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# Cognitive dysfunction affecting instrumental activities of daily living in patients with Alzheimer's disease: a comparative study using the At-the-Desk test

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## Abstract

**Background:** Despite an inability to perform various instrumental activities of daily living (IADL) in patients with mild Alzheimer's disease (AD) , the association between most cognitive and depression test results and IADL is unclear. Therefore, the present study was performed to examine cognitive ability and depression in 22 patients with mild AD, and compared IADL test performance to that of 25 healthy elderly adults. To measure IADL ability, the At-the-Desk IADL test, which includes seven types of IADL task and has been shown to be both reliable and valid, was performed. In addition, neuropsychological examination and administration of the Geriatric Depression Scale (GDS) -15, which is a depression screening test, was also conducted.

**Results:** Subjects in the mild AD group showed relatively high performance rates in the three tasks "folding clothes," "sorting trash," and "sorting books." However, the numbers of incorrect responses were significantly higher in all IADL tasks compared to healthy elderly adults. Correlations were observed between the seven IADL tasks and neuropsychological tests, but not GDS-15. Short-term memory showed higher correlations with IADL tasks. These findings suggest that subjects with mild AD can still carry out IADL tasks, but will make more incorrect responses. As cognitive function varies according to IADL task, it is suggested to specifically select these tests for assessing subjects with mild AD to identify IADL requiring support.

## KEY WORDS

Alzheimer's disease, IADL, Cognitive function

## Introduction

The aging of the Japanese population has progressed rapidly, and according to a 2012 report by the Japanese Ministry of Health, Labour and Welfare (MHLW) , the number of elderly patients with dementia has reached 4.39 million <sup>1)</sup> . The number of patients with Alzheimer's disease (AD) in the United States was estimated at 5.20 million in 2013 <sup>2)</sup> . AD and AD with other cerebrovascular disorders account for approximately 70-80% of all dementia cases in Japan <sup>1)</sup> . Thus, the need to develop measures to

address AD is a critical global issue.

The MHLW developed a "Five-Year Plan for the Promotion of Measures Against Dementia (Orange Plan) " to address the rapid increase in dementia patients and intends to implement "early intensive in-home support" based on "early support function" as a specific measure of this plan <sup>3)</sup> . Therefore, the number of opportunities to support activities of daily living (ADL) in patients with very mild or mild AD is expected to increase in Japan.

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Patients with very mild or mild AD are able to perform self-care ADL, including self-feeding and toileting. However, these individuals tend to experience difficulty in performing instrumental ADL (IADL), such as shopping and money management<sup>4)</sup>. Laurent et al.<sup>5)</sup> published a study using a modified IADL scale developed by Lowton et al.<sup>6)</sup>, Ueda et al.<sup>7)</sup>, and Galasko et al.<sup>8)</sup>, to assess IADL in patients with mild AD. Impairment in common IADL, including meal preparation (cooking), going to an unfamiliar place, home care and maintenance, financial management, and shopping, has been observed in these studies<sup>5-8)</sup>. Therefore, a reduction in the ability to perform certain IADL is observed in mild AD.

These data suggest that a specific factor affects IADL in AD patients, even in the mild stage of the disease. Researchers have assumed that certain types of cognitive dysfunction affect IADL performance, as AD patients develop cognitive dysfunction at an early stage<sup>9)</sup>. For instance, short-term memory impairment has been observed in patients with mild AD<sup>7)</sup>. In addition, Perry et al.<sup>10)</sup> reported visuospatial and attention impairment, and Maejima et al.<sup>11)</sup> reported that patients with mild AD developed prospective memory impairment, which is characteristically associated with memory loss. Furthermore, Kramer et al.<sup>12)</sup> reported that attention impairment or executive dysfunction was observed in amnesic patients with mild cognitive impairment (MCI) who were likely to progress to dementia. Therefore, these types of cognitive dysfunction could influence certain types of IADL and impair the ability to perform these IADL in AD patients.

Few studies have examined the types of cognitive dysfunction that occur in patients with mild AD and the influence of these on IADL. Moreover, no studies have used multiple regression analysis to determine the effects of psychological factors and various types of cognitive function on IADL. Examination of these topics could assist in the selection of appropriate assessments for cognitive function and determination of activities required to support the livelihood of patients with mild AD.

