest. Nonfasting blood samples were collected from seated participants. Blood cell counts were obtained, and routine tests of biochemical markers were performed in a sequential autoanalyzer.

Functional Capacity

The TMIG-Index of Competence (TMIG-IC)[18] was used for assessment of functional capacity (Table 1). Three first-order factors in the model are IADL, intellectual activity (IA), and social role (SR), and the second factor is competence. The response to each item was scored 1 for "yes" and 0 for "no." A higher score indicated a higher level of competence. Three sublevels of competence were also calculated; scores of 0 to 5 for IADL, scores of 0 to 4 for IA, and scores of 0 to 4 for SR.

Health Habits and Social Activities

We asked participants whether they habitually walked (once a day, less than once a day), did calisthenics (once a day, less than once a day), did sports or exercise (yes or no), had a hobby (yes or no), drank alcohol (yes, quit, or never) and whether they smoked (yes, quit, or never).

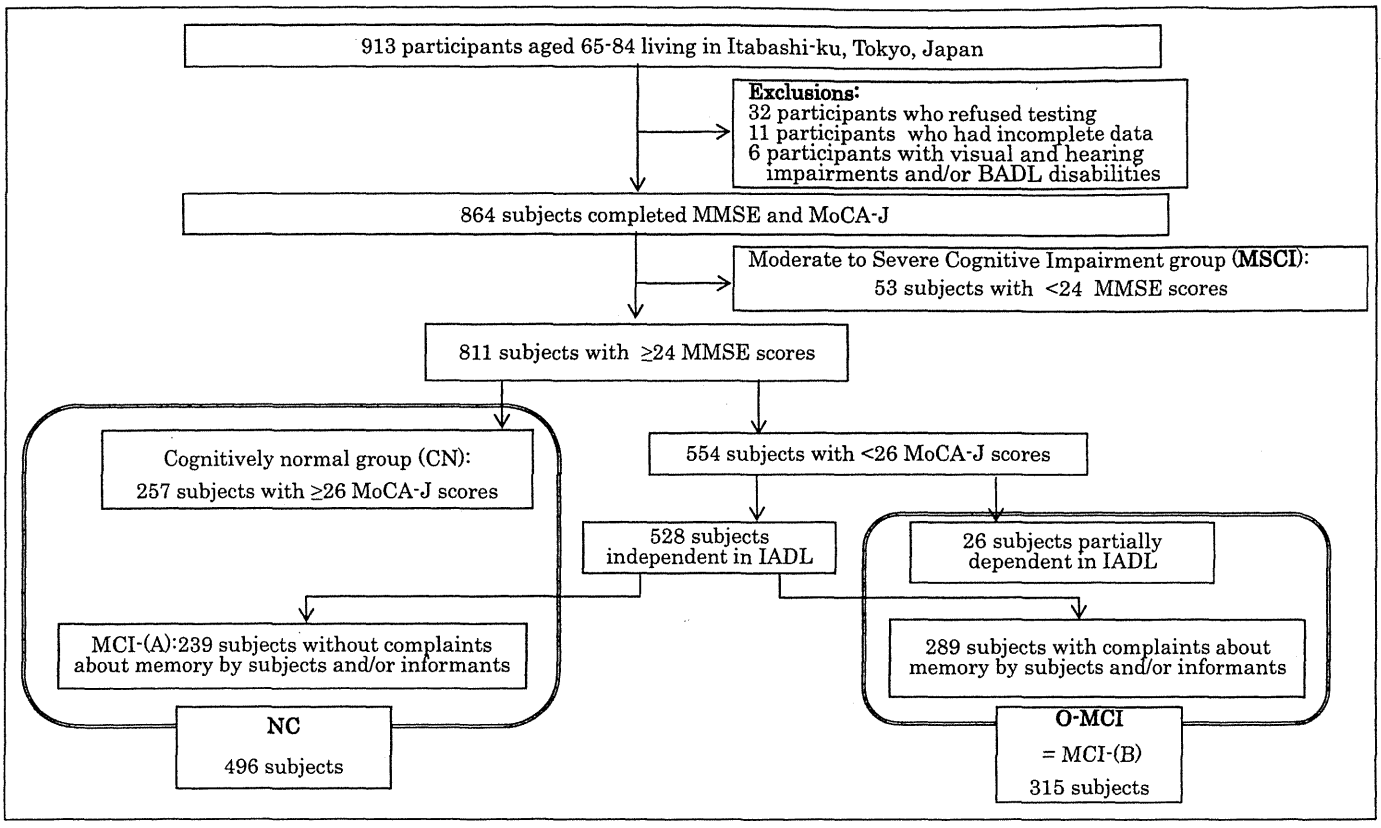

Figure 1. Protocol for selecting and grouping of participants. Participants were those who participated in the comprehensive health checkups (913 participants). Participants were those who completed the Mini-Mental State Examination and Japanese version of Montreal Cognitive Assessment (MoCA-J; 864 participants out of a possible 913 participants).Those with ≥26 in MoCA-J and subgroup (A) of mild cognitive impairment (MCI) are the normal controls. Subgroup (B) of MCI is operational MCI.

Physical Performance Test

A walking speed test was performed using a straight walkway 16 m in length on a flat floor, walking once at usual speed. Walking speed was measured over a 10-m distance between marks 3 and 13 m from the start of the walkway.

Hand grip strength was evaluated using a mechanical dynamometer in the dominant hand, and the higher of the 2 trials was used in the analysis.

Statistical Analysis

After excluding those who had visual and hearing impairments and/or BADL disabilities, differences between CN and subgroups MCI-(A) and MCI-(B) of MCI; and between O-MCI and NC, were evaluated using chi-square tests or Fisher exact test (when the expected number was <5) for categorical items and by the Mann-Whitney *U* test for continuous variables.

Furthermore, for the variables found to be significant in each test mentioned previously, we conducted a logistic regression analysis using the compulsory entered method, controlling for gender and age to identify sociopsychological and physical characteristics of O-MCI against NC. All statistical analyses were made with the Statistical Package for the Social Sciences/PC + statistical software for Windows version 18.0. The *P* values were 2-tailed, and the level of significance was set at 0.05.

Results

Of the 913 who participated in the checkup, 864 participants completed the MMSE and MoCA-J, 6 were excluded due to visual and hearing impairments and/or BADL disabilities, 32 refused testing, and 11 had incomplete data as shown in Figure 1.

Figure 2 shows a detailed scatter plot of the results of the MoCA-J and MMSE for 864 participants. There were no participants who scored ≥26 in MoCA-J and <24 in MMSE.

According to the conventional clinical criteria for normal cognitive function (MoCA-J≥26), the proportion of CN was only 29.7% (n = 257) among our sample of community-dwelling elderly people (Table 2). Taking complaints about memory problems and IADL of the participants into consideration, the proportions of CN, subgroups MCI-(A) and MCI-(B), and MSCI were 29.7% (n = 257), 27.7% (n = 239), 36.5% (n = 315), and 6.1% (n = 53), respectively.

