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Special Feature Article

Rehabilitation for Instrumental Activity of Daily Living in Community-dwelling Older Adults with Dementia

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Abstract

We review the actual status of instrumental activity of daily living (IADL) and its factors among community dwelling older adults with dementia, and discuss rehabilitation using IADL. Complex IADLs, such as medication management, are impaired in subjective memory complaint and mild cognitive impairment stages. Process analysis of daily activities for Dementia (PADA-D) revealed that IADL independence was high for processes requiring procedural memory, and low for processes requiring complex cognitive functions. Significant interaction was observed in the total score of PADA-D and Lawton IADLs in 3-month rehabilitation. The common goal that was improved was laundry. Goal-directed rehabilitation based on utilizing the remaining cognitive functions and processes, and detailed observation of IADL may be effective for rehabilitation.

Keywords: community-dwelling older adults with dementia, IADL, rehabilitation

Introduction

In 2015, the Ministry of Health, Labour and Welfare released the “New

Orange Plan”,¹²⁾ with the aim of “creating a society where the wishes of people with dementia are respected and they can continue to live as themselves in a good environment in their familiar community for as long as possible”. The plan also calls for the promotion of appropriate dementia rehabilitation, and states that “rehabilitation for people with dementia should be carried out with the actual living situation in mind, while carefully assessing their cognitive function and other abilities, and making the most of these abilities to promote independence and enable them to continue with their daily lives, including ADL (eating, toileting, etc.) and IADL (cleaning, hobbies, social participation, etc.)”. The key points to focus on are: (i) the rehabilitation should be tailored to the functional impairment, (ii) the actual living situation should be taken into account, and (iii) the cognitive function and other abilities of the individual should be assessed and utilized to the maximum extent possible. Regarding (i), since rehabilitation aimed at maintaining and improving cognitive function through cognitive training and other methods is not sufficient for actual living situations, the plan recommends implementing rehabilitation that is tailored to the living difficulties in order to continue living in a familiar area. Thus, it is important to directly address

activities and participation as defined in the International Classification of Functioning, Disability and Health (ICF). Regarding (ii), this indicates that rehabilitation should be carried out even for hospitalized dementia patients with the aim of imagining their lives after returning home. To achieve this, it is necessary to observe each patient's lifestyle, habits, and living environment through home visits and other means, even while they are in hospital, and clearly define their rehabilitation goals. Regarding (iii), although cognitive function declines as the disease progresses, there are cognitive domains that are more likely to decline and domains that are more likely to remain intact, depending on the characteristics of the disease and patient's life history (daily routine, occupation, leisure activities, etc.), so not all cognitive functions decline. It is important for rehabilitation professionals to gain a detailed understanding of the patient's current cognitive function, its level and areas of cognition, and make use of the patient's strong cognitive functions in order to help them live their lives to the fullest extent possible.

While taking into account the national policy, we would like to discuss rehabilitation for IADL (Instrumental Activities of Daily Living) after reviewing the current situation and factors of IADL and the characteristics

of IADL assessment in community-dwelling older adults with dementia. Note that some of the content of this article overlaps with that of the existing literature.¹⁹⁾

I. IADL of Community-dwelling Older Adults and People with Dementia

According to the DSM-5 criteria for diagnosing dementia, “cognitive deficits interfere with independence in daily activities”. For mild cognitive impairment, which is characterized by mild cognitive decline in one or more cognitive domains, “cognitive deficits do not interfere with independence in daily activities”. For more complex IADL, such as managing documents and medication, greater effort, compensatory strategies, and ingenuity are required than before.²⁾ It is clear that the degree of independence decreases in the order of complex IADL, other IADL, and ADL as cognitive function declines. Conversely, in the stage of mild cognitive impairment (MCI) as defined by Petersen, R.C. et al., although there are frequent problems with management, such as managing finances, paying bills, managing medication, and remembering and adhering to appointments and other commitments, there are few problems with using public transport, preparing meals, or doing the laundry.¹⁾ Therefore, complex IADL can be thought of as