The IADL scale developed by Lowton et al.<sup>6)</sup> and the scale developed for AD patients in the Alzheimer's Disease Cooperative Study-ADL conducted by Galasko et al.<sup>8)</sup> could be used to assess IADL in AD patients. However, these ADL scales could produce subjective errors, as their scoring systems are based on interviews

with the caregivers and family members of patients. A more objective assessment method that detects qualitative changes in IADL is required to determine the types of cognitive dysfunction that affect IADL. The current study utilized the At-the-Desk IADL test<sup>13)</sup> to assess IADL. Unlike existing IADL scales, its measures reflect incorrect responses regarding IADL tasks, using scores determined via patient performance and the observations of an evaluator, as a qualitative evaluation of IADL. In addition, the current study utilized neuropsychological tests to determine whether performance achievement varied according to IADL task. Furthermore, the current study sought to determine whether the differences in cognitive dysfunction affecting each task varied between subjects with and without mild AD.

## Methods

### Subjects and procedure

Twenty-two physician-diagnosed AD patients from healthcare facilities providing care for the elderly or ambulatory rehabilitation were included in the mild-AD group (Table 1). All patients in the mild-AD group had a Clinical Dementia Rating (CDR) score of 1 or 0.5, as determined by the rehabilitation center staff (e.g., physical therapists and/or occupational therapists). Patients with a history of other central neurological diseases were excluded. In addition, all subjects in the mild-AD group were diagnosed as AD, using criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision<sup>9)</sup> and imaging data from an outpatient clinic that specialized in dementia. Twenty-five healthy subjects comprised the control group (HC). These individuals were selected in accordance with the MCI criteria defined by Petersen et al.<sup>14)</sup> to exclude patients with MCI (i.e., subjects were included if their Mini-Mental State Examination score was  $> 24$  points, their CDR score was 0, and their mean Wechsler Memory Scale-Revised [WMS-R] score for logical memory was greater than or equal to the value obtained using the following equation: age corresponding mean - two standard deviations). Subjects in the HC group were recruited from the part-time volunteer staff of the ambulatory rehabilitation center, as well as from participants in care prevention classes.

Subjects from both groups (mild-AD and HC) received a written explanation of the study, and consent was

obtained either directly from the subject (HC group) or from family members or legal guardian of the subject (mild-AD group) . The study was approved by the ethics committee at the university with which the first author was affiliated (approval No. 2010C0018) .

The At-the-Desk IADL test

The At-the-Desk IADL test consists of seven IADL

tasks that can be performed at a desk (Table 2) . Subjects are required to consider the execution order and perform all tasks within a set time limit. The eighth task in the test, "at the end, hold up the end card when you believe that you have completed the task," was not included in the analysis, as it does not accurately reflect true IADL. IADL performed at a desk were selected

Table 1. Characteristics of subjects

	HC group (n = 25)	Mild AD group (n = 22)	Comparison test
Men:Women	(6:19)	(2:20)	Chi-square test n.s.
Age (year)	75.6±4.8	78.9±6.8	<i>t</i> -test n.s.
MMSE	28.7±1.7	20.6±3.6	***
WMS-R Logical Memory II	17.0 (Median)	3.0 (Median)	Mann-Whitney-U test
CDR	0	0.5 or 1	***

n.s. = not significant

\*\*\*p < 0.001

HC: healthy control, AD: Alzheimer's disease, MMSE: Mini-Mental State Examination, WMS-R: Wechsler Memory Scale-Revised, CDR: Clinical Dementia Rating

