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Preparation and evaluation of IADL improvement program for the elderly requiring support

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Abstract

Instrumental Activity of Daily Living (IADL) has been reportedly performed as part of occupational therapy for patients with physical disabilities such as those with spinal cord injuries and stroke sequelae. However, there are still no reports in the literature regarding the application of IADL to the elderly without psychosomatic disorders. This study aimed to (1) analyze common difficult household work factors among elderly people certified as on support level 1 or 2 (the Japanese nursing-care insurance system at a previous stage) whose IADL decreased because of disuse syndrome, (2) prepare a program to improve IADLs, and (3) perform and (4) evaluate such a program. IADLs were studied using a household work checklist in 608 elderly people certified as on support level 1 or 2 who visited home-visit care centers in S city and K city, A prefecture, and then factor analysis was performed. The results demonstrated 4 common factors causing difficulty in household work, namely, "motor coordination/skill movement" (first factor), "ambulation/carrying" (second factor), "upper limb movement" (third factor), and "grip strength and pinch strength" (fourth factor). Therefore, two kinds of IADL improvement programs were prepared, including exercise specific for IADLs to address these factors and a basic exercise program containing basic actions. The intervention program was performed for 20 to 30 minutes per session over 3 months in 9 elderly people who visited the home-visit care centers and 8 elderly who had to commute for care. The IADL items in the checklist of household work regarding chairs stand and the above-mentioned factors were significantly improved in those who visited home-visit care centers. On the other hand, the IADL items were improved in those who had to commute for care; however, there were no significant changes in basic ADLs such as stair climbing and walking outside, or body measurements. More subjects and a control group are needed in future studies to confirm the efficacy of this program.

Key words

IADL, Elderly, Support level 1 or 2, IADL improvement program, Evaluation

Introduction

Much attention has been paid to nursing care prevention programs to delay as much as possible conditions requiring care and to prevent further development of serious conditions necessitating care, even if the elderly person needs care since the amendment of the Long-term Care Insurance system in 2006 in Japan. The system aims to realize management of an independent life to the maximum in each elder person's familiar environment. Shinkai et al., reported in their cross-sectional survey of community-dwelling elderly

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using the Tokyo Metropolitan Institute of Gerontology Index of Competence that those whose instrumental activities of daily living (IADLs) decreased had increased risk of developing disability in basic activities of daily living (ADLs) 6 years later, and that their daily living abilities including social role, intellectual activity, IADLs, and basic ADLs decreased with aging in this order[1]. A decrease in basic ADLs indicates that the elderly are in a condition requiring care, which underscores the important need to prevent a decrease in IADLs. IADL has been reportedly performed as part of occupational therapy for patients with physical disabilities such as those with spinal cord injuries and stroke sequelae[2-5]; however, there are as yet no reports in the literature regarding the application of IADL to the elderly without psychosomatic disorders.

This study aimed to (1) analyze the common difficult IADL factors (hereafter, difficult household factors) among elderly people certified as on support level 1 or 2 (the Japanese nursing-care insurance system at a previous stage) whose IADLs decreased because of disuse syndrome, (2) prepare a program to improve IADLs, and (3) perform Studies 1 to 3 to evaluate the efficacy of the interventional program.

Study 1

To identify common difficult household factors in IADLs among the elderly certified as on support level 1 or 2 who used home-visit care centers, household assistance items of IADLs offered by the home-visit care centers were investigated, and factor analysis was performed. A program to improve the IADLs of the elderly was prepared by focusing on the difficult household factors obtained by the factor analysis.

1. Subjects and Methods

In this study, IADLs of 608 (479 females and 129 males; mean age, 79.9 years) elderly certified as on support level 1 or 2 were assessed at home-visit care centers in S city (88 people) and K city , A prefecture (120 People). Elderly people certified as on support level 1 or 2 were interviewed regarding household assistance by a review committee for the household work checklist consisting of 8 certified care workers who provided home-visit care. The household work checklist containing 56 items was prepared based on the interview. A 5-point scoring system was employed to assess each answer: 5 points ("perfect"), 4 points ("nearly perfect"), 3 points ("partially difficult"), 2 points ("difficult"), and 1 point ("unable")[6].

Certified care workers or the first care helpers in charge of the subjects filled out the household work checklist. If answers were uncertain, definite answers were obtained by direct interview.

2. Ethical considerations

The subject and family received an explanation from the care manager about the research request that described clearly the research purpose, investigation contents and program, Participation had to be by freewill, and privacy protection, and data management were strictly handled considering ethics. Written consent from the subject and family about the research participation were obtained.

3. Statstical analysis

Principal factor analysis with factor rotation (varimax rotation) was performed using SPSS(ver.15.0 for windows) to elucidate the factor structure of the study results.

4. Results

1) Extracted factors

Table 1 shows the study results from the 608 elderly certified as on support level 1 or 2. The factor loading was 0.4 or higher in all 56 items listed in the household work checklist, and 6 difficult household factors were extracted. The 5th and 6th factors showed less factor loading and were therefore excluded. When the IADL items overwrapped in the 1st, 2nd, 3rd, and 4th factors, the factor with greater factor loading was selected as the IADL item. The 1st factor included 24 "items which required motor coordination/ skill movement" (hereafter, "motor coordination/ skill movement"). The 2nd factor included 10 "items which required ambulatory/ carrying actions" (hereafter, "ambulation/ carrying"). The 3rd factor included 16 "items which required extensive movement of the upper limbs" (hereafter, "upper

Table 1　Results for the difficult household factors obtained by factor analysis.