activities of daily living that require medium- to long-term management, including advanced cognitive functions such as executive function and prospective memory. In a survey on physical frailty and MCI, the risk of requiring nursing care increases due to physical factors for shopping, going out, and general housework, and the risk of requiring nursing care increases due to cognitive factors for managing money and using the telephone.¹⁵⁾ As you can see, these complex IADL are IADL categories that are more strongly associated with cognitive decline than physical factors. In our study, which examined the progression of aging in patients with Alzheimer's disease (AD) who scored 24 or higher on the Mini-Mental State Examination (MMSE) and healthy older adults, around half of the AD group were impaired in terms of “medication and money management” from their 60s, while for the healthy older adults, “going out (using public transport)” was impaired earliest around the age of 75 (Figure 1).¹⁸⁾ Although cognitive function declines with age, in healthy older adults, the degree of independence declines from “going out”, which involves a large element of physical activity, and in AD, it declines from complex IADL, which involves a marked cognitive function element. In AD overall, medication and money management are impaired in

about half of cases from the latter half of the 20-point range on MMSE, followed by shopping, meal preparation, and housework (cleaning, etc.).⁹⁾ It is worth noting that washing was the most independent activity and the decline was slow.

However, IADL require the use of many household tools and appliances (everyday technology: ET). The multifunctionality of ET is convenient in that it can be used in a variety of situations, but as cognitive function declines, it becomes more difficult to operate ET, and it takes more time and places greater physical and mental burdens. The ability to use ET declines in older people with MCI or mild dementia, and this affects the level of independence in their daily lives at home.¹⁴⁾ In our research on the use of ET by older people living in the community,¹¹⁾ we found that errors in the use of ET occurred from the stage of subjective memory complaints (SMC), and that as cognitive function declined, from MCI to AD, the use of ET became more difficult. In particular, errors were common when operating remote controls, microwave ovens, washing machines, and (mobile) phones (Figure 2). More specifically, this included pressing the wrong button on a remote control or forgetting to take food out of the microwave. Thus, the inability to use ET is one of the major factors contributing to a decline in IADL

independence. Although the convenience of ET is likely to increase as a result of advances in technology, it will also be necessary to retain home appliances that are easy for older people to use, focusing on basic functions.

II. IADL Impairment and its Causes

In order to “make the most of one’s abilities” as promoted by the New Orange Plan, it is important to clarify which parts of IADL are impaired and which are not. It is important to analyze the processes of each daily activity, assess those that are being impaired, and formulate intervention strategies. For the remaining parts, we consider them to be activities that the person is good at, and it is important not to reduce opportunities to practice them in order to prevent a decline in ability due to disuse. The Process Analysis of Daily Activity for Dementia (PADA-D) that we developed is characterized by the fact that it is easy to observe a series of actions because it defines the starting and ending points for each ADL along the process of the action, and it is possible to specifically present action disorders related to cognitive function.¹⁶⁾ Although it was created based on community-dwelling AD patients who are prone to ADL impairment due to cognitive decline as a model, it can be applied for SMC, MCI, and dementia in general. The analysis

table consists of 8 IADL items (telephone, cooking, washing, housework, shopping, going out, medication management, and money management) and 6 basic activities of daily living (BADL) items, with 5 processes per item and 3 actions per process, with maximum scores of 15 per item and 3 per process. PADA-D has been shown to exhibit criterion-related validity and internal consistency reliability with PSMS (Physical Self-Maintenance Scale), which is composed of BADL such as excretion, eating, dressing, grooming, mobility, and bathing, the IADL Scale (Lawton IADLs) developed by Lawton, M.P., and the Hyogo Activity of Daily Living Scale (HADLS), which is composed of 18 items of BADL and IADL.¹⁷⁾ The Lawton IADLs consist of 8 items: using the telephone, shopping, preparing meals, housework, laundry, going out, managing money, and managing medication. They are widely used as IADL assessment for the elderly in general, and not just for those with dementia.