Table 2. The At-the Desk IADL test of tasks and rules

<b>The At-the Desk IADL test of tasks</b>	
Task No. 1	<b>Folding clothes:</b> Please fold a jacket and underwear and a towel on the table. Separate them, and please place each item into the clothing drawers.
Task No. 2	<b>Making a telephone call:</b> Please look for the phone number of Ichiro Shimizu from an address book. Please place a call.
Task No. 3	<b>Wiping a table while holding the receiver</b>
Task No. 4	<b>Boiling water in an electric pot:</b> Water is in the electric pot. Please plug the cord into the outlet, and bring the water to a boil.
Task No. 5	<b>Unplugging the cord from the outlet:</b> Unplug the cord from the outlet when the hot water boils.
Task No. 6	<b>Sorting trash:</b> Please put the various types of trash into their respective trash boxes.
Task No. 7	<b>Sorting books:</b> Shelve books on shelves by arranging them by type.
Task No. 8	<b>Putting up an end card:</b> At the end of a task, hold up the end card when you believe you have completed the task.
<b>Rules</b>	
	<ul style="list-style-type: none"> <li>• Please perform each task (Task No. 1 to No. 8).</li> <li>• The time limit is 5 minutes. It takes 4 minutes for water to boil.</li> <li>• You may refer to the instruction poster board and rules at any time.</li> </ul>

Task No. 8 is not in instrumental activities of daily living task. Therefore, this task has been excluded from the analysis.

from among those that patients with mild AD have been unable to perform in several studies<sup>4-6)</sup>. Subjects were required to perform all tasks within 5 minutes and permitted to refer to the task form during the test. In addition to receiving an explanation of the rules, subjects were informed that water would boil 4 minutes after an electric pot was plugged in. If difficulty in performing the task was noted after initiation of the test, the examiner instructed the subject to refer to the task form again. However, this intervention was performed only once. The tasks to complete the test were displayed on a poster board, mounted at the front of the desk and facing the participants, allowing them to refer to the board while performing the test (Figure 1). Using a video camera (Panasonic HDC-HS9-N), subjects were recorded by a videographer, who repositioned accordingly in an effort to capture subject behavior accurately during the test. This level of recording was necessary to score errors in performing IADL (hereafter termed incorrect responses).

IADL tasks in the At-the-Desk test were scored using a 5-point scale ranging from 0 to 4<sup>11)</sup>. Participants were given a score of 4 points for each task completed without any incorrect responses. For each incorrect response recorded during the performance of the task, 1 point was deducted, meaning that a score of 4 represented 0 incorrect responses, a score of 3 represented 1 incorrect response, a score of 2 represented 2 incorrect responses, etc.<sup>11)</sup>.

#### Neuropsychological and basic depression tests

To examine the effects of higher brain function or symptoms of depression on performance in the At-the-Desk IADL test, subjects performed the backward digit span test and mental control tasks (a subtask of the Wechsler Memory Scale-Revised [WMS-R] neuropsychological test), which evaluates attention function, and the logical memory II task (another WMS-R subtask), which evaluates delayed recall memory. In addition, subjects performed the clock-drawing test, which evaluates visuospatial/constructional ability, and the Behavioral Assessment of the Dysexecutive Syndrome (BADS), which evaluates performance ability. Scoring methods with a scale ranging from 0 to 10, developed by Rouleau et al.<sup>15)</sup>, were used in the clock-drawing test. In the BADS, the lowest score for the mild-AD group, which was considered the floor effect, was observed in the “zoo

map test.” Therefore, the total possible score was set at 20 in the analysis of the five other BADS tests: Rule Shift Cards, Action Program, Key Search, Temporal Judgment, and Modified Six Elements Tests. The 15-item Geriatric Depression Screening Scale (GDS-15) was used to assess the level of depression. The GDS-15 consists of a series of yes/no questions, and subjects with scores of 0-5, 6-9, or 10-15 are categorized as showing “no depression,” “mild depression,” or “more severe depression,” respectively.

#### Statistical analysis

Subjects who performed the tasks appropriately according to the rules, and some subjects who showed “incorrect responses,” were counted as “subjects who performed” the At-the-Desk IADL test. Any behavior that fell into the category of “incorrect responses” in the “checklist of incorrect responses,” shown in Figure 1, was considered an “incorrect response.” Therefore, the scores of “subjects who performed” = the number of “normal responses” + the number of “incorrect responses.” Therefore, the number of “subjects who performed” included those who performed the test with inappropriate responses. The subjects who performed without “incorrect responses” were defined as having a “normal response.” Therefore, the number of “normal responses” = the number of “subjects who performed” - the number of “incorrect responses.”

A chi-square test and Yates’ correction were used to compare the number of “subjects who performed” and the number of “normal responses” between groups. Three occupational therapists (with 10, 14, and 17 years of respective clinical experience) watched the video recordings. Tasks scored as incorrect by all three occupational therapists (Figure 1) were considered incorrect responses.