The results shown in Table 2 indicate that characteristics differed significantly among the 3 groups. Regarding psychological, medical, and physical variables, those with MCI-(A) were significantly older and had significantly better self-rated

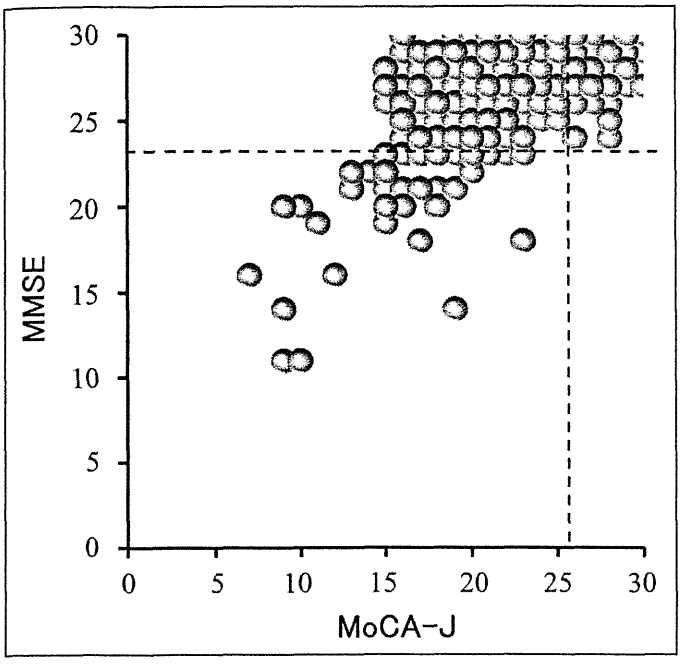

Figure 2. Scatter plots of Japanese version of Montreal Cognitive Assessment and Mini-Mental State Examination for 864 participants.

health, there was a greater proportion of males, current smokers, and a greater number of participants with a history of hypertension and higher systolic blood pressure, in comparison with CN. Those with MCI-(B) were significantly older and had significantly higher scores when tested for depressive symptom, lower prevalence of hyperlipidemia history, participated less frequently in sports and exercise, had fewer hobbies, and lower functional capacity in both IADL and IA as assessed by the TMIG-IC. They also took longer to complete the 10-meter walking time when walking at their usual speed rather than CN. Although there was no significant difference in MMSE between subgroups MCI-(A) and MCI-(B; 27.9 $\pm$ 1.6 vs 27.7 $\pm$ 1.6, $P = .582$), MCI-(A) was significantly higher than MCI-(B) in MoCA-J (22.4 $\pm$ 2.3 vs 21.9 $\pm$ 2.4, $P = .020$).

Table 3 lists and compares each variable between NC, consisting of CN and MCI-(A) (n = 496, 57.4%), and O-MCI. The MCI-(B; n = 315, 36.5%) consisted of participants with O-MCI. Subscores of all of the 6 cognitive domains of O-MCI were significantly lower than NC.

Participants with O-MCI were significantly older, had a lower number of total school years, lower cognitive function, more complaints about memory problems as reported by themselves and/or their proxies, worse self-rated health, and more depressive moods, compared to NC. In terms of medical and physical variables, O-MCI had an increased prevalence of polypharmacy, certification of long-term care insurance, lower systolic and diastolic blood pressure, and poorer IADL and IA. In health habits and social activities, O-MCI participated less frequently in sports and exercise and had fewer hobbies.

Table 4 helps to identify, using logistic regression analysis adjusted for gender and age, that the characteristics of O-MCI was as follows: increased depressive symptom, worse self-rated health, lower systolic blood pressure, poorer IA, no hobbies, weaker grip strength, and slower than usual walking speed when compared to NC.

Discussion

In the present study, those with $\geq$26 in MoCA-J and subgroup (A) and those with <26 in MoCA-J who were independent of IADL and with no memory complaints were defined as the NC, 57.4%. Subgroup (B): those with <26 in MoCA-J who were independent of IADL with memory complaints or partially dependent on IADL with/without memory complaints were defined as O-MCI, 36.5%.

The O-MCI characteristics were increased depressive symptom, worse self-rated health, lower systolic blood pressure, poorer IA, no hobbies, weaker grip strength, slower than usual walking speed and adjusted for gender and age in comparison with NC.

Prevalence and incidence estimates associated with MCI vary greatly both between definitions and within each definition. Population-based observational studies reported prevalence of MCI at 3% to 42%.[19]

One of the main reasons for the discrepancy may be due to the unavailability of common tests for detecting MCI in community settings. Using MoCA to detect those with MCI enables us to conduct cross-cultural comparative studies, because it has been translated and used in approximately 30 countries worldwide.[7] Such studies can contribute to establishing reasonable prevalence and incidence of MCI in a community setting.

However, according to the conventional clinical criteria for normal cognitive function (MoCA-J $\geq$ 26), the proportion of normal cognitive participants was only 29.7% among community-dwelling elderly people. The proportion was smaller than the actual distribution of elderly people in communities, considering that the majority (95.9%) of the participants were voluntarily participating in the health checkup and are not yet certified in the long-term care insurance system. Similar problems are highlighted by recent population-based epidemiological studies.[11,12,13] For example, Rossetti et al[11] demonstrated that 66% of 2653 participants (mean age, 50.3 years; mean school years, 11.0) were below the clinical-based cutoff point (<26). A recent Japanese community-based study also reported that 82.6% of 1977 participants (mean age, 73.6 years; mean school years, 13.4) fell below the preferred cutoff of 26 points.[13] The suggested cutoff point has not always been applied in community-based screening for MCI.

In a clinical setting, when we developed the MoCA-J, participants with MCI were diagnosed according to the criteria proposed by Petersen et al[1] as well as development of the original English version of the MoCA.[8] The criterion includes the presence of a complaint about memory for a period of at least 6 months, participants and/or informants reported memory impairment, and absence of other obvious medical, neurological, or psychiatric explanations for memory loss. In this study, using our criteria, 36.5% of participants were defined as O-MCI and 57.4% were categorized as NC. Even if MoCA-J

Table 2. Characteristics of Participants Stratified by 3 Cognitive Function Levels.

