Activity Groupings Reflecting Functional Characteristics Required in Daily Life in Institutionalized Dependent Females in the Old Old Elderly Group

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Abstract

Objectives: This study aimed to determine the activity groupings reflecting functional characteristics required in daily life for the institutionalized dependent females in the old-old elderly group, by examining the interrelationships of activities based on actual achievement characteristics.

Methods: The participants were 697 dependent elderly living at welfare institutions in Japan and 344 old-old females were used for analysis. Factor analysis, based on Promax with the Kaiser Normalization method, was conducted using 74 activities of daily living (ADL) items to determine activity groups. Furthermore, whether each activity group could be classified into sub-groups was confirmed by applying factor analysis to the activities consisting of each activity group.

Results: Four activity groups of lower extremity activities, manual activities, changing and holding posture activities, and upper extremity and dexterous manual activities were interpreted. Except for the manual activity group, these activity groups were classified into two sub-groups.

Conclusions: These activity groupings were characterized by similarities of the body parts used in achievement and the difficulty of activity. The activity groupings obtained in this study are considered to be useful in ADL assessment focusing on evaluating functional characteristics of the dependent elderly.

Key words: ADL, Japanese dependent elderly, factorial structure, the old-old population

Introduction

In assessments of activities of daily living (ADL), ADL domains are generally defined based on the object and content of the activity, such as dressing, movement, eating, bathing and toileting. These categories are available to evaluate situations in daily living where personal or impersonal care is needed. ADL domains have been used in many ADL indexes focused on assessing physical independence in daily living by measuring the amount of personal or impersonal care needed in daily life (1).

On the other hand, the importance of ADL assessment focusing on an evaluation of physical functional characteristics,

such as lower or upper extremity function, has also been suggested (2, 3). In ADL assessments focusing on evaluating physical functional ability, ADL domains are not necessarily useful because each ADL domain consists of activities using different body parts and with various difficulties. Indeed, activities using the lower extremities are included in the ADL domains of movement, bathing, dressing, and toileting, and it is difficult to determine what activity is appropriate to evaluate lower extremity function.

Ando (4) calculated the achievement rates for 39 activities selected from the ADL domains of movement, feeding, grooming, dressing, toileting and bathing, and analyzed the structure characteristics of these activities using Hayashi's quantification theory III. He suggested the possibility that these activities can be categorized into several groups characterized by similarities of difficulty and the body parts used in achievement. Demura et al. (5) investigated the interrelationships between activities, and suggested that there are strong relationships between activities having comparable difficulty even if the activities belong to

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different ADL domains. Spector et al. (6) indicated that there was a hierarchical structure based on the difficulty in daily life activities, and that the achievement characteristics of activities should be examined considering their difficulty.

These reports indicate that activities can be categorized into several groups characterized by similarities of difficulty and the body parts used in achievement. In other words, it is thought that activities can be categorized into several groups characterized by functional characteristics, differing from the ADL domains. Furthermore, several physical functions influence the achievement of each activity. For example, achievement of a dressing activity, closely relating to the function of the extremities, premises a stable sitting or standing posture. Similarly, achievement of walking premises a stable standing posture. It is difficult to hypothetically establish activity groupings reflecting functional characteristics, and these groupings should be objectively examined considering the interrelationships of activities based on actual achievement characteristics.

In ADL assessments, however, not much attention has been paid to examining the ADL groupings considering the functional characteristics of the activities and interrelationships based on the achievement characteristics. These activity groupings reflecting functional characteristics are considered to be useful in ADL assessment focusing on an evaluation of physical functional characteristics. This study aimed to determine the activity groupings reflecting the functional characteristics of ADL activities for institutionalized dependent elderly.

Methods

1. Subjects and data collection

A questionnaire survey was conducted at ten welfare institutions for the elderly located in the three prefectures of Akita (Akita City), Ishikawa (Kanazawa City) and Fukui (Fukui City). The questionnaire survey was conducted with 697 Japanese institutionalized dependent elderly. The subjects were ranked A, B or C on the standard for the degree of independence for dependent elderly approved by the Ministry of Health and Welfare of Japan in 1991. This standard consists of four categories of rank A (house-bound: needing partial assistance only in outdoor activities), B (chair-bound: needing partial assistance only in indoor activities), C (bed-bound: dependent for most daily activities) and J (independent in daily life activities). It is a widely used standard in welfare institutions in Japan. The subjects were selected from each institution by the staff (e.g., nurses, physical therapists, and occupational therapists). ADL assessment was carried out by the staff at the subjects' institutions. The survey duration at each institution ranged between four and six weeks. Informed consent was obtained from the subjects via institutional staff.