A Mann-Whitney U test was used to compare scores between the HC and mild-AD groups in the neuropsychological, depression, and the At-the-Desk IADL tests. The significance level was set at 5% for the chi-square, Mann-Whitney U, and t-tests.

Factors affecting the results of the At-the-Desk IADL test included cognitive dysfunction and depression symptoms. Therefore, we decided to examine the associations between the seven tasks and influencing factors (i.e., neuropsychological and depression tests). Analysis was performed using the Spearman’s rank correlation coefficient ( $p < 0.05$ ). JMP ver. 8 (SAS

Worldwide Headquarters) was used to perform the statistical analysis.

### Results

Table 3 shows the comparisons of the numbers of “subjects who performed” and “correct responses” in the At-the-Desk IADL tasks between groups. A chi-square test was inappropriate for use in the “folding clothes,” “making a telephone call,” “boiling water in an electric pot,” “sorting trash,” and “sorting books” tasks, as all members of the HC group were able to carry out these tasks with no incorrect responses. In addition, the results of the three tasks of “folding clothes,” “sorting trash,” and “sorting books” showed high performance ratios of 86.4%, 95.5%, 100%, respectively, in the subjects of the mild-AD group. However, the number of people in the mild-AD group who performed the other two tasks (wiping a table while holding the receiver, unplugging the cord from the outlet) was significantly lower when compared to the HC group ( $p<0.001$ ). Furthermore, across all seven tasks, the number of people in the mild-AD group who gave correct responses was significantly lower relative to that in the HC group ( $p<0.05$ ).

Table 4 shows the results of the At-the-Desk IADL and neuropsychological tests as well as the GDS-15 scores. The mild-AD group's scores for all seven tasks in the At-the-Desk IADL test were significantly lower relative to those of the HC Group ( $p<0.01$ ). In addition, there were fewer than four incorrect responses for each task. The mild-AD group's neuropsychological test scores were significantly lower relative to those of the HC group ( $p<0.05$ ). The GDS-15 scores did not differ significantly between groups.

Table 5 shows the result of the correlation analysis. Spearman's rank correlation coefficients were used to determine the associations between scores for the seven At-the-Desk IADL tasks, neuropsychological test scores, and GDS-15 scores. The analysis showed that scores for the At-the-Desk IADL tasks were not correlated with GDS-15 scores. Concerning the relationship between neuropsychological measures and At-the-desk IADL test scores, results appeared to support significant correlations in some task. For example, the correlation between the “wiping a table while holding the receiver” and “unplugging the cord from the outlet” tasks and mental control, were found to not be statistically significant.

Correlational coefficients were small in the other

Table 3. Differences in the number of “subjects who performed” (top number) and “correct responses” (bottom number) in the At-the-Desk IADL test of tasks

Task No. and Name	HC Group	Mild-AD Group	Chi-square test
	(n=25)	(n=22)	
	n (%)	n (%)	
Task No. 1: Folding clothes	25 (100.0)	19 (86.4)	-
	22 (88.0)	8 (36.4)	***
Task No. 2: Making a telephone call	25 (100.0)	10 (45.5)	-
	23 (92.0)	5 (22.7)	***
Task No. 3: Wiping a table while holding the receiver	21 (84.0)	6 (27.3)	***
	11 (44.0)	1 (4.5)	***
Task No. 4. Boiling water in an electric pot	25 (100.0)	8 (36.4)	-
	24 (96.0)	6 (27.2)	***
Task No. 5. Unplugging the cord from the outlet	15 (60.0)	2 (9.1)	***
	11 (44.0)	1 (4.5)	***
Task No. 6: Sorting trash	25 (100.0)	21 (95.5)	-
	24 (96.0)	7 (31.8)	*
Task No. 7: Sorting books	25 (100.0)	22 (100.0)	-
	24 (96.0)	11 (50.0)	***

\*\*\* $p<0.001$  \* $p<0.05$

HC: healthy control, AD: Alzheimer's disease

tasks that demonstrated a significant relationship with mental control. In addition, the logical memory II scores demonstrated moderate correlation coefficients with the “folding clothes,” “sorting trash,” and “sorting books” tasks. Moderate to high correlations between other IADL tasks were observed, and the WMS-R digit span test demonstrated moderate to high correlations with all IADL tasks.