[a]Complaints About Memory Problems Independent in IADL; Full Score (=5/5)	Cognitively Normal[b] MoCA-J ≥ 26 n = 257, 29.7%	MCI-(A)[c] MoCA-J <26 and MMSE≥24 Absent and Independent n = 239, 27.7%	MCI-(B)[d] MoCA-J <26 and MMSE≥24 Present and/or Dependent n = 315, 36.5%	MSCI[e] MMSE<24 n = 53, 6.1%	All Participants[f] n = 864, 100.0%	*P* Value of Tests[g] [b]vs[c]	[c]vs[d]	[d]vs[b]
Sociodemographic variables								
Sex, n, % female	180, 70.0	117, 49.0	206, 65.4	19, 35.8	522, 60.3	<.001	<.001	ns
Age, mean ± SD, years	71.8 ± 4.7	73.3 ± 5.1	74.3 ± 4.7	76.9 ± 4.7	73.4 ± 5.0	.001	.072	.000
School years, mean ± SD, years	12.6 ± 2.5	12.6 ± 2.5	12.2 ± 2.8	10.6 ± 2.5	12.3 ± 2.7	1.000	.205	.129
Living alone, n, % yes	68, 26.5	66, 27.6	95, 30.2	13, 24.5	242, 28.0	ns	ns	ns
Having a spouse, n, % yes	151, 58.8	141, 59.0	163, 51.7	29, 54.7	484, 56.0	ns	.072	.090
Cognitive variables								
MoCA-J, mean ± SD, years (range)	27.3 ± 1.2 (26-30)	22.4 ± 2.3 (15-25)	21.9 ± 2.4 (15-25)	16.4 ± 3.8 (7-23)	23.3 ± 3.3 (7-30)	<.001	.020	.000
MMSE, mean ± SD, years (range)	28.9 ± 1.2 (24-30)	27.9 ± 1.6 (24-30)	27.7 ± 1.6 (24-30)	20.9 ± 3.0 (11-23)	27.7 ± 2.4 (11-30)	<.001	.582	.000
Complaints of memory impairment by self, n, % yes	116, 45.1	0, 0.0	300, 95.2	29, 55.8	445, 51.6	<.001	<.001	<.001
Memory impairment pointed out by those close to you, n, % yes	31, 12.1	0, 0.0	93, 29.5	17, 32.1	141, 16.3	<.001	<.001	<.001
Psychological variables								
Self-rated health, n, % fair to poor	44, 17.1	21, 8.8	75, 23.8	14, 26.5	154, 17.9	.018	<.001	.092
Depressive symptom assessed using depression and suicide screen, n, % present	39, 15.2	23, 9.7	71, 22.6	18, 34.6	151, 17.5	.080	<.001	.025
Medical and physical variables								
History of hospitalization in the past year, n, % present	32, 12.5	22, 9.2	39, 12.4	5, 9.4	98, 11.3	ns	ns	ns
Taking medicine, n, % 5 kinds or more/d	67, 26.1	67, 28.0	108, 34.3	21, 39.6	236, 30.4	ns	ns	.054
History of hypertension, n, % present	103, 40.1	124, 51.9	139, 44.1	27, 50.9	393, 45.5	.009	.072	ns
Stroke, n, % present	12, 4.7	11, 4.6	17, 5.4	4, 7.5	44, 5.1	1.000	ns	ns
Heart diseases, n, % present	16, 29.5	43, 18.0	48, 15.2	7, 13.2	139, 16.1	.552	ns	ns
Diabetes, n, % present	25, 9.7	34, 14.2	34, 10.8	8, 15.1	101, 11.7	.129	.090	ns
Hyperlipidemia, n, % present	95, 37.0	68, 28.6	89, 28.3	7, 13.2	259, 30.0	.055	ns	.038
Long-term care insurance certification, n, % yes	5, 2.0	9, 3.8	18, 5.7	3, 5.7	35, 4.1	ns	ns	.047
Body mass index, mean ± SD, kg/m^2	22.9 ± 3.0	22.9 ± 3.3	22.8 ± 3.6	22.4 ± 3.2	22.8 ± 3.3	1.000	1.000	1.000
2-3 kg body weight loss within 6 months, n, % present	32, 12.5	41, 17.2	49, 15.6	13, 24.5	135, 15.7	ns	ns	ns
Systolic blood pressure, mean ± SD, mm Hg	131.5 ± 18.5	136.1 ± 19.5	130.2 ± 18.7	143.0 ± 20.8	133.3 ± 19.2	.021	.005	1.000
Diastolic blood pressure, mean ± SD, mm Hg	76.3 ± 10.8	76.8 ± 10.4	74.7 ± 10.3	78.7 ± 12.4	76.0 ± 10.7	1.000	.051	.180
Heart rate, mean ± SD, beats/minute	72.2 ± 10.9	71.6 ± 11.0	72.2 ± 11.1	72.7 ± 11.3	72.1 ± 11.0	1.000	1.000	1.000
Serum albumin, mean ± SD, g/dL	4.3 ± 0.2	4.3 ± 0.2	4.3 ± 0.2	4.2 ± 0.3	4.3 ± 0.2	.668	1.000	.544
Serum creatine, mean ± SD, mg/dL	0.7 ± 0.2	0.8 ± 0.2	0.8 ± 0.5	0.8 ± 0.3	0.8 ± 0.4	.175	1.000	.521
HbA_{1C}, mean ± SD, %	5.3 ± 0.6	5.3 ± 0.7	5.2 ± 0.5	5.3 ± 0.5	5.3 ± 0.6	1.000	.560	1.000
Serum HDL cholesterol, mean ± SD, mg/dL	65.5 ± 17.6	63.2 ± 16.6	64.9 ± 17.1	60.6 ± 19.3	64.4 ± 17.3	.446	.766	1.000
Serum LDL cholesterol, mean ± SD, mg/dL	118.0 ± 27.1	112.2 ± 29.6	114.0 ± 28.7	109.1 ± 29.1	114.3 ± 28.6	.070	1.000	.291
Hemoglobin, mean ± SD, g/dL	13.3 ± 1.4	13.5 ± 1.2	13.3 ± 1.1	13.4 ± 1.6	13.3 ± 1.3	.189	.122	1.000

(continued)

Table 2. (continued)

[a]Complaints About Memory Problems Independent in IADL; Full Score (=5/5)	Cognitively Normal[b] MoCA-J ≥ 26 n = 257, 29.7%	MCI-(A)[c] MoCA-J <26 and MMSE≥24 Absent and Independent n = 239, 27.7%	MCI-(B)[d] MoCA-J <26 and MMSE≥24 Present and/or Dependent n = 315, 36.5%	MSCI[e] MMSE<24 n = 53, 6.1%	All Participants[f] n = 864, 100.0%	*P* Value of Tests[g] [b]vs[c]	[c]vs[d]	[d]vs[b]
Functional capacity assessed by subscales of TMIG-IC								
IADL, n, % full score (=5/5)[h]	256, 99.6	239, 100.0	289, 91.7	45, 84.9	829, 95.9	.063	ns	.006
Intellectual activity, n, % full score (=4/4)[h]	235, 91.4	209, 87.4	259, 82.2	30, 56.6	733, 84.8	ns	.051	.001
Social role, n, % full score (=4/4)[h]	220, 85.6	201, 84.1	242, 76.8	36, 67.9	699, 80.9	ns	ns	.054
Health habits and social activities								
Walking habit, n, % once a day	107, 41.6	131, 54.8	136, 43.2	29, 54.7	403, 46.6	.067	ns	ns
Calisthenics habit, n, % once a day	99, 38.5	100, 41.8	136, 43.2	21, 39.6	356, 41.2	ns	ns	ns
Sports or exercise habit, % yes	106, 41.2	81, 33.9	92, 29.2	10, 18.9	289, 33.4	.097	ns	.003
Having a hobby, % yes	171, 66.5	146, 61.0	175, 55.6	23, 43.4	515, 59.6	ns	ns	.037
Drinking habit								
% current drinker	109, 42.4	117, 49.0	134, 42.5	28, 52.8	388, 44.9	ns	ns	ns
% past drinker	28, 10.9	21, 8.8	26, 8.3	8, 15.1	83, 9.6			
% never drank	120, 46.7	101, 42.3	155, 49.2	17, 32.1	393, 45.5			
Smoking habit								
% current smoker	20, 7.8	28, 11.8	26, 8.3	14, 26.4	88, 10.2	<.001	.007	ns
% past smoker	54, 21.0	85, 35.7	83, 26.4	21, 39.6	243, 28.2			
% never smoked	183, 71.2	125, 52.5	205, 65.3	18, 34.0	531, 61.6			
Physical performance test								
10-Meter walking time at usual speed, mean ± SD, second	7.2 ± 1.3	7.5 ± 1.4	7.8 ± 1.8	8.7 ± 2.7	7.6 ± 1.7	.097	.032	<.001
Grip strength, mean ± SD, kg	25.8 ± 8.1	27.1 ± 8.0	24.3 ± 7.2	24.9 ± 8.2	25.5 ± 7.8	.167	<.001	.061

Abbreviations: SD, standard deviation; MoCA-J, Japanese version of Montreal Cognitive Assessment; MMSE, Mini-Mental State Examination; HbA_{1C}, hemoglobin A; HDL, high-density lipoprotein; LDL, low-density lipoprotein; TMIG-IC, Tokyo Metropolitan Institute of Gerontology Index of Competence; IADL, instrumental activities of daily living; ns, not significant; MCI, mild cognitive impairment; MSCI, moderate to severe cognitive impairment; CN, cognitive normal.

[a] Participants who have complaints of memory impairment by self or memory impairment pointed out by those close to them.

[b] Participants who scored ≥26 in MoCA-J were classed as CN.

[c] Participants who were independent in IADL and scored <26 in MoCA-J and ≥24 in MMSE without complaints of memory impairment by participants and/or informants were classed as MCI-(A).