In Akita City, five institutions were selected from 12 special nursing homes for the aged. The ratios of subjects/institutionalized elderly of these five institutions were 57/90, 48/80, 77/110, 72/100 and 32/60. In Kanazawa City, three institutions were selected from 10 health facilities, and the ratios of these three institutions were 72/100, 65/100 and 145/240. In Fukui City, two institutions were selected from 13

special nursing homes, and the ratios of these two institutions were 55/80 and 74/100.

In this study, considering the sample size of each gender and age group, 344 females in the old-old group aged 80 years or over were used for the following analyses (mean age was 86.1 ± 4.6 yr). The ratios of the old-old females/survey sample of each institution were as follows: 30/57, 36/48, 44/77, 50/72 and 20/32 in Akita City, 40/72, 34/65 and 40/145 in Kanazawa City, 32/55 and 38/74 in Fukui City.

In investigating assistance devices for movement, 25.0% of the old-old females were without assistance, 27.5% used a stick, 24.5% used a wheelchair and 23.0% were immobile. The percentages of disease morbidity of the subjects were as follows: cardiac disease (15.8%), cerebrovascular disorders (30.8%), articular and skeletal impairments (38.0%), respiratory disease (32.6%), digestive organs disease (32.6%), high blood pressure (15.8%), dementia (10.5%), neuralgia (11.6%), sense organ's disease (22.1%), and paralytic disease (20.3%). Fifty-five and two-tenth percent of the old-old females had multiple diseases.

2. ADL items

We assumed that ADL consists of nine domains of 1) movement, 2) going up and down stairs, 3) changing and holding the posture, 4) bathing, 5) using the toilet, 6) dressing, 7) grooming, 8) eating and 9) manual activities. Considering previous studies (7–15), this study selected 74 ADL items representing each ADL domain to assess the ADL ability of institutionalized dependent elderly (Table 1). The rating scale for each item was a dichotomous scale of “possible (the subject can achieve the activity)” or “impossible (the subject cannot achieve the activity),” and each item was assessed by the staff at the subjects' institutions.

3. Procedure of grouping ADL activities

In ADL assessment, the ADL domains defined based on the object and content of the activity, such as dressing, eating, bathing, have been widely used. Although these ADL domains are useful to assess the amount of personal or impersonal care and the situations where care is needed in daily life, they are not necessarily useful in evaluating physical function of the elderly because the functional characteristics of activities such as body part used in achievement and difficulty are not considered. In addition, in many cases of ADL, several physical functions are complexly related to the achievement of an activity. Thus, it is difficult to hypothetically classify these daily life activities into activity groups reflecting functional characteristics, and these activity groups should be objectively examined by performance.

We hypothesize that ADLs are categorized into several groups characterized by several functional characteristics, such as lower and upper extremity function, and these groupings are influenced by difficulty of activity and the body parts used in achieving. In this study, 74 activities in daily life were classified into several activity groups by factor analysis. Furthermore, whether each activity group could be classified into sub-groups was confirmed by applying factor analysis to the activities comprising each activity group.