The household work checklist	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor name
Washing1：hand washing	0.54	0.16	0.42	0.13	0.27	0.17	Items which required motor coordination/ skill movement (24 items)
Washing3：Washing Basami stop	0.45	0.17	0.40	0.21	0.56	-0.07	
Washing6：Button stop	0.61	0.17	0.13	0.11	0.21	0.16	
Shopping5：Small change is taken out of the purse	0.53	0.19	0.13	0.23	0.22	-0.15	
Cooking1：Rice is boiled	0.60	0.12	0.22	0.07	0.18	-0.15	
Cooking2：Meat is minced	0.71	0.18	0.27	0.27	-0.08	0.12	
Cooking3：Fish is carved	0.64	0.25	0.28	0.35	-0.09	0.24	
Cooking4：fish is cut in three pieces	0.77	0.15	0.13	0.15	0.01	0.27	
Cooking5：cut a Japanese radish	0.76	0.17	0.21	0.24	0.03	0.02	
Cooking6：Peel a japanese radish	0.86	0.17	0.17	0.14	0.02	0.07	
Cooking7:　Julienne stripe	0.87	0.18	0.14	0.13	0.04	0.18	
Cooking8：cut a pumpkin	0.60	0.25	0.25	0.43	-0.05	0.25	
Cooking9：Peel a taro	0.83	0.19	0.17	0.17	0.04	0.20	
Cooking10：Take a potato bud	0.88	0.13	0.15	0.17	0.05	0.07	
Cooking11：Peel a onion	0.84	0.10	0.16	0.16	0.11	-0.12	
Cooking12：Mince	0.87	0.12	0.11	0.14	0.12	0.04	
Cooking13：Take a streak of the pea	0.84	0.09	0.16	0.13	0.12	-0.16	
Cooking14：Grate	0.79	0.16	0.20	0.32	0.06	0.01	
Cooking15：cut a devil's tongue jelly	0.79	0.11	0.16	0.26	0.04	-0.13	
Cooking16：Knead meat	0.79	0.11	0.21	0.17	0.04	-0.10	
Cooking17：Mix up	0.84	0.14	0.19	0.16	0.05	-0.15	
Cooking18：Dish up	0.82	0.15	0.17	0.17	0.11	-0.11	
Cooking19：Water in pan throw away	0.49	0.32	0.31	0.44	0.05	0.05	
Cooking25：Soup is carried	0.49	0.35	0.23	0.30	0.25	-0.11	
Cleaning12：takes out the trash	0.10	0.49	0.40	0.13	0.29	0.01	Items which required ambulatory/ carrying actions (10items)
Shopping1：shuttles on foot	0.10	0.75	0.17	0.05	0.07	0.02	
Shopping2：shuttles by bicycle	0.05	0.49	0.16	0.16	0.03	-0.03	
Shopping3：stair climbing	0.15	0.72	0.26	0.08	0.13	-0.02	
Shopping4：Getting on and off of escalator	0.23	0.56	0.22	0.18	0.20	-0.13	
Shopping6：Transportation of big thing	0.18	0.74	0.30	0.16	0.04	-0.05	
Shopping7：round the shop more than two stores	0.20	0.78	0.20	0.07	0.03	0.08	
Shopping8：It turns round the counter	0.20	0.79	0.25	0.14	0.04	0.02	
Shopping9：After it returns to the house, housework is done at once	0.24	0.63	0.29	0.13	-0.02	0.13	
Shopping10：carried luggage of 2kg	0.17	0.77	0.26	0.15	-0.01	0.02	
Cleaning1：cleaner	0.15	0.38	0.61	0.12	-0.14	-0.08	Items which required extensive movement of the upper limbs (16items)
Cleaning2：Furniture removal	0.18	0.33	0.61	0.15	0.08	-0.16	
Cleaning3：dust	0.32	0.22	0.63	0.05	0.10	-0.13	
Cleaning4：sweep by broom	0.23	0.31	0.69	0.04	0.02	-0.18	
Cleaning6：carried a bucket	0.07	0.47	0.57	0.21	-0.05	-0.01	
Cleaning7：sweep up	0.08	0.33	0.61	0.13	-0.03	0.13	
Cleaning8：wipe	0.27	0.28	0.59	0.17	0.10	0.11	
Cleaning9：cleaning of bathtub	0.15	0.35	0.65	0.16	0.04	0.13	
Cleaning10：cleaning of toilet	0.34	0.18	0.61	0.05	0.23	0.05	
Cleaning11：Cleaning of gas range	0.46	0.13	0.58	0.11	0.27	0.01	
Cleaning13：newspaper is bound	0.33	0.26	0.47	0.41	0.19	0.16	
Cleaning14：Opening and shutting of shutter	0.26	0.26	0.49	0.28	0.38	-0.01	
Washing2：Transportation to cloth-drying place	0.30	0.37	0.45	0.13	0.47	0.01	
Washing4：Sheet drying	0.21	0.43	0.50	0.25	0.30	0.18	
Washing5：Opening and shutting of chest of drawers	0.24	0.34	0.45	0.40	0.30	0.18	
Washing7：put away the bedding	0.14	0.49	0.53	0.25	0.12	0.14	
Cleaning5：wrnig a dustcloth	0.38	0.16	0.45	0.45	0.04	0.07	Items which required grip and pinch (6items)
Cooking20：take off the lid of PET bottle	0.38	0.20	0.21	0.77	0.08	0.02	
Cooking21：take off the lid of pull-tab	0.39	0.19	0.19	0.79	0.08	-0.01	
Cooking22：opening a jar	0.33	0.24	0.17	0.77	0.07	0.03	
Cooking23：opening a tofu-pack	0.51	0.22	0.14	0.67	0.07	-0.07	
Cooking24：opening a milk-pack	0.53	0.20	0.15	0.64	0.08	-0.06	