[d] Participants who were independent in IADL and who scored <26 in MoCA-J and ≥24 in MMSE with complaints about memory problems or without complaints of memory impairment and partially dependent in IADL were classed as MCI-(B).

[e] Participants who scored <24 in MMSE were classed as MSCI.

[f] Participants excluded those who had visual impairments, hearing impairments, or basic activities of daily living disabilities (n = 6).

[g] Differences between CN, and subgroups MCI-(A) and MCI-(B) respectively were evaluated using chi-square tests or Fisher exact test (when the expected number was <5) for categorical items and by the Mann-Whitney *U* test for continuous variables.

[h] A higher score indicates a higher level of competence.

Table 3. Characteristics of Participants[a] Stratified by Cognitive Function Levels.

	NC[b], n = 496 n	O-MCI[c], n = 315 n	*P* Value of Tests[d]
Sociodemographic variables			
Sex, % female	297, 59.9	206, 65.4	.074
Age, mean ± SD, years	72.5 ± 4.9	74.3 ± 4.7	<.001
School, mean ± SD, years	12.6 ± 2.6	12.2 ± 2.8	.023
Living alone, % yes	134, 27.0	95, 30.2	.338
Having a spouse, % yes	292, 58.9	163, 51.7	.050
Cognitive variables			
MoCA-J total scores, mean ± SD, years (range)	24.9 ± 3.0 (15-30)	21.9 ± 2.3 (15-25)	<.001
MoCA-J subscores			
Time and place orientation, mean ± SD, years	5.9 ± 0.4 (4-6)	5.8 ± 0.5 (2-6)	.020
Delayed recall task, mean ± SD, years	2.9 ± 1.6 (0-5)	1.5 ± 1.5 (0-5)	<.001
Visuospatial abilities, mean ± SD, years	3.6 ± 0.7 (1-4)	3.4 ± 0.7 (0-4)	.006
Executive functions, mean ± SD, years	2.7 ± 1.0 (0-4)	2.1 ± 1.0 (0-4)	<.001
Attention, concentration, and working memory, mean ± SD, years	5.2 ± 0.9 (2-6)	4.7 ± 1.0 (0-6)	<.001
Linguistic cognition, mean ± SD, years	4.5 ± 0.9 (2-6)	4.0 ± 0.9 (1-6)	<.001
MMSE, mean ± SD, years	28.4 ± 1.5 (24-30)	27.7 ± 1.6 (24-30)	<.001
Complaints of memory impairment by self, % yes	116, 23.4	300, 95.2	<.001
Memory impairment pointed out by those close to you, % yes	31, 6.2	93, 29.5	<.001
Psychological variables			
Self-rated health, % fair to poor	65, 13.1	75, 23.8	<.001
Depressive symptom assessed using depression and suicide screen, % present	62, 12.5	71, 22.6	<.001
Medical and physical variables			
History of hospitalization in the past year, % present	54, 10.9	39, 12.4	.572
Taking medicine, % 5 kinds or more/d	134, 27.0	108, 34.3	.033
History of hypertension, % present	227, 45.8	139, 44.1	.664
Stroke, % present	23, 4.6	17, 5.4	.622
Heart diseases, % present	84, 16.9	48, 15.2	.559
Diabetes, % present	59, 11.9	34, 10.8	.653
Hyperlipidemia, % present	163, 32.9	89, 28.3	.186
Long-term care insurance certification, % yes	14, 2.8	18, 5.7	.043
Body mass index, mean ± SD, kg/m^2	22.9 ± 3.1	22.8 ± 3.6	.866
2-3 kg body weight loss within 6 months, % present	73, 14.7	49, 15.6	.763
Systolic blood pressure, mean ± SD, mm Hg	133.7 ± 19.1	130.2 ± 18.7	<.001
Diastolic blood pressure, mean ± SD, mm Hg	76.6 ± 10.6	74.7 ± 10.3	.012
Heart rate, mean ± SD, beats/minute	71.9 ± 11.0	72.2 ± 11.1	.774
Serum albumin, mean ± SD, g/dL	4.3 ± 0.2	4.3 ± 0.2	.337
Serum creatine, mean ± SD, mg/dL	0.8 ± 0.2	0.8 ± 0.5	.150
HbA_{1C}, mean ± SD, %	5.3 ± 0.6	5.2 ± 0.5	.400
Serum HDL cholesterol, mean ± SD, mg/dL	64.4 ± 17.2	64.9 ± 17.1	.322
Serum LDL cholesterol, mean ± SD, mg/dL	115.0 ± 28.5	114.0 ± 28.7	.065
Hemoglobin, mean ± SD, g/dL	13.4 ± 1.3	13.3 ± 1.1	.083
Functional capacity assessed by subscales of TMIG-IC			
IADL, % full score (=5/5)[e]	495, 99.8	289, 91.7	<.001
Intellectual activity, % full score (=4/4)[e]	444, 89.5	259, 82.2	<.001
Social role, % full score (=4/4)[e]	421, 84.9	242, 76.8	.059
Health habits and social activities			
Walking habit, % once a day	238, 48.0	136, 43.2	.582
Calisthenics habit, % once a day	199, 40.1	136, 43.2	.857
Sports or exercise habit, % yes	187, 37.7	92, 29.2	.015
Having a hobby, % yes	317, 63.9	175, 55.6	.018
Drinking habit, % current drinker	226, 45.6	134, 42.5	.397
% past drinker	49, 9.9	26, 8.3	
% never drank	221, 44.6	155, 49.2	
Smoking habit, % current smoker	48, 9.7	26, 8.3	.639
% past smoker	139, 28.1	83, 26.4	
% never smoked	308, 62.2	205, 65.3	
Physical performance test			
10-Meter walking time at usual speed, mean ± SD, second	7.3 ± 1.4	7.8 ± 1.8	<.001
Grip strength, mean ± SD, second	26.4 ± 8.0	24.3 ± 7.2	<.001

Abbreviations: NC, normal control; O-MCI, operational mild cognitive impairment; SD, standard deviation; MoCA-J, Japanese version of Montreal Cognitive Assessment; HbA_{1C}, hemoglobin A; HDL, high-density lipoprotein; LDL, low-density lipoprotein; TMIG-IC, Tokyo Metropolitan Institute of Gerontology Index of Competence; IADL, instrumental activities of daily living; MMSE, Mini-Mental State Examination.

[a] Participants excluded those who had visual impairments, hearing impairments, or basic activities of daily living disabilities (n = 6) and those who scored <24 in MMSE.

[b] The NC, participants who scored ≥26 in MoCA-J and who were independent in IADL and scored <26 in MoCA-J without complaints of memory impairment by participants and/or informants.

[c] The O-MCI, participants who were independent in IADL and who scored <26 in MoCA-J with complaints about memory problems by participants and/or informants or without complaints of memory impairment and partially dependent in IADL.

[d] Differences between NC and O-MCI were evaluated using chi-square tests or Fisher exact test (when the expected number was <5) for categorical items and by Mann-Whitney *U* test for continuous variables, $p<0.05$.

[e] A higher score indicates a higher level of competence.

Table 4. Adjusted Odds Ratios for Baseline Variables of the [a]O-MCI Group Compared to the [b]NC Group Among Community Dwelling Older Japanese.