### Discussion

Significantly fewer number of correct responses was shown in the AD group than HC group. Even though the completion rate in some tasks was still sufficient in the AD group, they committed qualitative errors. In other words, subjects with AD were still able to complete the IADL task but were unable to do correctly. Additionally, the subjects of the mild-AD group achieved significantly lower

scores than the HC group in all neuropsychological tests. These results indicate that subjects with mild AD suffered from cognitive dysfunction (attention, working memory, visuospatial cognition, construction, executive function, and delayed recall) . Thus, when patients with mild AD attempted the IADL tasks, the cognitive dysfunctions (evaluated with the clock-drawing test, BADS, WMS-R Logical Memory II, and WMS-R backward digit span task) interfered with correct performance in these tasks.

The tasks that showed a performance rate of more than 80% in the mild-AD group consisted of the three tasks of “folding clothes,” “sorting trash,” and “sorting books.” Subjects performed the At-the-Desk IADL test following the instructions and rules for each task contained in a “task form.” Hence, the proportion of people who were able to perform the task was influenced by the level of understanding of the form.

Table 4. Results of At-the Desk IADL test and neuropsychological tests, GDS-15 scores

		HC group (n=25) (Median/ 25%-75%-ile)	Mild-AD group (n=22) (Median/ 25%-75%-ile)	Mann- Whitney -U test
At-the Desk IADL test	Folding clothes	4.0/4.0-4.0	2.0/1.0-4.0	***
	Making a telephone call	4.0/4.0-4.0	0.0/0.0-2.5	***
	Wiping a table while holding the receiver	2.0/2.0-4.0	0.0/0.0-1.0	***
	Boiling water in an electric pot	4.0/4.0-4.0	0.0/0.0-4.0	***
	Unplugging the cord from the outlet	2.0/0.0-4.0	0.0/0.0-0.0	**
	Sorting trash	4.0/4.0-4.0	2.0/2.0-4.0	***
	Sorting books	4.0/4.0-4.0	3.5/2.0-4.0	***
	WMS-R Digit span	6.0/6.0-8.0	4.0/3.0-6.0	***
WMS-R mental control	5.0/4.0-6.0	3.0/1.5-5.3	**	
WMS-R Logical Memory II	17.0/13.5-23.0	3.0/0.0-7.3	**	
Clock Drawing Test	11.0/10.0-11.0	4.0/3.0-5.5	***	
BADS	14.0/12.0-15.8	7.0/4.0-8.0	***	
GDS-15	3.0/0.0-4.8	2.5/2.0-4.3	n.s.	

\*\*p<0.01 \*\*\*p<0.001

ns: not significant, HC: healthy control, AD: Alzheimer's disease, WMS-R: Wechsler Memory Scale  
-Revised, BADS: The Behavioral Assessment of the Dysexecutive Syndrome, GDS: Geriatric  
Depression Scale

Ouchi et al.<sup>16)</sup> reported that IADL performance was limited qualitatively rather than quantitatively in patients with very mild AD and a CDR score of <0.5. In the At-the-Desk IADL test, incorrect responses could be considered a qualitative evaluation of IADL (Figure 1). In this study, the qualitatively incorrect responses were performed with a significantly higher frequency in the mild-AD group, supporting the findings and hypotheses proposed by Ouchi et al.<sup>16)</sup>

The weak correlations were demonstrated between the WMS-R mental control scores and all IADL tasks, considering that the WMS-R mental control test measures sustained attention rather than general attention. On the other hand, the WMS-R digit span had moderate to strong associations with each IADL task. The WMS-R Logical Memory II correlations with “folding clothes,” “sorting trash,” and “sorting books” tasks were not

quite as strong, while this test had moderate to strong associations with other IADL tasks. Therefore, this test assesses cognitive functions that are relevant to IADL. Although these two tests measure short-term memory, the backward digit span task is a test of attention and working memory. Baddeley et al.<sup>17)</sup> reported reductions in dual-task scores due to impaired working memory or distributed attention in AD patients even at a mild stage of the disease. Furthermore, the digit span test measures immediate memory because participants have to answer within a short time. On the other hand, the WMS-R Logical Memory II is a recent memory test since it uses delayed recall. It was reported that working memory and recent memory decrease remarkably in people suffering from AD<sup>7)</sup>. In this study, working memory and recent memory were both related to false responses in the IADL tasks, and working memory in particular seemed to