limb movement"). The 4th factor included 6 "items which required grip and pinch " (hereafter, "grip / pinch ").

2) Preparation of a program to improve the extracted IADL items

The IADL improvement program consisted of two parts: (1) a basic exercise program focused on joint movement and stretching and (2) an exercise program specific to IADL difficult household factors. As for the basic exercise program, exercises to balance the center of gravity in the supine, upright, and standing positions, which were developed by Atomi et al.[7], and an exercise for the toes, shoulders, and hands developed by Kimura et al.[8] were employed. The exercise for IADL difficult household factors included movements corresponding to each IADL, in which the elderly enjoyed moving their bodies in a group. A dancing exercise was planned specifically for the 1st factor ("motor coordination/ skill movement") in which subjects sat on the floor and held a 30-cm-long stick in each hand to mimic cooking actions such as peeling, cutting, frying, and stirring (hereafter, "pole exercise"). A dancing exercise was prepared for the 2nd factor ("ambulation/ carrying") where the elderly performed dancing, holding hands and moving in a circle with music. They moved the center of gravity of their bodies back and forth and up and down similar to cross steps and squats in a standing position (hereafter, "Circle dancing"). Another exercise for the 2nd factor was performed in a standing position using a ball with a partner. A pair pushed, pulled, and handed the ball assuming that the ball was a pan and dishes (for ambulation) or laundry (for carrying). The upper limb movement for the 3rd factor was conducted by posture dancing with music. The exercise mimicked hanging clothes, using a duster, wiping windows, sweeping, and vacuuming. Several games were devised for the 4th factor ("grip/ pinch") such as tug of war with a partner using a ribbon of 1.5 cm width and Chigiri-e (a technique using colored paper torn to create images).

Study 2

In this study, the 2 programs prepared in Study 1 (i.e., the basic exercise program and IADL exercise program) were evaluated as to whether they were effective in improving IADLs of home-visit care users.

1. Subjects and Methods

Nine subjects (7 females and 2 males; mean age, 83.2 years) were selected after a complete explanation of the study objectives and obtaining informed consent. In terms of the level of certified support need, 7 subjects required support level 1 and 2 subjects required support level 2. They were asked in the home-visit care center to do cleaning (9 subjects), shopping (3 subjects), and cooking (1 subject).

Before starting the program (hereafter, "intervention"), certified care workers received a 20-hour lecture and training on developing (1) ideas to support self-sufficient living, (2) an intervention method to improve IADLs, and (3) an evaluation method to measure the effects of intervention.

The intervention was performed once a week before and after carrying out household assistance at the home-visit care centers and 10 interventions were performed. The time required for 1 intervention was 10 minutes for the basic exercise program and 10 to 20 minutes for the IADL exercise program, for a total of 20 to 30 minutes. The intervention was performed by visiting the subjects. The core exercises consisted of a Pole bar, Ball exercise, and Ribbon tug of war, and posture dancing and Chigiri-e were considered elective exercises when circumstances allowed.

To assess the effects of the intervention, the certified care workers visited the subjects 1 week before and after the intervention to evaluate 3 items regarding their physical functions and IADLs. IADLs were evaluated using a household work checklist. To evaluate their motor coordination / skill movement as physical functions, the number of forearm pronation supination alternate movements in 10 seconds was measured twice on both sides, and the maximum value was recorded. Grip / pinch was measured twice on both sides using a grip dynamometer, and the maximum value was recorded. Motor coordination/ skill movement and

grip strength/ pinch strength were evaluated on the same side and compared with the measurement before the intervention. For ambulation / carrying, the time spent standing on the dominant foot with eyes open and the number of standing up movements from chairs in 30 seconds were measured. Also, the physical activity was measured for 1 week using a acty-maker (Panasonic Electric Works Co.,Ltd.) pedometer to evaluate. Thereafter, 56 IADL items similar to Study 1 were evaluated using the household work checklist and the mean values of 4 IADL difficult factors were compared.

2. Ethical considerations

The subject and family received an explanation from the care manager about the research request and gave written informed consent as in study 1. Moreover, the subjects and the family were notified to be contributed to the thesis with the document, and it won consent for the signature.

3. Statstical analysis

Wilcoxon's test was performed for physical functions evaluation and common difficult household factors.