Table 1 Result of factor analysis and activity groups

Domains	No.	ADL activities	F1	F2	F3	F4	Communality
III	18	Squatting down from the standing posture.	0.902	0.082	-0.183	-0.050	0.660
II	7	Going up the stairs.	0.859	-0.052	0.106	0.003	0.813
III	16	Sitting cross-legged from the standing posture.	0.834	0.107	-0.120	0.057	0.734
II	8	Going down the stairs.	0.825	-0.042	0.075	0.060	0.796
III	17	Sitting upright from the standing posture.	0.775	0.115	-0.107	0.067	0.666
I	5	Going down a slope.	0.748	-0.070	0.143	0.140	0.824
I	4	Going up a slope.	0.748	-0.070	0.143	0.140	0.824
VI	27	Putting on socks or stockings in the standing posture.	0.742	-0.073	0.316	-0.186	0.628
III	20	Standing up from the squatting posture.	0.736	-0.022	-0.084	0.186	0.657
VI	26	Putting on pants or a skirt in the standing posture.	0.713	-0.060	0.182	0.015	0.660
III	44	Keeping the standing posture.	0.685	0.134	0.122	-0.057	0.630
II	9	Getting on and off an automobile.	0.678	-0.063	0.143	0.168	0.748
III	43	Maintaining the knee-standing posture.	0.588	0.336	0.116	-0.332	0.414
IV	22	Getting out of the bathtub.	0.586	0.000	0.046	0.296	0.716
IV	21	Entering the bathtub.	0.586	0.000	0.046	0.296	0.716
V	24	Using a Japanese-style lavatory.	0.568	0.031	-0.206	0.449	0.668
I	6	Crossing the doorstill.	0.524	-0.047	0.038	0.436	0.770
III	40	Walking on the knees.	0.494	0.089	0.113	0.135	0.525
VIII	45	Eating with a spoon or a fork.	0.008	1.000	-0.121	-0.097	0.835
VIII	47	Eating while holding the tableware on the table.	0.008	1.000	-0.153	-0.097	0.773
VIII	48	Eating while holding the tableware up towards the mouth.	0.058	1.000	-0.186	-0.020	0.814
VII	54	Washing hands.	-0.035	0.918	-0.049	0.032	0.798
VIII	52	Pouring hot water from a kettle into another vessel.	-0.009	0.864	0.014	0.064	0.835
VIII	46	Eating with chopsticks.	0.066	0.858	0.018	-0.081	0.716
V	68	Controlling defecation.	0.028	0.784	0.083	0.014	0.747
IX	74	Opening and closing a drawer.	0.209	0.725	0.144	-0.177	0.666
V	67	Controlling urination.	0.001	0.664	0.137	0.114	0.717
VII	36	Washing the face.	-0.002	0.658	0.018	0.219	0.693
III	41	Tossing about in bed.	-0.041	0.653	-0.122	0.309	0.617
VIII	49	Biting food.	-0.003	0.633	-0.057	0.152	0.495
V	66	Wiping off and flushing after excretion.	-0.076	0.554	0.237	0.175	0.685
III	42	Maintaining the sitting posture.	0.152	0.519	-0.104	0.212	0.488
VII	57	Shaving (males). Combing (females).	-0.030	0.480	0.308	0.087	0.595
VI	58	Pulling a zipper closed.	0.181	-0.184	0.991	-0.290	0.655
IX	71	Cutting paper with scissors.	0.034	0.161	0.845	-0.197	0.704
VI	59	Clasping buttons.	0.126	-0.148	0.834	-0.087	0.580
IV	38	Washing the hair in the bath.	0.202	-0.072	0.799	-0.110	0.647
IV	61	Washing the extremities in the bath.	-0.097	-0.166	0.774	0.309	0.730
VIII	51	Cutting fruits and vegetables with a knife. Peeling fruit and vegetables with a knife.	-0.184	0.214	0.764	0.051	0.744
IV	62	Scooping water in the bathtub.	0.052	-0.070	0.760	0.117	0.697
IX	70	Writing characters.	0.067	-0.006	0.742	-0.126	0.477
IV	63	Rinsing the body with the shower.	0.150	-0.102	0.709	0.124	0.699
IV	64	Drying the body with a towel after bathing.	-0.173	-0.025	0.683	0.420	0.822
VII	56	Cutting the nails.	-0.085	-0.188	0.649	0.305	0.524
IV	39	Washing the back in the bath.	0.360	-0.116	0.636	-0.075	0.587
VI	60	Tucking the hem of the jacket into pants or a skirt.	-0.073	0.302	0.626	0.036	0.708
VII	55	Taking care of dentures. (Brushing the teeth.)	-0.204	0.322	0.624	0.121	0.738
VIII	53	Opening and closing the faucet.	0.218	0.313	0.609	-0.344	0.546
VIII	50	Peeling a mandarin orange.	-0.070	0.142	0.553	0.135	0.521
IV	65	Squeezing a wet towel.	0.001	0.112	0.530	0.281	0.710
IX	69	Tying a string.	-0.069	0.449	0.459	0.076	0.719
IX	73	Undoing a package wrapped in cloth.	0.051	0.148	0.442	0.219	0.586
IX	72	Opening and closing a sliding door.	0.119	0.304	0.333	0.094	0.534
III	13	Getting off the bed.	0.062	0.013	-0.080	0.955	0.903
III	14	Getting up on the bed.	0.122	0.039	-0.153	0.944	0.902
III	10	Shifting the body while lying on one's back.	0.016	-0.040	0.038	0.890	0.814
I	2	Walking in the room.	0.159	0.040	-0.136	0.874	0.844
III	15	Sitting on a chair from the standing posture.	0.112	0.067	-0.109	0.864	0.831
III	11	Sitting up from the lying posture.	0.010	-0.011	0.040	0.861	0.792
I	3	Walking to an adjoining room.	0.245	0.015	-0.164	0.835	0.832

Table 1 (Continue)