We classified the severity of cognitive function decline in community-dwelling older adults with AD and investigated the characteristics of IADL using PADA-D. With cooking, the overall tendency was for a high degree of independence in “food processing” such as cutting and cooking, and “serving

food”, but a low degree of independence in “planning meals” and “seasoning food”. Even in the severe group, there was a tendency for the ability to perform “food processing” and “serving” to remain, so it was considered that the processes related to procedural memory were easy to perform as a partial role. However, the processes of “menu planning”, involving cognitive processes such as goal setting and planning, and “seasoning of ingredients”, which is affected by a decline in the sense of smell and taste in addition to the selection and judgment of seasonings (and their quantities), were processes that were readily impaired (Figure 3). Regarding telephone use, when the severity of the condition was moderate, the ability to search for the number of the person you want to call and press “Call”, as well as the ability to confirm the person you are talking to and communicate your message, were more likely to be impaired than the ability to respond to calls, such as “answering the phone” or “talking to the person who has called you”. With shopping, as the severity of the disease increased, there was a significant decline in the ability to “select products”, which involves finding the desired product and checking the price and quantity needed, and in the ability to “pay for items”, which involves paying the amount displayed and checking any change. In the case of

washing clothes, as the severity progressed, the ability to carry out activities requiring procedural memory, such as “drying the laundry” and “getting the laundry in; folding the laundry”, tended to remain, while the ability to “start the washing machine” by adding the right amount of detergent and operating the buttons, and “putting the washed clothes away” by carrying them to the storage area to put them away, declined (Figure 4).

IADL are composed of a series of elements, including goal setting, planning, implementation, and confirmation,³⁾ and the number of these processes, their complexity, and the time taken to carry them out all affect impairment. Impairment of executive function and short-term memory can lead to problems such as forgetting to put things away, forgetting to turn off lights or appliances, making errors in sequence or operation, and making mistakes in management and judgment, which can easily lead to IADL impairment. When we conducted PADA-D of people with SMC living in the same community,¹⁰⁾ we found that many IADL, such as money and medication management, were already impaired at this stage. Common factors were the use and operation of tools, management of goods, selection of objects and means, and monitoring. In addition to these, it is considered that

individual factors such as frequency of implementation, frequency of using tools, and other habits, as well as the implementation environment and personality, also strongly affect IADL impairment. In the case of people with SMC, MCI, or mild dementia, it is important to first observe each IADL in detail from preparation to completion, after ascertaining the habits and personal factors. For the impaired activities, we should observe the pattern of errors and psychological reactions such as confusion, and try to simplify and break down the tasks to avoid frustration or confusion, and provide appropriate support through physical and verbal guidance. For the non-impaired activities, it is considered necessary to provide instruction to promote autonomy, etc., avoiding over-assistance from family supporters, etc., so that the person can perform the tasks habitually.

III. Strategic Rehabilitation for IADL

There are some international studies on strategic ADL intervention by occupational therapists and others. Skill-building through task-oriented motor practice (STOMP)⁴⁾ is an application of evidence that teaches new behaviors through task-specific and focused practice.¹¹⁾ This practice involves breaking down the challenges faced by people with dementia in their

daily lives into stages, modifying the environment, and learning skills. Psychological support is also provided by giving frequent praise. It aims to achieve a synergistic effect by making use of errorless learning and procedural memory. Dooley, N.R. et al.⁵⁾ conducted a home-based occupational therapy program for people with mild to moderate dementia, and based on the results of IADL assessment, implemented interventions in three areas: environmental adjustments (e.g., putting labels on drawers), approaches to caregivers (e.g., structuring daily routines), and community-based support (e.g., providing information on social resources). As a result, it was reported that the burden of care on caregivers was reduced and IADL of people with dementia improved. Gitlin, L.N. et al.⁶⁾ conducted a 6-month home environmental skill building program (ESP) for people with dementia and their family caregivers, which consisted of support education, problem-solving and coping skills, environmental adjustment, and direct ADL practice, and reported improvements in caregivers' skills, a decrease in the frequency of care, and decrease in behavioral symptoms. In addition, when a tailored activity program was implemented for four months to instruct the primary caregiver, there was a significant decrease in the number and