4. Results

The number of forearm pronation supination alternate movements in 10 seconds, that of steps for 1 week, grip strength and time spent standing on the dominant foot with eyes open increased after the intervention, but showed no significant differences. On the other hand, the number of standing up movements from chairs in 30 seconds significantly increased. Ambulation / carrying and motor coordination / skill movement factors in the household work checklist were significantly improved (Table 2).

Study 3

The effectiveness of the IADL improvement program was proven in Study 2. In Study 3, we investigated whether the program was also effective in those who had to commute for care.

1. Subjects and Methods

Ten subjects were selected from the elderly certified as on support level 1 or 2 who commuted for care as nursing care prevention.

Before starting the intervention, 6 staff involved in commuting for care and in charge of the intervention were first given a 4-hour lecture and training on how to instruct the subjects regarding conducting movements in an appropriate manner.

The intervention was performed for approximately 30 minutes once a week at the time of using commuting for care; 12 interventions were performed. In the first intervention, an occupational therapist instructed each subject how to sit on the floor and perform a pole exercise. Each training session consisted of the basic exercise program for warm-up and the IADL exercise program, which included a pole exercise, Ball exercise, Ribbon tug of war, and posture dancing. Other programs were performed on a day-by-day basis.

The effects of the interventional activities were evaluated 1 week before and after the intervention. Study 2 evaluated the tasks at the home-visit care centers given by the certified care workers while Study 3 assessed the effects of these tasks objectively and subjectively. The items for the objective evaluation corresponded to the 4 difficult

Table 2 Results of intervention by program to improve extracted IADL items of home-visit care users.

Asessment items		Pre-intervention		Post-intervention		Difference	P※3	
		Average	SD	Average	SD			
【Physical functions evaluation 】								
Grip strength	(kg)	20.3	6.1	20.4	7.1	0.2	0.54	
Forearm pronation supination	(Times/10 sec)	20.2	8.5	23.7	9.7	3.4	0.55	
Standing on with eyes open	(Sec)	13.2	11.3	17.4	8.7	4.2	0.31	
chairs stand※1	(Times/30 sec)	13.3	9.5	16.1	7.8	2.8	0.01	**
Physical activity※2	(Ex)	1.2	0.1	1.3	0.1	0.11	0.36	
【Common household difficult factors】								
Motor coordination/skill movement	(24items)	4.4	0.6	4.7	0.4	0.3	0.01	**
Ambulation/carrying	(10items)	3.5	0.7	3.9	0.7	0.4	0.02	*
Upper limb movement	(16items)	4.0	0.7	4.2	0.8	0.2	0.06	
Grip/pinch strength	(6items)	3.6	0.7	4.1	0.5	0.5	0.18	

※1 The number of standing up movements from chairs in 30 seconds were measured.
※2 The physical activity was measured for 1 week using a acty-maker.
※3 Physical functions and common household difficult factors evaluation:Wilcoxon-test,*P<0.05,**P<0.01

household factors. Motor coordination was measured by having the subjects grab a big knob of modular arrangement with predetermined time standards (MODAPTS; Takei Scientific Instruments Co., Ltd.). The number of repeats from side to side in 6 seconds was measured twice on each side following 1 practice session. Skill movement was measured by instructing the subjects to grasp the small MODAPTS knob with the right thumb, index finger, and middle finger. The number of repeats from side to side in 6 seconds was measured twice on each side following 1 practice session. The maximum value for motor coordination and skill movement was recorded. Measurements after the intervention were evaluated on the same side similarly to measurements before the intervention. To evaluate ambulation / carrying, walking speed for 10 m, number of standing up movements from chairs in 30 seconds, and time spent standing on the dominant foot with eyes open were measured. Grip was measured twice for each hand using a hand dynamometer, and the maximum value was recorded. Pinch force between the thumb and the index finger was measured twice for each hand, with the maximum value recorded. Grip strength and pinch pinch strength after the intervention were measured on the same side similarly to measurement before the intervention. The anteroposterior and horizontal upper limb movements, which could not be measured in Study 2, were measured to evaluate functional reach. Furthermore, the physical activity was measured for 1 week using a acty-maker. For the subjective measurement, the subjects were asked to choose at most 3 IADL tasks to be improved, and then they were asked to self-evaluate their goal achievement (hereafter, "goal achievement") and satisfaction level (hereafter, "satisfaction") using the Canadian Occupational Performance Measure (COPM). The score ranged from 0 to 10. When evaluating the IADLs, the difficult items for elderly people requiring support (e.g., body washing and shampooing, laundry, cleaning, tidiness, taking the trash out, going to a hospital, and relaxation) were added to the ADL-20 developed by Eto et al.[9] while the easy items for people requiring support (e.g., turning over in bed, walking inside, grooming, and communication) were excluded. Therefore, 20 IADL items were evaluated at home by staff of the comprehensive community support center. The results were scored 0 or 1 based on the checklist. When the subjects answered that it was "easy to handle" or "all right", the score was 0 and when they answered that it was "difficult to handle", the score was 1. After the intervention, a questionnaire regarding the improved IADLs was distributed.

2. Ethical consideration

The subject and family received an explanation from the care manager about the research request and gave written informed consent as in study 1. Moreover, the subjects and the family were notified to be contributed to the thesis with the document, and it won consent for the signature.