Table 5. Result of correlation analysis of At-the Desk IADL test and neuropsychological tests, GDS-15 scores

Dependent variable	Clock Drawing Test	WMS-R mental control	WMS-R digit span	WMS-R Logical Memory II	BADS	GDS-15
Folding clothes score	0.44 **	0.39 **	0.61 ***	0.39 **	0.49 **	-0.13
Making a telephone call score	0.47 **	0.39 **	0.56 ***	0.69 ***	0.57 ***	-0.07
Wiping a table while holding the receiver score	0.55 ***	0.24	0.61 ***	0.62 ***	0.66 ***	-0.05
Boiling water in an electric pot score	0.67 ***	0.33 *	0.60 ***	0.67 ***	0.56 ***	-0.05
Unplugging the cord from the outlet score	0.48 **	0.29	0.46 **	0.56 ***	0.35 *	-0.09
Sorting trash score	0.49 ***	0.29 *	0.59 **	0.38 *	0.62 ***	-0.05
Sorting books score	0.55 ***	0.39 **	0.68 ***	0.34 **	0.68 ***	0.12

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

WMS-R: Wechsler Memory Scale-Revised,

BADS: The Behavioral Assessment of the Dysexecutive Syndrome,

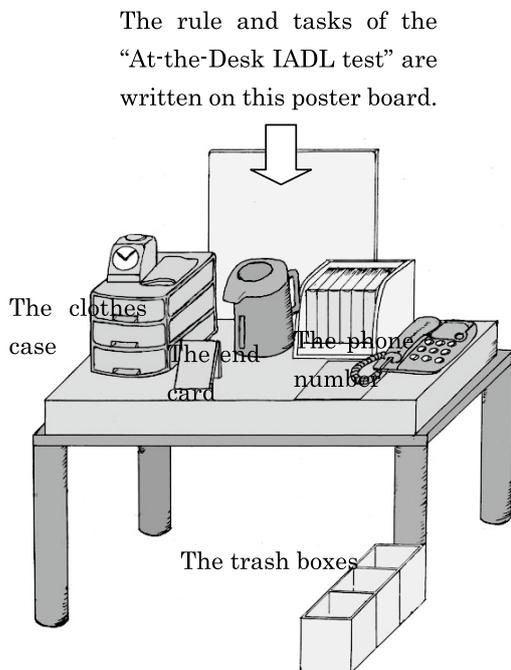
GDS: Geriatric Depression Scale

influence on all IADL tasks. The clock-drawing test scores showed strong correlations with tasks such as “boiling water in an electric pot” and “wiping a table while holding the receiver”. It is likely that visuospatial cognition and constructional ability could have affected performance in these tasks, as the clock-drawing test requires visuospatial cognition and constructional ability<sup>18)</sup>. Thus, visuospatial cognition is necessary for these household items. The correlation with the BADS score was weak for the task of “unplugging the cord from the outlet,” which can be performed swiftly. However, the BADS test scores exhibited strongly significant correlations with other tasks, which suggested that executive function also affected IADL. The findings from these tests and their effect on IADL suggest that the IADL for assistance have to be carefully evaluated.

The number of correct responses for the At-the-Desk IADL test was quite low for some tasks (e.g., “wiping

a table while holding the receiver” and “unplugging the cord from the outlet”) even in the HC group (e.g., 44% correct responses). In other words, these two tasks presented even more difficulty for individuals with AD to make correct completion. Other IADL tasks, for example, “making a telephone call” and “boiling water in an electric pot” were not as challenging. Nevertheless, completion rate and correct responses in the mild-AD group were relatively low. Lechowski<sup>5)</sup> found that for cooking and answering the phone, people with AD are more likely to experience difficulties. The same applies to the task “wiping a table while holding the receiver” and “unplugging the cord from the outlet.”