frequency of severe behavioral symptoms, level of assistance required for daily activities, and pain.⁷⁾ Graff, M.J. et al.⁸⁾ developed a community-based occupational therapy program for people with dementia and their families. They visited the homes of participants five times to implement environmental adjustments to help participants demonstrate their remaining abilities, gave guidance and support for caregivers, and provided telephone consultations, and they reported that this led to improvements in ADL and a reduced burden of care. In Japan, the “Research and Study to Promote Rehabilitation for Dementia” project¹³⁾ identified “guidance on performing IADL activities using compensatory movements that make use of cues” and “encouraging the person themselves to understand their own cognitive strengths and weaknesses” as effective methods of intervention for people with dementia.

A synthesis of the preceding studies revealed five intervention strategies for the targeted IADL categories: (i) utilizing and compensating for remaining cognitive functions and processes, (ii) repetitive skill practice, (iii) physical environmental intervention, (iv) human environmental intervention, and (v) support and education for families and caregivers.

IV. Rehabilitation Based on Analysis of Daily Activity Process

Finally, I would like to introduce the intervention study: “Study on the Standardization of Rehabilitation Interventions for Patients with Alzheimer's Disease Based on the Analysis of Activities of Daily Living”²⁰⁾ that was conducted as Health and Labour Sciences Research in 2019-2020. In this study, we used PADA-D to identify intervention points for community-dwelling AD and MCI patients, set goals, then verify the effects of the 3-month intervention using a non-randomized controlled trial, and subsequently organize intervention strategies to achieve the goals. The subjects were community-dwelling older adults aged 65 years or older with AD or MCI, and those with severe physical disabilities were excluded. Subjects were recruited from the Center for Dementia-related Diseases, Visiting Nursing Stations, and day-care facilities in six prefectures nationwide. In the intervention group, the processes that had declined and those that remained were clarified using PADA-D, and up to three ADL activities were selected for intervention with the agreement of patients and their families. Specific goals were then decided, including processes, and goal-oriented interventions were implemented for ADL. The intervention was based on

one session a week, 40 minutes per session, for 3 months, and was carried out by occupational therapists and others visiting patients' homes, but it was also possible to carry out the intervention at day-care facilities if it was in line with the goals. The control group was limited to programs normally provided at facilities and by other long-term care insurance services. The intervention strategies were divided into the following categories: (i) use and compensation for remaining cognitive functions and processes, (ii) repetitive skill practice, (iii) physical environmental intervention, (iv) human environmental intervention, and (v) support education for family members and caregivers.

Excluding dropouts due to factors such as COVID-19, the intervention group consisted of 25 participants (16 women, 76.2 ± 9.1 years old, MMSE: 19.5 ± 5.9 , DBD 13 (Dementia Behavioral Disorders Scale): 16.2 ± 7.9 , Lawton IADLs: 3.6 ± 2.3), and there were 24 control subjects (15 females, 78.5 ± 6.4 years old, MMSE: 19.3 ± 4.9 , DBD13: 16.4 ± 7.6 , Lawton IADLs: 3.6 ± 2.6). There were no significant differences between the two groups at the baseline in any of the following: basic information, cognitive function, ADL, DBD13, or the Japanese short version of the Zarit Caregiver Burden Interview (J-ZBI_8), which can be used to measure