3. Statstical analysis

Wilcoxon's test was performed to compare the measurements before and after the intervention for objective evaluation of its effects. The progress in improvement in each household task to be improved, related objective measurements, actual changes in IADLs, and the questionnaire were summarized for the subjective evaluation.

4. Results

From the 10 original subjects to be evaluated, 2 were excluded (1 was hospitalized and 1 withdrew due to lack of enjoyment with the basic exercise program), leaving 8 subjects (1 male and 7 females; mean age, 86.4 years) as participants. The certified support need level was 1 in 2 subjects and 2 in 6 subjects. The degree of independence in daily life of the elderly with disability was J1 in 1 subject, J2 in 2 subjects, and A1 in 1 subject.

Only 1 subject could not sit on the floor because of knee osteoarthritis, regardless of the instructions given in the program.

The physical examination results demonstrated that skill movement, motor coordination, grip strength, number of standing up movements from chairs, and functional reach (left side excluded) increased, but showed no significant differences. There were no changes in standing on the dominant foot with eyes open, walking speed for 10

Table 3 Results of intervention by program to improve extracted IADL items of commuting for care.

Measurement item			Pre-intervention		Post-intervention		Difference	P
			Average	SD	Average	SD		
Grip / pinch	Grip	(kg)	13.7	2.3	15.1	3.0	1.4	0.23
	Pinch	(kg)	4.4	1.3	4.0	1.5	−0.4	0.84
Upper limb movement	Functional reach (Front)	(cm)	16.4	2.7	17.3	1.8	0.9	0.63
	Functional reach (Right)	(cm)	13.1	5.3	13.4	4.8	0.3	0.34
	Functional reach (Left)	(cm)	8.8	5.4	15.4	9.2	6.6	0.01 *
Motor coordination/ skill movement	Skill movement	(num/6sec)	8.8	2.4	9.4	2.0	0.6	0.56
	Moter coordination	(num/6sec)	5.4	2.0	6.3	1.0	0.9	0.28
Ambulation / carrying	Standing on with eyes open	(sec)	3.2	4.5	2.9	2.2	−0.3	0.64
	10m gait (common)	(sec)	21.3	7.0	24.6	15.2	3.2	0.95
	Chairs stand	(num/30sec)	6.1	2.2	7.5	4.0	1.4	0.34
	Physical activity	(Ex)	1.2	0.0	1.2	0.1	0.0	0.98

※ Physical functions and common household difficult factors evaluation:Wilcoxon-test,*P<0.05

m, pinch grip, or physical activities (Table 3).

The results of the IADL evaluation indicated difficulty in standing up from chairs in 6 of the 8 subjects, followed by stair climbing and getting in and out of the bathtub in 5 subjects, and walking outside, body washing, shopping, and going on outings in 4 subjects. IADLs were improved after the intervention in all 6 subjects who used to have difficulty with food preparation, safe use of electric and gas appliances, phone calling, managing medications, taking the trash out, and recreation. In addition, IADLs were improved in 3 of 4 subjects who used to have difficulty with shopping and in 2 of 3 subjects who used to have difficulty with changing clothes, cleaning, laundry, and tidiness. However, worsening of getting in and out of the bathtub, tidiness, and going on outings was observed in 1 subject (Table 4).

From the COPM results (Table 5), goal achievement and satisfaction were improved in Case Nos. 2, 5, 7, and 8. In the subjective evaluation, the scores for both goal achievement and satisfaction in the COPM task "I want to walk well" increased by 8 points for Case No. 2. In actuality, the walking speed for 10 m for Case No. 2 decreased by 1.66 seconds, but the subject still had difficulty in walking and going on outings; however, the subject answered in the questionnaire that shopping ability was improved. Moreover, the IADL item "I want to raise my hands without feeling any pain" also improved for Case No. 2 after the intervention, and the subject answered in

Table 4 The results of the IADL evaluation. (Unit : number)

IADL items	Pre-intervention		Post-intervention					
	Difficulty		Improve		No improvement		Decline	
Standing up from chairs	6	75.0 %	2	33.3 %	4	66.7 %	0	0.0 %
Stair climbing	5	62.5	2	40.0	3	60.0	0	0.0
Getting in and out of the bathtub	5	62.5	3	60.0	2	40.0	1	20.0
Walking outside	4	50.0	0	0.0	4	100	0	0.0
Body washing and shampooing	4	50.0	2	50.0	2	50.0	0	0.0
Shopping	4	50.0	3	75.0	1	25.0	0	0.0
Going on outings	4	50.0	2	50.0	2	50.0	1	25.0
Changing clothes	3	37.5	2	66.7	1	33.3	0	0.0
Going to a hospital	3	37.5	1	33.3	2	66.7	0	0.0
Cleaning	3	37.5	2	66.7	1	33.3	0	0.0
Laundry	3	37.5	2	66.7	1	33.3	0	0.0
Tidiness	3	37.5	2	66.7	1	33.3	1	33.3
Food preparation	2	25.0	2	100.0	0	0.0	0	0.0
Phone calling	2	25.0	2	100.0	0	0.0	0	0.0
Recreation	2	25.0	2	100.0	0	0.0	0	0.0
Safe use of electric and gas appliances	1	12.5	1	100.0	0	0.0	0	0.0
Managing medications	1	12.5	1	100.0	0	0.0	0	0.0
Taking the trash out	1	12.5	1	100.0	0	0.0	0	0.0
Oral hygiene	0	0.0	0	0.0	0	0.0	0	0.0
Property management	0	0.0	0	0.0	0	0.0	0	0.0

Table 5　Relationship with the measurement items of physical functions and in individual living tasks obtained using COPM, IADL evaluation, and the questionnaire.