		Odds Ratio	95% CI	*P* Value[c]
Self-rated health	Fair to poor (reference excellent, good)	2.05	1.41-2.98	<.001
Depressive symptom assessed using depression and suicide screen[d]	Present, ≥2 (reference, <2)	2.00	1.36-2.93	<.001
Taking medicine	5 ≥kinds/d (reference, <5 kinds/d)	1.25	1.72-0.91	.172
Long-term care insurance certification	Yes (reference no)	1.63	3.41-0.78	.194
Systolic blood pressure	1 mm Hg increment	0.99	0.98-1.00	.047
Diastolic blood pressure	1 mm Hg increment	0.99	0.97-1.00	.065
Intellectual activity	Decline, <4 full mark[e] (reference ≥4)	1.89	1.38-2.58	<.001
Sports or exercise habit	No (reference yes)	1.35	0.99-1.83	.060
Having a hobby	No (reference yes)	1.43	1.06-1.92	.017
10-Meter walking time at usual speed	1 Second increment	1.16	1.05-1.28	.003
Grip strength	1 kg decrement	1.03	1.01-1.06	.017

Abbreviations: NC, normal control; O-MCI, operational MCI; MoCA-J, Japanese version of Montreal Cognitive Assessment; IADL, instrumental activities of daily living.

[a] The O-MCI, participants who were independent in IADL and who scored <26 in MoCA-J with complaints about memory problems by participants and/or informants or without complaints of memory impairment and partially dependent in IADL.

[b] The NC, participants who scored ≥26 in MoCA-J and who were independent in IADL and scored <26 in MoCA-J without complaints of memory impairment by participants and/or informants.

[c] Multiple logistic regression analyses were performed, adjusted for gender and age.

[d] Lower score indicates better performance.

[e] Higher score indicates better performance.

could be used effectively in the detection of older persons with MCI, it is difficult for medical or public health service providers to intervene with the participants and proxies without any registered complaints about memory in community-based health checkups. Therefore, the definition of O-MCI is not only academic but also based on a practical rationale. Furthermore, it is possible that there are other unreported medical, neurological, or psychiatric explanations for memory loss, as the present study used a self-reported questionnaire. After excluding those who had diseases or conditions associated with cognitive decline, it is posited that the proportion of O-MCIs would decrease to a more rational prevalence.

Worse self-rated health, increased depressive symptom, lower systolic blood pressure, poorer IA, no hobbies, weaker grip strength, and slower usual walking speed were significantly associated with O-MCI as compared to the NC, adjusted for age and gender. These factors predicts future decline in IADL among community-dwelling older people.[15,20,21] Lower systolic blood pressure and weaker grip strength, however, showed no clinical association with O-MCI, because their Odds ratios were about 1, respectively.

Previous studies have reported that depressive symptoms were often seen at the early stage of Alzheimer's disease or vascular dementia, ie, so-called "pseudo-depression."[22] On the other hand, older persons with senile depression tended to exhibit a decline in activities of daily living and in self-rated health, ie, so-called "depressive pseudo-dementia."[23] Older persons with senile depression often complained of memory deficits but exhibited large fluctuations in cognitive test results. It is argued that longitudinal studies on cognitive decline will be important in differentiating "pseudodepression" from "depressive pseudodementia."

In the present study, older persons with O-MCI had fewer hobbies and poorer IA in the TMIG-IC than the NC. Previous research indicates that older adults who engage in social activities such as playing games, participating in hobby clubs and volunteering experience less decline in cognitive function[24-26] and have a reduced risk of dementia.[27] Although the exact mechanisms are unknown, a commonly recognized possibility is that social activity challenges older adults to participate in complex interpersonal exchanges, which could promote or maintain efficient neural networks in a case of "use it or lose it."[28]

The present study demonstrated that there was a significant difference in walking speeds between O-MCI and NC. Several cross-sectional[29,30] and longitudinal studies[31,32] reported that measures of physical and cognitive performance correlated or interacted with each other, even among older persons without apparent cognitive impairment. Previous prospective studies of community-dwelling older Japanese people showed that walking speeds especially participants' step length at walking pace was a good predictor of subsequent cognitive decline.[33] Although the precise mechanism that controls step length in walking remains unclear, studies have suggested that shorter stride length indicated subclinical structural damage within the basal ganglia[34] or reduced gray matter in the sensorimotor cortex.[35]

As the present study did not diagnose MCI using clinical criteria, we recognize that the present definition of MCI is not absolute, and future studies should examine the validity of the definition from aspects of sensitivity and specificity and predictive values for developing dementia in community settings.

Nevertheless, this study is unique in examining the physical and sociopyschological characteristics of community-dwelling elderly people with MCI as assessed through MoCA-J. Although Ihara et al considered the longitudinal relationship between physical activity and executive function, the number

of study participants was limited to 10, and the study mainly focused on physical activity.

In contrast, this study is community based, with a large number of participants—913, with an age range of 65 to 84 years, focusing on both physical and sociopyschological variables. In particular, this study's focus on sociopyschological variables, including depressive symptom, self-rated health, intellectual activity, and hobbies has not been replicated in any other studies to date. The results underline the need for comprehensive testing in order to provide holistic support to those with MCI.

Limitations of this study should be noted. First, as this is a cross-sectional study, it does not permit causal inference. As MCI is the transitional state between normal aging and dementia, population-based studies conversely demonstrated that 14% to40% of participants with MCI experienced a so-called "reversion to normal" a year later.[36,37] It is necessary to follow-up on the proportion of conversion and reversion among NC, O-MCI, and MSCI. This would be possible by studying the changes in several variables of physical and sociopsychological functions which were found to be significantly different among these 3 groups.

Second, the present study has a potential selection bias due to the low response rate to initial invitations to participate in the checkups. As it is probable that independent and healthy persons also participated, it is possible that a healthy volunteer effect existed. However, mean age and the proportion of sex among the participants were similar to those of all residents in Itabashi-ku aged 65 to 84 (mean age, 73.4 vs 73.2; % female, 55.7 vs 60.3, respectively).The study population is therefore reasonably representative of the community.

The use of MoCA-J as a screening tool has multiple implications. In particular, the main screening target of MoCA-J as based on the original MoCA[8] test was developed using clinical data, according to MCI criteria as proposed by Petersen et al.[1] The current MoCA-J is based on the data of memory clinic patients. Previous Japanese studies have demonstrated that most patients in memory clinics had memory complaints and more than 70% of patients diagnosed with dementia had Alzheimer's disease, after first experiencing MCI.[38,39] In a clinical setting, the current test therefore has the capacity to very clearly target those participants who have amnestic MCI.[40] In the present community-based study, however, the use of MoCA-J was useful in disclosing participants with heterogeneous subtypes of MCI or undetected neurologic comorbidities. In other words, the use of MoCA-J in a community setting was highly effective in bringing to light multiple participants with a wider variety of mild cognitive decline than has been previously discovered in the clinical setting. The MoCA-J consists of subscores in multicognitive domains: visuospatial abilities, executive functions, attention, concentration and working memory, language, time, and place orientation. In fact, subscores of all of the 6 cognitive domains of O-MCI were significantly lower than NC in the present study. Future studies should compare differences in each subscore between clinical MCI and community-based MCI using the MoCA-J. Additionally, further large-sampled longitudinal investigations are needed to demonstrate predictive validity including reconsidering an adequate cutoff point.

In conclusion, this research shows that older persons with O-MCI as defined by MoCA-J are operating with partially decreased physical and sociopsychological functions, in addition to cognition, although the majority of all groups are independent in IADL. Therefore, strategies for supporting independent elderly people with O-MCI should be comprehensive not only through a specific cognitive approach but also including psychosocial and physical approaches. In order to offer support to those who need it, methods of screening become a highly integral part of the process. It is argued that the MoCA-J exhibits great potential as a holistic and comprehensive screening tool for detecting at-risk, preclinical frail elderly people in the community.