the physical and psychological burden of care as a measure of the caregiver burden. When comparing data before and after intervention, a significant interaction was noted (improvement in the intervention group: decline in the control group) in the Lawton IADLs and PADA-D total score, and the effect of the intervention was recognized. There were no significant changes in cognitive function, DBD13, or other ADL scales. The ADL targeted were mostly laundry, shopping, medication management, and personal grooming, and there was a significant interaction effect only for laundry (Figure 5). For the eight participants involved in the laundry process, there were improvements in processes that required procedural memory, such as “drying clothes” and “taking in and folding clothes” (Figure 6). This program combined a series of exercises such as “smoothing wrinkles out of laundry”, “drying”, “checking dryness”, “taking laundry in”, “folding”, and “putting it away in storage”, the posting of notices to encourage these activities, introduction of pegs on clotheslines, and other interventions in the physical environment, as well as the use of remaining cognitive functions and repetition. The degree of satisfaction and performance of the targeted ADL significantly improved, and the person in question also experienced subjective benefits in

activities of daily living that had not actually improved. The intervention strategy most frequently used was “utilization and compensation for remaining cognitive functions and processes” at 45.8%, but there was also a complex use of “repetitive skill practice”, “physical environmental intervention”, “human environmental intervention”, and “supportive education for family and caregivers” (Table). For example, the strategy involved getting them to carry out a certain process using procedural memory, but also involved physical environmental intervention with the aim of raising awareness and simplifying the method of use, and skill practice to make the process habitual.

Based on these results, it is possible that if rehabilitation interventions based on activity of daily living analysis are provided for community-dwelling older adults with AD, there may be partial improvements in ADL independence, even if there are no improvements in cognitive function. As an occupational therapist, We think that ADL interventions utilized the remaining cognitive functions and processes, with a focus on activities and participation as classified by ICF, are important for “continuing to live in a familiar community”, although approaches aimed at maintaining and improving cognitive function are also

sometimes necessary. There are many limitations and issues that need to be addressed, but we believe that analyzing ADL and visualizing the remaining and impaired processes, as well as changes in independence due to interventions, will be useful for collaboration and sharing with those who support home life.

Conclusion

Occupational therapists must actively participate in ADL/IADL interventions in local communities, as promoted by the National Dementia Policy and New Orange Plan, and put measures into practice that improve the ability to perform activities of daily living. However, the activities of occupational therapists in and around the home are not sufficient. As a means of community intervention, we hope that you will consider rehabilitation based on analysis of activities of daily living.

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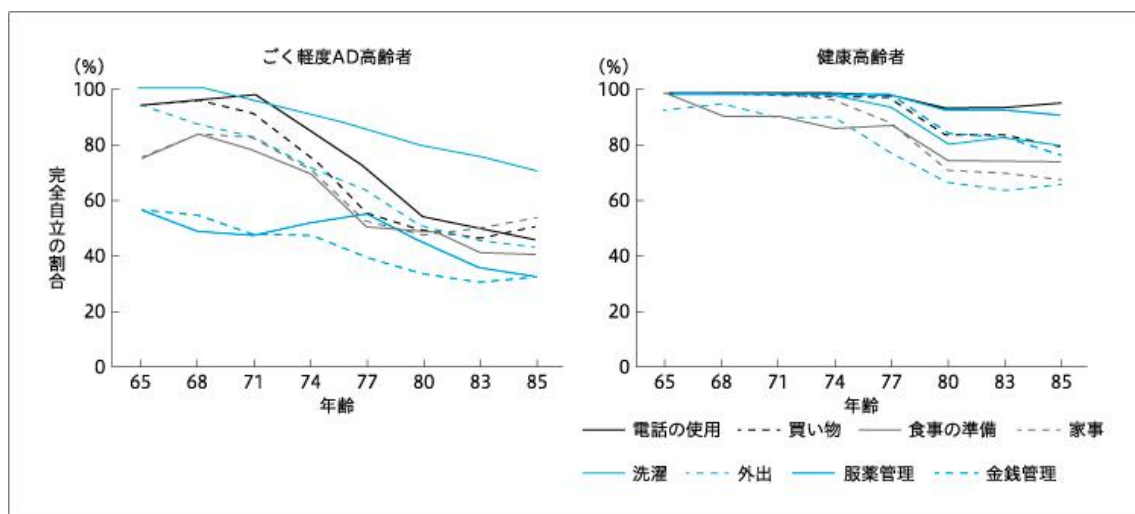