Case	COPM (Unit:point)				Objective measurements (Extract)								IADL evaluation (Extract) (Unit:point)														Questionnaire (Unit:point)							
	IADL tasks	achievement (point)		Satisfaction (point)		Grip (kg)		Pinch (kg)		Skill movement (number)		Moter coordination (number)		10m gait (sec.)		Chairs stand (number /30sec.)		Stand& sit		Walking outside		Getting in and out of the bathtub		Food preparation		Shopping		Outing		Laundry		Recreation		I can sit and stand	I can carry things easily	I can walk easily	I can shop	I can take a bath easily	My fingers regain strength	I became easy to cook	I became easy to dry washing
		Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.	Pre.	Post.								
1	I want to find diversion of mind	2	3	10	3	11.2	19.0	2.5	4.8	5.5	9.5	1.5	5.0	29.9	59.4	3	4	1	1	1	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0
	I want to walk well	5	5	5	5																																			
2	I want to walk well	0	8	0	8	16.0	13.5	3.5	5.0	8.5	9.5	3.5	6.5	25.8	27.5	6	8	0	0	1	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	1	1	0	0	1
	I want to raise my hands without feeling any pain	0	10	0	10																																			
	I want to peel off an apple alone	0	0	0	0																																			
3	I want to be able to go shopping	0	0	0	0	14.0	15.5	4.0	4.0	10.5	8.5	7.5	6.5	27.0	28.7	8	11	1	1	1	1	0	1	1	0	1	0	0	1	1	0	1	0	0	0	0	0	1	0	0
4	I want to stand and sit without any difficulty	0	0	0	0	12.5	13.5	4.0	2.6	4.5	7.5	4.5	6.0	19.9	15.1	5	15	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	I want to walk longer	2	9	3	9	18.0	20.5	6.0	4.9	10.5	12.5	7	7.5	15.3	15.1	3	5	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	1	0	0
	I want to stand up from chairs without any assistance	2	7	5	7																																			
	I want to use chopsticks freely	3	4	10	5																																			
6	I want to be able to walk without the grip in the thing with	5	5	0	5	14.3	14.0	6.0	5.8	10.5	9.5	6.5	7.0	17.3	21.2	8	4	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0
	I want to be able to stand easily while it is cooking	3	3	0	0																																			
7	I want to take a bath by myself	0	0	0	0	12.0	12.0	5.5	1.0	10.5	6.5	6	4.5	14.6	16.1	8	6	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0
	I want to enjoy my hobby (dancing)	0	3	0	5																																			
8	I want to do handwork	5	10	0	8	12.0	12.0	4.0	4.0	9.5	11.5	6.5	7.0	15.3	13.5	8	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

the questionnaire "I can take a bath easily". Case No. 5 showed improvement and earned 7 and 6 points in goal achievement and satisfaction in the task "I want to walk longer", respectively. However, there was no improvement in the walking speed for 10 m. Also, the IADL evaluation result showed that "going on outings" was improved and the subject answered "I can carry things easily" in the questionnaire. Furthermore, the item "I want to stand up from chairs without any assistance" was improved and scored 5 points, goal achievement and satisfaction 2 points, and the number of standing up movements from chairs increased by 2. Moreover, Case No. 5 also showed improvement in the task "standing and sitting" in the IADL evaluation and answered "I can stand and sit without any difficulty" in the questionnaire. The item"I want to use chopsticks freely" was improved and earned 1 point in goal achievement, but lost 5 points in terms of satisfaction. Pinch grip strength increased by 0.5 kg and 1.5 times during the measurement of skill movement. Case No. 5 answered "my fingers regained strength" in the questionnaire. Case No. 7 showed improvement in the task "I want to enjoy my hobby (dancing)" and earned 3 and 5 points in goal achievement and satisfaction, respectively. However, there was no improvement in another task "I want to take a bath by myself" with a score of 0 in goal achievement and satisfaction. Also, the number of standing up movements from chairs decreased 2-fold and the IADL evaluation indicated no improvement in getting in and out of a bathtub, even though Case No. 7 answered "I can take a bath properly" and "I can stand and sit" in the questionnaire. Case No. 8 showed improvement in the task "I want to do handwork" and earned 5 points and 8 points in goal achievement and satisfaction, respectively. The IADL evaluation indicated that "standing and sitting" was improved and that there were no longer any difficult tasks. Finally, Case No. 8 answered "I can stand and sit" in the questionnaire.