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特集

地域包括ケアとケアマネジメント

認知機能が低下した独居の高齢者への地域包括ケアシステム

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● 抄録

急増する認知機能が低下した独居高齢者の社会参加・自立生活を支援するためには，地域包括ケアシステムにおいて，認知症に対する偏見の解消と社会的孤立の予防に向けた取り組みが不可欠である．とくに後者については日常の見守りのなかで，認知機能が低下した高齢者の多様なリスクをより早期に発見し，健康障害や生活機能低下を予防することが重要である．

筆者らは，具体的には，室外での人的な見守りとして，住民や関係機関からの情報提供のチェックシートを開発してきた．室内での見守りとしては，情報通信技術（Information Communication Technology；ICT）に着目し，見守りセンサー（赤外線人感センサー）を用いて，対象者の行動変化の情報を地域ケア機関（地域包括支援センターや担当ケアマネジャー）に提供する．1年間のパイロット試験を通して，見守りセンサーとコールセンターを介したシステムの安定した運営が可能になった．

Key Words：地域包括ケアシステム，認知機能低下，独居高齢者，人的ネットワーク，情報通信技術

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Ⅰ．はじめに；認知症施策と地域包括ケアシステム

65歳以上の高齢者のうち認知症者は推計15%で，2012年時点で約462万人に上ることが厚生労働省研究班（研究代表者・朝田隆）の発表[1]で分かった．近い将来，認知症になる可能性が高い軽度認知障害（Mild Cognitive Impairment；MCI）の高齢者も約400万人いると推計された．65歳以上の4人に1人が認知症とその“予備軍”となる計算である．また，2010年時点では約439万人となり，うち在宅有病者数は約270万人，そのなかで独居者は約43万人と分析された．

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国は認知症施策について「今後の認知症施策の方向性について」（厚生労働省，2012年6月18日発表），さらには「認知症施策推進5か年計画（オレンジプラン）」（厚生労働省，2012年9月5日発表）を提示した．

筆者らは，これまで高齢者の社会参加という視点で認知症高齢者についてデイサービス利用[2]から認知症高齢者自身によるボランティア活動[3]まで幅広く，その意義や現状と課題について研究を重ねてきた．

地域包括ケアシステムの構築という文脈のなかでは，認知症施策は早期診断・早期対応に直結する．その際に，①認知症に対する偏見の解消，②地域包括支援センターの機能強化，③かかりつけ医の認知症対応力向上，④認知症疾患医療センターの設置，⑤社会資源の地域連携推進，が強調されている[4]．

Ⅱ．社会参加の阻害要因としての認知機能低下

前述した①～⑤の要件のうち，認知機能低下を社会参加の阻害要因としてとらえた際には，とりわけ，①の認知症に対する偏見の解消と，社会参加の対極にある社会的孤立の予防に向けた取り組みが不可欠である．

①については，厚生労働省が2005年4月より「認知症を知り，地域をつくる10ヵ年構想」というキャンペーンを推進し，その一環として，地域や職域における認知症サポーター養成や，さらに同サポーターの養成を企画・実施するキャラバン・メイトの養成事業が展開されている．同サポーター数は，2013年6月30日時点で427万人を超え，地域ぐるみの認知症支援体制を構築し，地域包括ケアシステムを側面支援している[5]．筆者らは，キャラバン・メイトによる小中学生への認知症啓発授業の好影響として，認知症に関する知識や認知症高齢者に対する共感的意識の促進を確認している[6,7]．

Ⅲ．認知機能低下と社会的孤立の予防

地域には，認知症をはじめ，さまざまな健康・生活障害等により，医療や介護保険のサービス等による支援が必要と思われる状態にあるにもかかわらず，これらのサービスを受けず，近隣住民や友人・知人等から孤立し，必要な支援を受けずに暮らす高齢者も少なくない．筆者らは，このような状態にある高齢者のことを「要介入高齢者」と称した[8]．

地域包括ケアシステムにおいては，要介入高齢者を早期に把握し，適切な医療・介護サービスおよびその他のインフォーマルな社会資源へつなぐことで，重篤化の防止と生活の安定化を支援することが求められている．

首都圏をはじめとする大都市部では，75歳以上人口は2010～2025年の間に，60～100%増と推計されている（総務省統計局による「平成22年国勢調査」および国立社会保障・人口問題研究所が平成25年3月に推計した「日本の地域別将来推計人口」）．認知機能障害のみならず，多様な心身の障害が生じやすくなるこれら後期高齢者が著増するということは，高齢者の介護・医療を中心としたさまざまなサービスに対応すべきマンパワーも単純に考えると，今後10年ほどで，60%以上補強されなければならないことになる．

しかし，医療費・介護費の投入に限界があるわが国の現状では，限られた資源で地域包括ケアシステムをいかに効率的・効果的に推進するかが問われている．そこで筆者らは，以下のような人的ネットワークと情報通信技術（Information Communication Technology；ICT）を用いた2つのアプローチにより要介入高齢者を発見し見守り，適宜，必要な支援・サービスにつなげる方策を提示してきた．

Ⅳ．独居者への人的見守り

認知機能が低下した独居高齢者に対しては，近隣の住民や地域ケア機関職員が対象者の外出時のようすを把握することが求められる．独居高齢者に対する「見守り」活動と称して，近隣住民や友人・知人が健康状態や日常生活の変化に気づくと，地域包括支援センター等に情報が提供されるような，ソフト面でのシステムづくりが近年，多くの自治体において推進されている．

しかし，とくに都市部では住民どうしのつながりが希薄なために，自治町会など住民からの協力が得づらいなど，情報収集に資するネットワークづくりが進んでいない地域も少なくない．さらに，民生委員や住民組織が見守り活動を行っている地域もあるが，これらの団体も，住民のプライバシー意識の高さから，要介入高齢者に関する情報が得られないといった課題を抱えている[9]．今後，住民らからの情報提供を促す何らかの仕掛けが必要と思われる．すでに，地域包括支援センターへ情報提供してほしい高齢者の特徴を記した冊子な

どのツールを住民に配布し，高齢者の見守りと情報提供に関する普及啓発に取り組んでいる自治体も散見される[10]．

Ⅴ．情報提供のチェックシート開発と限界

前述の既存ツールに記された特徴の抽出と選択プロセスは不明である．そこで，野中らは，要介入高齢者の把握を担当する地域包括支援センター職員に，民生委員や住民組織の役員といった住民リーダーからの情報提供を希望する特徴や状態を直接たずね，実用性の高いツール「都市部版地域包括支援センターへの情報提供のチェックシート」（以下，情報提供のチェックシート）を作成した[11]．情報提供のチェックシートは，情報提供のためだけの一方向性ツールではなく，地域ケア機関職員が住民リーダーとコミュニケーションを図るためのきっかけづくりのツールでもある．

しかし，これらのツールには限界がある．筆者の先行研究によると，認知機能が低下した独居高齢者本人とその家族の回答の一致状況について，高齢者の生活状況については，第三者が観察しやすい外出を伴う生活機能においては一致率が高く，はっきりとした行動を伴いにくい項目では一致率が低かった[12]．この先行研究は，同居家族がいる場合を想定している．ましてや認知機能が低下した独居高齢者において，外出を伴わない行動を近隣住民が評価することがいかに困難であるかは容易に推測できよう．

認知機能が低下した独居高齢者は，社会的に孤立している場合には，手段的日常生活動作能力（Instrumental Activities of Daily Living；IADL）の低下に対して周囲が援助しにくいため，自立生活は破たんしやすい．また，IADLが自立したMCIであっても，身体機能は低下している可能性は高い[13]．いずれにせよ，社会的孤立を予防し，心身機能の変化を早期に発見し対応することが，独居生活を安心し継続していくうえで重要である．