図1 MMSE 24点以上のADと健康高齢者の加齢推移
N=107, 年齢, 性別マッチング
(文献 18 より抜粋)

Figure 1: Changes in age of AD patients with MMSE scores of 24 points or higher and healthy older adults

N=107, age- and sex-matched

(Excerpt from Reference 18)

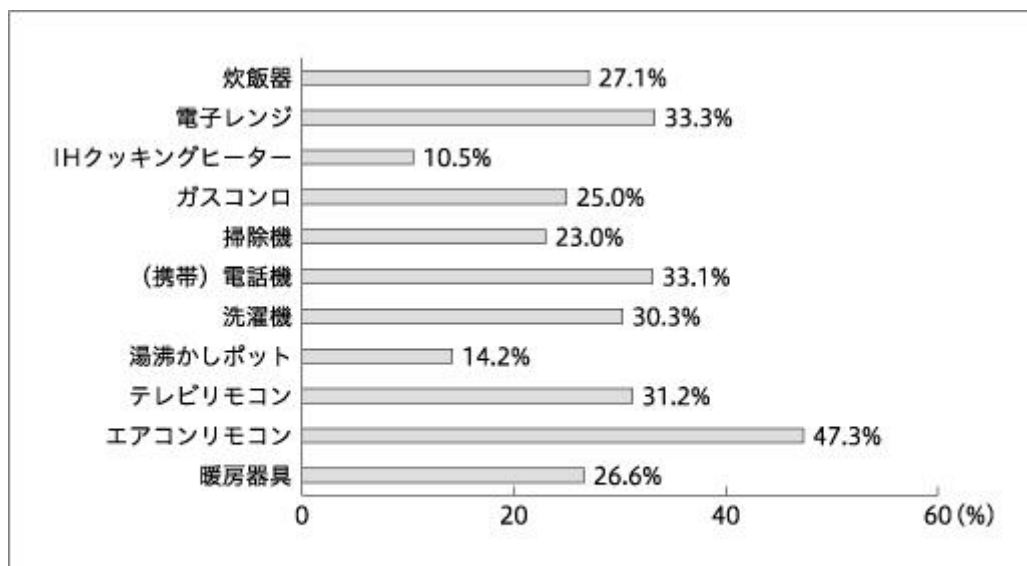


図2 SMCのある高齢者 (MCI, AD 含む) のET使用エラーの割合
(文献15より一部抜粋)

Figure 2: Percentage of errors on using ET in older adults with SMC (including MCI and AD)

(Excerpt from Reference 15)