Discussion

Factor analysis was performed in Study 1 to extract difficult household factors such as cooking, cleaning, shopping, and laundry, which were offered by the home-visit care service to the elderly requiring support. The results indicate extraction of 6 factors. The 1st factor ("motor coordination / skill movement"), 2nd factor ("ambulation / carrying"), 3rd factor ("upper limb movement"), and 4th factor ("grip strength and pinch grip") were clear; however, the 5th and 6th factors were excluded because of the small factor loading. In the literature, the majority of previous studies investigated the effects of different factors, including age, hospitalization and obesity, on IADLs[10-12]; however, studies to investigate common difficulty factors in the performance of IADLs are rare. The difficult IADL tasks for people requiring support are ambulation and carrying, which require center of gravity balance of the lower body, motor coordination of the eyes and hands for proper use of instruments, skillful movements of the fingers for accuracy, grip / pinch to press, fix, and hold objects, and upper limb movement for cleaning and other activities. Subjects slated for IADL tasks were usually trained in the actual setting to perform IADLs[2-5]; however, this study is characterized by the inclusion of a special program containing simulation of IADLs corresponding to the 4 difficult factors for the elderly requiring support.

In Studies 2 and 3, the IADL improvement program prepared in Study 1 was performed for home-visit care and commuting for care to evaluate the effects of the intervention. The measurements of physical functions in Study 2 showed that standing up from chairs improved and that those of other items also increased, although significant differences were not found. Furthermore, Ambulation / carrying and Upper limb movement factors were significantly improved, while, the improvement in IADLs may have been influenced not only by participation in this program, but also attitude changes in the certified care workers. The certified care workers understood that their guidance on voluntary participation of the subjects in household work was important, and they also realized the

importance of support tasks of home-visit care from the household work checklist, all of which may lead to the improvement of IADLs.

Study 2 suggested that the improvement in IADLs of the subjects may have been influenced by the assistance method provided by the home-visit care, as well as the program. Therefore, Study 3 evaluated the effects of the population-based program for commuting for care on IADLs. The assigned occupational therapists instructed the subjects how to stand and sit based on their ability, the subjects being required to sit on the floor during the Pole bar and the basic exercise program. In the intervention, 6 of the 8 subjects could not stand up from or sit down on the floor, while the rest also thought that they could not do similarly because they usually sat on chairs at home. However, all the subjects except for 1 with knee osteoarthritis were able to stand up from and sit on the floor when they followed the instructions. The body and sensory functions of the elderly decreased due to aging and thus they could not perform ordinary ADLs, leading to the need for care service. This condition may lead to a downward spiral of becoming less and less active and result in the development of disuse syndrome. However, when the subjects realized that they could regain their functions, they were definitely willing to participate in the program, which may improve their IADLs. The present results indicate that what the elderly really needs is continuous support and not assistance to perform difficult ADLs and IADLs. Also, the results indicate the importance of not only performing a population-based program, but also providing tailor-made instructions regarding ADLs and IADLs based on an appropriate evaluation of the ability of each subject.

The evaluation items of Study 3 included basic ADLs other than IADL such as standing and sitting, stair climbing, and walking outside which are difficult for people certified as on support level 1 or 2, unlike the IADL evaluation of the assistance items of home-visit care in Study 2. After the intervention, all the subjects showed improvement in the following items: food preparation, safe use of electric and gas appliances, managing medications, taking the trash out, and recreation. Three of 4 subjects (75.0%) showed improvement in shopping, and 2 of the 3 subjects (66.7%) showed improvement in cleaning, laundry, and tidiness. However, there were no significant improvements in the basic ADL items. For example, only 2 of 5 subjects (40.0%) showed improvement in stair climbing, and only 2 of 6 subjects (33.3%) showed improvement in standing and sitting, while none showed improvement in walking outside. Furthermore, there were no remarkable changes in the objective measurement of physical functions such as standing on the dominant foot with eyes open and the walking speed for 10 m. These results indicate that the present IADL program influenced the improvement in IADL of the subjects, but had little effect on individual basic ADLs and physical functions.

Agreement with the objective and subjective measurements were studied in individual living tasks obtained using COPM, IADL evaluation, the questionnaire, and relationship with the measurement items of physical functions. Case Nos. 2 and 5 showed improvement in the subjective measurement of "I want to walk well" and an increase in the scores of goal achievement and satisfaction; however, the objective measurement of the walking speed for 10 m was not improved, suggesting that the subjective improvement of "walking well" may not always agree with the objective improvement in "faster walking speed". It is thus suggested that the subjective motivation of the subjects and not the improvement in their physical functions may significantly influence IADLs.

A motor function improvement program including resistance training to prevent the elderly from developing conditions requiring care due to fracture after falling has been performed for commuting for care and commuting rehabilitation. However, Timonen et al.[13] reported that resistance training in a population-based program did not improve ADLs/ IADLs. It is important to improve the IADLs and ADLs of the elderly for them to maintain their activity and stay functional at home

as long as possible. Here, a program to improving the difficult factors in IADLs was prepared and performed in commuting for care and home-visit care contexts. The results proved that the program provided some help in improving IADLs and also suggest that the elderly should start an exercise program and focus on motor coordination/ skill movement, ambulation/ carrying, upper limb movement, and grip/ pinch when they feel more advanced in age to improve their IADLs.

The limitation of this study is the small number of the elderly participants certified as on support level 1 or 2, which was insufficient to set a control group because only 1 elderly participant from 1 center for commuting for care and home-visit care participated. Therefore, the effectiveness of the program could not be adequately evaluated, specifically whether the improvement in the IADLs was brought about by participation in the program or due to an alteration in the subjects' consciousness from participation in the program. A larger number of subjects should be evaluated in future studies by soliciting cooperation from many centers to clarify this topic in greater depth.