Ⅵ．孤立を予防する重層的防御網

こうした課題の解決に向けては，地域包括ケアシステムにおいて，認知機能低下の有無にかかわらず独居高齢者の孤立を予防し，安心・安全な自立生活を支える重層的な戦略を構築する必要がある．筆者はその仕組みとして，①社会活動への参加の促進によるネットワークづくり，②近隣や友人，別居家族との交流を通じたネットワークによる声かけ・見守り，③行政や民間事業者といった専門的なサービスによる異変察知・緊急通報システム等ハード面の整備に大別した．そのうえで，①～③をそれぞれ孤立の一次，二次，三次予防と操作的に定義し，孤立予防・自立支援ための三層の防御網とした[14]（図１）．一次，二次予防の資源となる町内会や近隣関係などは，従来，わが国の地域共同体のなかにあったものであり，既存の社会的資源を利用することで独居高齢者の孤立は予防できるとも考えられる．しかし，実際には加齢に伴い長期的かつ頻繁な社会活動の維持は容易ではないことや，近隣・地域組織の崩壊や住民どうしのプライバシー意識の高まりなどで一次，二次予防のみに依拠するには限界がある．

Ⅶ．ICTを活用した三次予防

そこで，三次予防の一助として，見守りセンサー（赤外線人感センサー）や緊急通報装置などのIT機器を利用したICTによる補完が期待される．これらのIT機器は，多忙をきわめる地域包括支援センターや介護事業者等（以下，地域ケア機関）の業務の効率化にも寄与することが期待される．

近年，海外でもこの種の取り組みは注目されている．“Smart home（スマートホーム）”と称され，「在宅生活者の生活の質と身体的自立度のモニタリングを促進し，介護者の負担感も減らすための在宅に装備された通信技術」[15]を意味する．

ペンダントや壁掛け式等の緊急通報装置が，高齢者自身の能動的な対応を必要とするのに対して，

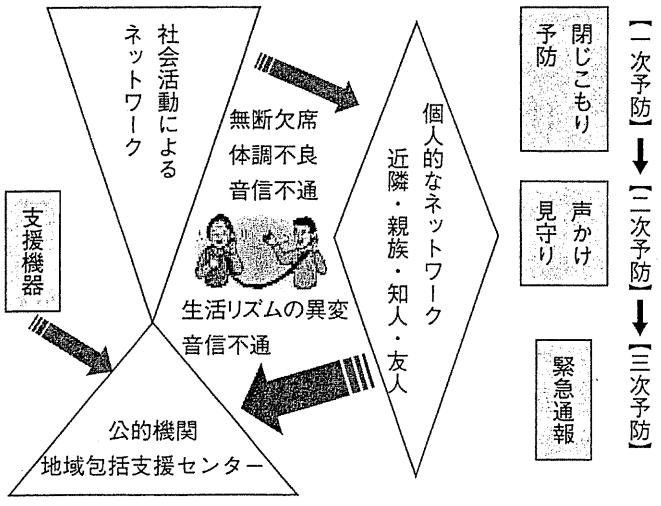

図1　地域包括ケアシステムにおける孤立予防・自立支援のための三層の防御網

見守りセンサーは，設置するだけで生活のようすや安否状況を自動的に家族等の外部の関係者に伝えることができる．従って，緊急通報装置に比べて，見守りセンサーは，認知機能が低下した高齢者など，心身の変調を自身により能動的に表現することが困難である人，また健康管理についての自己認識が低い人，さらには，地域ケア機関職員による頻回な対人的サポートを好まない人へのソーシャルサポート・ネットワークサービスとして今後，急速に増大・浸透していくと考えられている．

Ⅷ．見守りセンサーを用いた地域包括ケアシステムの開発

こうした理由から，筆者らは，認知機能が低下した独居高齢者の生活を支えるIT機器のなかでも，見守りセンサーに注目した．見守りセンサーは，独居高齢者やその家族からのニーズが高いと予想され，多くの企業によって多種多様なサービスが商品化されているものの，その有効性や課題に関して学術的見地から検討されることは少なかった．

小池ら[16]が先行研究を概観したところ，1990年代以降，見守りセンサーに関連する研究は積み重ねられてきたが，その主流はセンサーの技術開発やその機能を検証する研究であり，見守りセンサーの有効性や実践的な利用に関する研究はきわめて少なかった．2000年代後半になると，海外では有効性に関する研究がわずかながらみられるようになったが，わが国の研究はその流れに遅れをとっている．研究が不十分なものにとどまっている原因としては，見守りセンサーの開発の歴史が浅いため，いまだ機器やシステムの開発や機能の検証を行っている段階であること，見守りセンサーを導入する際に，見守られる側の抵抗感や費用負担の問題があり，期待されるほど普及しにくいといった点が指摘されていた[17]．

これらの現状を踏まえて，筆者らは厚生労働科学研究費補助金の助成を受け，見守りセンサーを用いた地域包括ケアシステムの開発に向けた研究を進めている[14]．

当研究班の目的は，認知機能が低下した高齢者の多様なリスクを早期に発見し，健康・生活機能障害の予防機能をもつ見守りセンサーを導入し，地域ケア機関が有効活用できる地域包括ケアシステムを呈示することである．以下に，これまでの研究の概略を示す

Ⅸ．パイロット試験の概要

本パイロット試験の介入システムは，図2のとおりである．

居室に設置した見守りセンサー（立山システム研究所製）により対象者の行動をモニタリングし，行動変化を定量的にとらえ，コールセンターに提供する．ただし，パイロット研究中は研究スタッフがモニタリングし，生活リズム（トイレ回数の変動や，就寝・起床時間のパターンや外出状況等）についての必要な情報をまとめたレポートを作成し，地域ケア機関や家族に提供する．