This study examined the association between IADL and depression. However, none of the correlations between the GDS-15 and the At-the-Desk IADL test were significant. One reason might be that the GDS-15 did not differ between the two groups. Another reason could be that



Checklist of incorrect responses (excerpt)

Task Name	Contents of incorrect responses to each task	Check column
Folding clothes	Folding clothes but not putting them into the drawers	
	Making an error in the classification of clothes	
	Putting the dish towel away rather than the clothes	
	Not folding clothes completely	
Making a telephone call	Pushing the button key of the telephone with a dish towel	
	Movement stops on the way	
	Pushing the keys without lifting the receiver first	
	Telephoning someone other than Ichiro	
	Placing the receiver on the table	

Figure1 At-the-Desk IADL test equipment placement

both groups were comprised of persons with low levels of depression symptoms. Therefore, we could not determine whether depression symptoms affected IADL. This should be investigated in future studies.

In this study, IADL related to housework activities were performed via the At-the-Desk IADL test. It is likely that patients with mild AD had performed these IADL tasks at home. These tasks provide opportunities for intervention as part of home-based support. Impaired short-term memory, executive function, visuospatial cognition, and constructional ability influenced IADL scores are consistent with the presence of cognitive dysfunction in AD patients<sup>18-19)</sup>. Therefore, the current results were valid and novel, as they identified the relative contributions of cognitive functions to the different IADL tasks. It indicates that the neuropsychological tests performed in this study should be used to evaluate IADL for the perspective support in daily life. Furthermore, these neuropsychological assessments could help to identify the available support.

#### **Limitations of the study**

The At-the-Desk IADL test has been strongly associated with IADL<sup>13)</sup>. However, future studies should seek to determine whether the current results are directly related to IADL-related circumstances in AD patients. Furthermore, according to Okazaki et al.<sup>21)</sup>, executive function and apraxia affected IADL task performance in AD patients. In addition, Grossi et al.<sup>22)</sup> posited that

attention distribution disability occurs in AD patients because their recognition of co-simulation is inadequate. This study did not examine apraxia or attention distribution, but it is likely that these types of cognitive dysfunction influence the performance of patients in the At-the-Desk IADL test. The effects of these types of cognitive dysfunction should therefore be studied in future research. In addition, it is necessary to examine the influence of depression on IADL.

#### **Conclusions**

In the AD group, the completion rate for some IADL tasks was acceptable. However, the number of incorrect responses in all IADL tasks was significantly bigger in comparison with the healthy control group. In addition, the strength of the correlations with various cognitive functions varied according to each IADL task. This suggested that severe cognitive impairments substantially contributed to these high rates of incorrect responses in the IADL. Therefore, these results could be useful in selecting items for use in cognitive function evaluation in AD patients, which could inform the planning of everyday support programs.

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## アルツハイマー病者の IADL に影響する高次脳機能障害についての 検討 –机上 IADL 検査を用いて–

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### 要 旨

はじめに:アルツハイマー病(AD)の軽度段階では、いくつかの手段的日常生活活動(IADL)の能力が低下し、高次脳機能の低下やうつが IADL に影響していると考えられている。しかし、IADL と高次脳機能、うつとの関連について検討した報告は少ない。そこで、我々は「机上 IADL 検査」を用いて、高次脳機能やうつが IADL にどのように影響しているのかについて検討した。方法:対象は軽度 AD 群 25 名と健常高齢者群 22 名とし、7 種類の IADL 課題で構成され信頼性と妥当性が証明されている、「机上 IADL 検査」と神経心理学的検査、簡易うつ検査(GDS-15)を実施した。結果:軽度 AD 群では、「服をしまう」、「ごみの分別」、「本の分別」の課題については、実施割合が高い結果となった。しかし、すべての IADL 課題で誤反応が健常高齢者より有意に多い結果となった。7 種類の IADL 課題と神経心理学的検査と GDS-15、年齢との関連を検討したところ、神経心理学的検査によって相関の強さの違いがみられた。また各 IADL 課題は、短期記憶との関連が強かった。考察:軽度 AD 者は、誤り行動を含みながら IADL タスクを実施していると考えられた。また、軽度 AD 者への IADL 支援を行う際は、影響する認知機能の種類に配慮した検査の選択が必要と考えられた。