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要支援高齢者のためのIADL向上プログラムの評価と開発

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要　　旨

作業療法では脊髄損傷者や脳卒中後遺症者などの身体障害者にIADLのアプローチの報告はあるが、心身機能障害のない高齢者での文献はない。本研究の目的は、高齢に伴う廃用症候群でIADLが低下した要支援１、２の者を対象に、困難なIADLの共通因子を分析し、IADLの向上を図るプログラムを立案し、実施し、評価した。A県、S市、K市で研究協力の得られた訪問介護サービス事業所を対象に、要支援１、２の608名のIADLを訪問介護で主に援助している家事を家事実施チェック表により調査し、因子分析を行った結果、第１因子「協調性・巧緻性」、第２因子「移動・運搬」、第３因子「上肢の動き」、第４因子「握力やつまみ力」の４つの家事困難共通因子が読みとれた。それらの因子に対応したIADLエクササイズと基本的動作からなる基礎的運動プログラムの２つのIADL向上のためのプログラムを立案し、訪問介護利用者９名、通所介護８名を対象に３ヶ月、20～30分の介入を行った。訪問介護では、身体活動量と各因子に対応した家事実施チェック表によるIADL項目に有意な改善がみられた。通所介護では、階段昇降、屋外移動などの基本的ADLや身体計測値に特に変化がなかったが、IADL評価項目に改善があった。本プログラムの有効性を明らかにするために、対象者を増やし、対照群を設定し、介入を行う必要性があると考えられた。

Appendix. The household work checklist

The household work checklist	Possible	Possible to do almost.	Part is difficult	considerably difficult.	difficult.
Washing1：hand washing	5	4	3	2	1
Washing2：Transportation to cloth-drying place	5	4	3	2	1
Washing3：Washing Basami stop	5	4	3	2	1
Washing4：Sheet drying	5	4	3	2	1
Washing5：Opening and shutting of chest of drawers	5	4	3	2	1
Washing6：Button stop	5	4	3	2	1
Washing7：put away the bedding	5	4	3	2	1
Cooking1：Rice is boiled	5	4	3	2	1
Cooking2：Meat is minced	5	4	3	2	1
Cooking3：Fish is carved	5	4	3	2	1
Cooking4：fish is cut in three pieces	5	4	3	2	1
Cooking5：cut a Japanese radish	5	4	3	2	1
Cooking6：Peel a japanese radish	5	4	3	2	1
Cooking7: Julienne stripe	5	4	3	2	1
Cooking8：cut a pumpkin	5	4	3	2	1
Cooking9：Peel a taro	5	4	3	2	1
Cooking10：Take a potato bud	5	4	3	2	1
Cooking11：Peel a onion	5	4	3	2	1
Cooking12：Mince	5	4	3	2	1
Cooking13：Take a streak of the pea	5	4	3	2	1
Cooking14：Grate	5	4	3	2	1
Cooking15：cut a devil's tongue jelly	5	4	3	2	1
Cooking16：Knead meat	5	4	3	2	1
Cooking17：Mix up	5	4	3	2	1
Cooking18：Dish up	5	4	3	2	1
Cooking19：Water in pan throw away	5	4	3	2	1
Cooking20：take off the lid of PET bottle	5	4	3	2	1
Cooking21：take off the lid of pull-tab	5	4	3	2	1
Cooking22：opening a jar	5	4	3	2	1
Cooking23：opening a tofu-pack	5	4	3	2	1
Cooking24：opening a milk-pack	5	4	3	2	1
Cooking25：Soup is carried	5	4	3	2	1
Shopping1：shuttles on foot	5	4	3	2	1
Shopping2：shuttles by bicycle	5	4	3	2	1
Shopping3：stair climbing	5	4	3	2	1
Shopping4：Getting on and off of escalator	5	4	3	2	1
Shopping5：Small change is taken out of the purse	5	4	3	2	1
Shopping6：Transportation of big thing	5	4	3	2	1
Shopping7：round the shop more than two stores	5	4	3	2	1
Shopping8：It turns round the counter	5	4	3	2	1
Shopping9：After it returns to the house, housework is done at once	5	4	3	2	1
Shopping10：carried luggage of 2kg	5	4	3	2	1
Cleaning1：cleaner	5	4	3	2	1
Cleaning2：Furniture removal	5	4	3	2	1
Cleaning3：dust	5	4	3	2	1
Cleaning4：sweep by broom	5	4	3	2	1
Cleaning5：wrnig a dustcloth	5	4	3	2	1
Cleaning6：carried a bucket	5	4	3	2	1
Cleaning7：sweep up	5	4	3	2	1
Cleaning8：wipe	5	4	3	2	1
Cleaning9：cleaning of bathtub	5	4	3	2	1
Cleaning10：cleaning of toilet	5	4	3	2	1
Cleaning11：Cleaning of gas range	5	4	3	2	1
Cleaning12：takes out the trash	5	4	3	2	1
Cleaning13：newspaper is bound	5	4	3	2	1
Cleaning14：Opening and shutting of shutter	5	4	3	2	1