また，一定時間，対象者の体動を見守りセンサーが感知しない場合には，サーバーから，登録された地域ケア機関職員や家族にアラートメールが

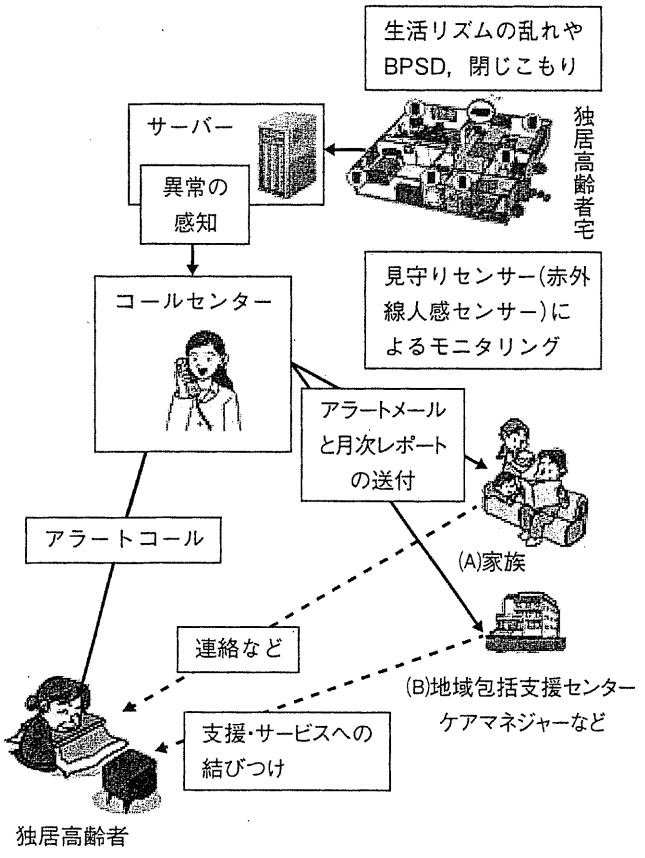

図2　見守りセンサーを導入したパイロット試験の介入システム

送信される．同時に，コールセンターから，対象者に安否確認の電話（アラートコール）がかかるように設定されている．

本パイロット試験の1年間のプロセスを明らかにし，1年後の対象者の認知機能・生活機能や，心理的負担感の変化を評価した．

主に東京都内の地域ケア機関等を通じて，65歳以上の在宅独居高齢者に対してパイロット試験対象者を募集した．

認知機能，身体・心理機能を健康調査によりアセスメントし，要件を統制した65歳以上の認知機能低下者24人（MCI 12人と軽度認知症12人）と，社会的孤立傾向にある健常者16人を選定した．これらの対象者を2群に分け，対象者本人，家族，地域ケア機関職員を対象に第一回調査(2011年10月～2012年3月）を行った．パイロット試験対象者のうち，見守りセンサーを設置する介入群15人と未使用の対照群21人に対して調査を完了した．両群とも，平均年齢80歳，Mini-Mental State Examination（MMSE）25点，（うち要介護認定者10人）である．第1回調査のあとに介入群にはセンサーを設置し，地域ケア機関への情報伝達形態について検討開始した．居室構造の違いや同一動作においても体動の個人差があり，アラートメールの設定における誤報が課題として明らかになった．

対照群は，従来の日常生活および人的なケア・見守りサービスを継続している．1年後に第2回調査を実施し，対照群の改訂長谷川式簡易知能評価スケール（HDS-R）のみ有意な低下を認めた．見守りセンサーへの抵抗感は，設置当初から6か月で低下した．孤立感，孤独感，主観的健康感はいずれも対照群で増悪傾向であったのに対し，介入群では維持・改善傾向を示した．

一方，パイロット試験において，地域ケア機関担当者は，介入群の対応事例について，見守りセンサーのデータおよび月次レポートで示される外出頻度，夜間のトイレ回数，または各居室の見守りセンサー全数の総検知回数（1日の総活動量）を把握することが寄与したとの回答を得ることができた．

X．システム評価のフレームワークの開発

一方，亀井らは，今後，地域ケア機関職員が多様な状況・条件の認知機能が低下した独居高齢者を対象として，ICTによる見守りセンサーを利用した介入システムを利用した際の在宅生活の質，および身体的自立のモニタリングを可能にするために，同システムを体系的に評価するためのフレームワークの一般化に着手した[18]．すなわち，Smart homeを用いる際の利用開始時の本人・家族のニーズ，および地域ケア機関の方向性を検討するツール「スマートホーム利用開始時の日本版アセスメントとアルゴリズム；J-DASH ver.1」を作成し，記載可能性を評価した．項目精選の結果，①本人の基本情報，②本人・家族の生活情報，③

本人・家族のニーズアセスメント，④現在の生活上の課題，⑤スマートホームによるモニタリング内容のアセスメント，モニタリング内容を判断するためのアルゴリズム，⑥スマートホーム利用による成果の評価で構成するJ-DASH ver.1（42項目）を作成した[19]．

XI．パイロット試験の成果

1年間のパイロット試験を通して，見守りセンサーを個別にチューニング設定することにより，アラームの誤作動を減らし，コールセンターを介した安定した運営が可能になった．本パイロット試験に臨むにあたり，センサー設置による介入効果の評価については，対象者のセンサーに対する抵抗感，孤立・孤独感は軽減する傾向がみられたものの，認知機能が低下した対象者の心身機能の測定により，介入効果を評価することは容易ではなかった．むしろ，観察期間を延長することにより，在宅生活の終焉，つまり入院・入所をアウトカムとすることや，地域ケア機関職員による評価が重要であることが再確認できた．

地域ケア機関担当者は，介入群で対応可能であった事例については，見守りセンサーのデータおよび月次要約レポートで示される総活動量など，主要情報により高齢者の日常生活のパターンや実態を的確に把握することが可能であった．それにより，地域ケア機関担当者は，認知機能が低下した独居高齢者の健康課題の実態を把握し的確かつ迅速に対応できる可能性が示唆された．また，今後，J-DASH ver.1を完成させることにより，認知機能が低下した独居高齢者のアセスメントは可能になるだろう．

しかしながら，死亡，転倒や認知症の行動・心理症状（Behavioral and Psychological Symptoms of Dementia；BPSD）の出現といった健康障害や入院・入所の発生件数は案外少なかった．よって，見守りセンサーのデータによる日常生活リズムの逸脱から健康障害発生を予測するには至っていない．対象者を増強し，観察期間を延長することにより，主要な健康障害が発生する際のリズム逸脱の閾値を算出していくことが望まれる．

XII．職員への啓発の重要性

ICTを有効活用するためには，見守りセンサーを活用することに対する，地域ケア機関職員自身の姿勢がなにより重要である．多様なケアが必要な多数の高齢者に対して多忙きわまる地域ケア機関職員は，ICTを駆使するどころか，パソコンにログインする余裕すらないと訴える場合が少なくない．可能な限り簡潔明快な月次要約レポートを作成・提供することが，地域ケア機関職員にICTに対する親和性をもたせる第一歩となるだろう．

XIII．ま と め

今後，急増する認知機能が低下した独居高齢者の安心・安全な在宅生活，さらには社会参加をいかに支援するかが，地域包括ケアシステムに問われている．そのためには，地域包括支援センターを核としたアウトリーチによる住民リーダーや関係機関との連携による居宅外からの「人的な気づき」と，Smart homeに代表される居宅内での「ICTを活用した気づき」を相互に補完・活用し早期発見・早期対応につなげることが望まれる．

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高齢者の社会的孤立と世代間交流事業

――その効果と課題

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孤立死の予防戦略の基本は高齢者の社会的孤立の予防である。
孤立した高齢者の生活機能の低下リスクは、そうでない高齢者を大幅に上回る。
筆者らによる高齢者ボランティアの絵本読み聞かせプログラム、
REPRINTS は高齢者の生活機能維持に世代間交流が有効なことを証明した。
しかし、持続性があり実践しやすい世代間交流プログラムの開発には壁もある。

1 「孤立」を取り巻く社会的背景

血縁、地縁、社縁を中心に形成されてきた、我が国の社会的サポート・ネットワークは、急激な都市化・核家族化と雇用環境の変化により脆弱になった。とりわけ地域社会の結びつきが希薄になってきた近年、社会的孤立の終末像の一つとして高齢者の孤立死が注目されている。

孤立死とは、社会から孤立した結果、死後、長期間放置されるような死を意味する。全国統計は存在しないが、東京都監察医務院のデータによれば東京23区内における一人暮らしの65歳以上の自宅での死亡者数は、2002年の1,364人から2011年は2,618人と10年間で2倍に増加している。孤立死に至る背景には貧困、健康問題、失業や離婚など社会的な孤立を余儀なくされる状況を経る場合が多いことから、深刻な社会問題である。

一方、孤立死の発生により、その事後処理の経済的・人的負担、近隣住民相互の無力感・不信感が生じるなど、コミュニティ全体に及ぼす負の影響は大きい。国も地方公共団体とともに総合的な取組みに着手し、2007年度から孤立死防止推進事業（「孤立死ゼロ・プロジェクト」）を推進してきた。

その成果・指針は、2008年3月に「高齢者等が一人でも安心して暮らせるコミュニティづくり推進会議（「孤立死」ゼロを目指して）」により報告された[1)]。その中で、我が国においては、単身高齢者世帯や高齢者夫婦のみ世帯が急増しており、「孤立生活」はもはや特別な生活形態ではなく、標準的な生活形態であることを認識すべきとしている。

2 社会的孤立の定義

孤立死は、ある日突然生じる急性のイベントであることは少ない。孤立死の定義が、上述の「社会から孤立した結果、死後、長期間