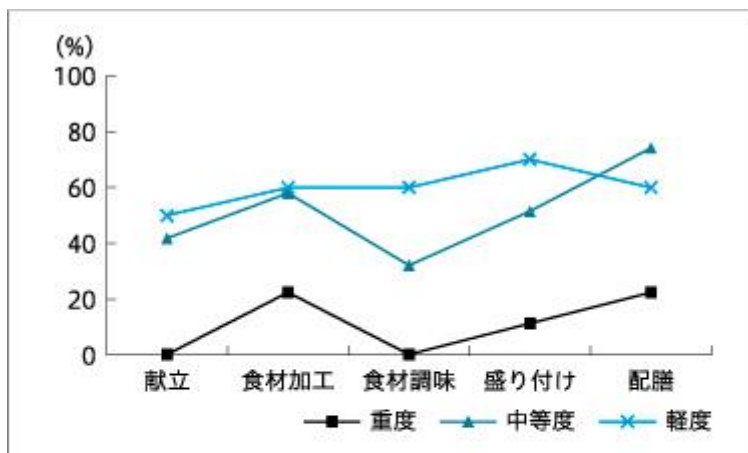


図3 「調理」の各工程における重症度比較（3点満点の割合）

地域在住 AD 患者 52 名（女性 44 名，平均年齢 83.7 ± 7.4 ，平均 MMSE 14.65）

重度：MMSE 10 点未満 10 名，中等度：MMSE 10～19 点 32 名，軽度：20 点以上 10 名

（文献 16 より一部抜粋）

Figure 3: Comparison of severity of each step in “cooking” (Percentage on a 3-point scale)

Fifty-two community-dwelling AD patients (44 women, average age: 83.7 ± 7.4 , average MMSE: 14.65)

Severe: 10 or lower on MMSE (10 patients), Moderate: 10 to 19 on MMSE (32 patients), Mild: 20 or higher on MMSE (10 patients)

(Excerpt from Reference 16)

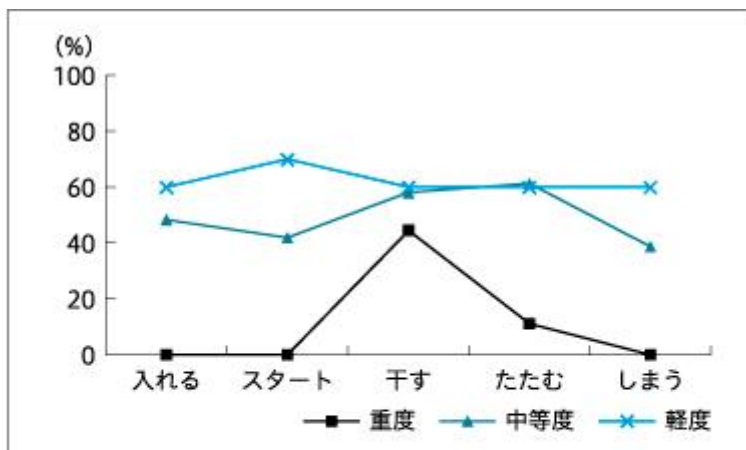


図4 「洗濯」の各工程における重症度比較 (3点満点の割合)

地域在住 AD 患者 52 名 (女性 44 名, 平均年齢 83.7 ± 7.4 , 平均 MMSE 14.65)

重度: MMSE 10 点未満 10 名, 中等度: MMSE 10~19 点 32 名, 軽度: 20 点以上 10 名

(文献 16 より一部抜粋)

Figure 4: Comparison of severity of each stage of the “laundry” process (Percentage on a 3-point scale)

Fifty-two community-dwelling AD patients (44 women, average age: 83.7 ± 7.4 , average MMSE: 14.65)

Severe: 10 or lower on MMSE (10 patients), Moderate: 10 to 19 on MMSE (32 patients), Mild: 20 or higher on MMSE (10 patients)

(Excerpt from Reference 16)

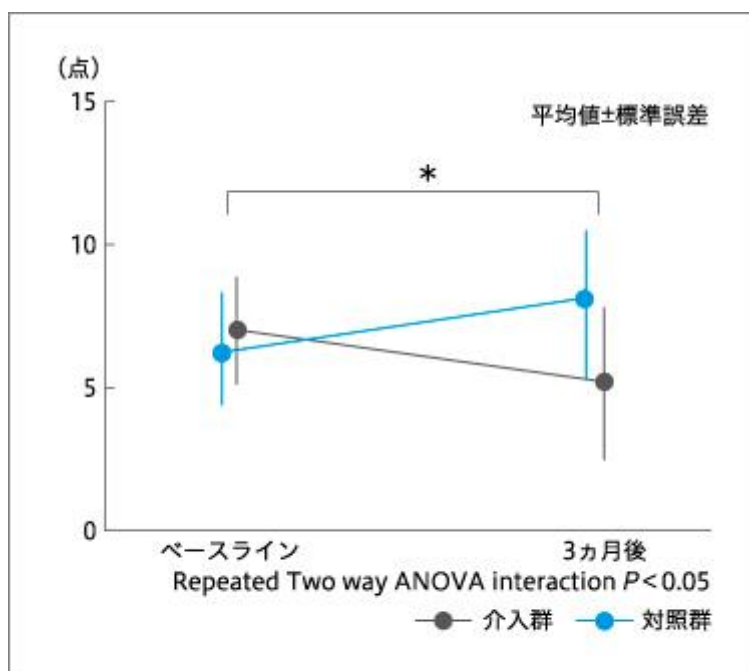


図5 「洗濯」の介入前後比較例
MAX 15, 介入群; N=25, 対照群; N=24
(文献 20 より一部抜粋)

Figure 5: Example of comparison before and after intervention for "laundry"
MAX 15, intervention group: N=25, control group: N=24
(Excerpt from Reference 20)

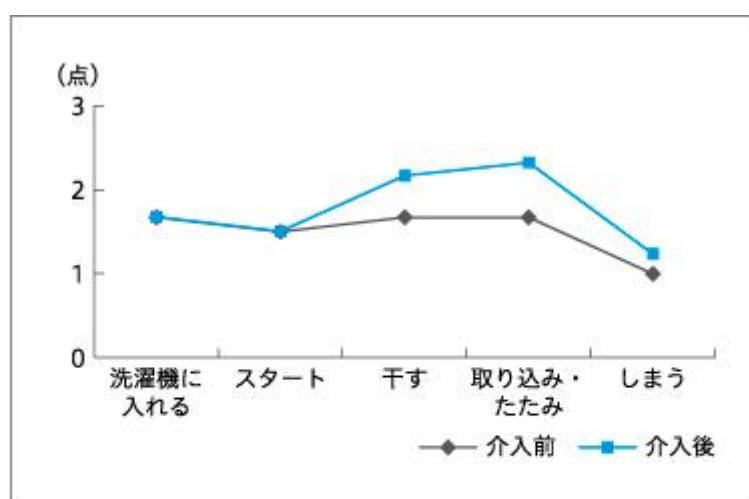


図6 洗濯の各工程の介入前後の変化
洗濯を目標とした者 8 名 (女性 7 名, 74.1 ± 7.7 歳, MMSE 21.2 ± 4.9 , DBD 13.1 ± 5.5)
(文献 20 より一部抜粋)

Figure 6: Changes before and after intervention for each stage of the "laundry"

process.

Eight people targeted for laundry (7 women, 74.1±7.7 years old, MMSE: 21.2±4.9, DBD: 13 11.9±5.5)

(Excerpt from Reference 20)

表 使用した介入戦略の割合

介入戦略	%
1 残存している認知機能や工程の活用・代償 (手続き的記憶, 視覚的手かがりなど)	45.8
2 反復技能練習 (分割した/一連の行為の反復練習)	30.5
3 物理的環境介入 (家具などの配置, 自助具, IoT など)	30.5
4 人的環境介入 (家族・近隣の方の支援など)	34.7
5 家族・介護者への支援教育 (具体的な支援方法の教示など)	29.2
6 その他 (ADL 以外の meaningful activity 支援など)	5.0

(文献 20 より一部抜粋)

Table: Percentage of intervention strategies used

Intervention strategy %

1 Utilization/compensation of remaining cognitive functions and processes
(procedural memory, visual cues, etc.) 45.8

2 Repetitive skill practice
(repeated practice of divided/series of actions) 30.5

3 Physical environment intervention
(furniture arrangement, assistive devices, IoT, etc.) 30.5

4. Human environmental intervention
(support from family and neighbors, etc.) 34.7

5. Education of family and caregivers
(teaching specific support methods, etc.) 29.2

6. Other
(support for meaningful activities other than ADL, etc.) 5.0

(Excerpt from Reference 20)