V	23	Using a Western-style lavatory.	0.104	-0.057	0.069	0.823	0.827
I	1	Crawling.	0.140	-0.015	-0.048	0.798	0.730
VI	30	Putting on mules.	-0.060	0.212	0.050	0.744	0.810
III	12	Moving the face of the body towards a different direction in the sitting posture.	0.206	-0.020	0.030	0.732	0.797
VI	29	Putting on socks or stockings in the sitting posture.	0.142	-0.010	0.135	0.676	0.765
V	25	Pulling up and down the underwear during excretion.	0.081	0.188	0.001	0.672	0.750
VI	28	Putting on pants or a skirt in the sitting posture.	0.146	0.018	0.145	0.651	0.777
VI	31	Putting on wooden clogs.	-0.056	0.105	0.303	0.612	0.807
VII	37	Wiping the body with a towel.	-0.003	0.096	0.339	0.533	0.778
VI	33	Putting on shoes.	0.052	0.099	0.294	0.525	0.765
III	19	Standing up from the sitting posture.	0.479	-0.015	-0.103	0.484	0.645
VI	35	Putting on a long-sleeved shirt with buttons.	-0.118	0.116	0.462	0.477	0.783
VI	34	Putting on a short-sleeved shirt with buttons.	-0.118	0.116	0.462	0.477	0.783
VI	32	Putting on shoes without strings.	0.096	0.124	0.299	0.431	0.705
Correlations between factors							
F1: Lower extremity activity group							
F2: Manual activity group			0.436				
F3: Dexterous manual activity and upper extremity activity group			0.569 0.654				
F4: Holding and changing the posture activity group			0.672 0.672 0.724				

ADL domain is as follows; I: Movement, II: Going up and down stairs, III: Changing and holding posture, IV: Bathing, V: Using the toilet, VI: Dressing, VII: Grooming, VIII: Feeding, IX: Manual activity.

4. Statistical analyses

The “achievement rate” was calculated for each ADL item by dividing the “possible” responses by the total responses. Phi coefficients were calculated for the 74 items, and factor analysis was applied to the Phi coefficients’ matrix. The extraction method of factors was used as the principal component analysis, and the extracted components were then rotated by Promax with the Kaiser Normalization method, because various physical functions complexly influenced the performance of each activity. Statistical significance was set at $p < 0.05$.

Results

Table 1 shows the results of factor analysis using the 74 items and the achievement rate for each item. Four activity groups were extracted. The first activity group (F1 group) was mainly composed of activities using the lower extremities, such as going up and down the stairs, standing up from the sitting posture, sitting down from standing posture and dressing in a standing posture. The second activity group (F2 group) was mainly composed of manual activities, such as eating, toileting and grooming. The third activity group (F3 group) mainly consisted of activities requiring more dexterity and range of motion in the upper extremities than the activities of the F2 group, such as washing the extremities in the bath, cutting the nails, clasping buttons, cutting paper with scissors, writing characters and cutting fruit and vegetables with a knife. The fourth activity group (F4 group) was mainly composed of activities regarding changing and holding the posture, such as crawling, shifting the body while lying on one’s back, sitting up from the lying posture, putting on pants or skirt in the sitting posture, walking in the room and sitting down from the standing posture. Moderate or higher correlations from 0.436 to 0.724 were found among the four factors, and the highest correlation was found between the F3 group and the F4 group.

In this study, whether each activity group was categorized

into sub-groups was confirmed by applying factor analysis to the activities comprising each activity group. Since Item 72, “Opening and closing a sliding door,” showed the highest factor loading for the third factor, this item was included in the activities of the F3 group.

As shown in Tables 2-1 to 2-3, the F1 group was classified into two activity groups, regarding movement (F1a group) and standing posture (F1b group). The F2 group was not classified into sub-groups. The F3 group was categorized into activity groups regarding upper extremities (F3a group) and dexterous manual activities (F3b group). The F4 group was classified into groups regarding changing and holding a sitting posture (F4a group) and holding a standing posture (F4b group). The correlations between sub-groups were 0.7 or over in all activity groups.

Figure 1 shows the relationship between achievement rates of items, ADL domains and activity groups. Each activity group obtained in this study tended to be characterized by the similarity of achievement rate.

Discussion

In the old-old female group of institutionalized dependent elderly, ADL activities were considered to be classified into the four activity groups of lower extremity activity (F1 group), manual activity (F2 group), upper extremity activity (dexterous manual activities and upper extremity activities (F3 group), and holding and changing a posture activity (F4 group). Kim et al. (16) categorized the activities from the viewpoints of the three functional characteristics of balancing, operating and moving, and the three body parts of the upper extremities, lower extremities and the whole body. In examining the factor structure of ADL ability in community-dwelling elderly, Kim et al. interpreted four factors of movement, upper extremity function, manual function, and standing and changing posture. In this study, the F1 group was mainly composed of activities using

Table 2-1 Sub-groups of the lower extremity activity group (F1 group) and achievement rate of each activity

Domain	No.	ADL activity	F1a	F1b	Communality	%#
IV	21	Entering the bathtub.	1.000	-0.191	0.797	18.1
IV	22	Getting out of the bathtub.	1.000	-0.189	0.787	23.9
VI	26	Putting on pants or a skirt in the standing posture.	0.862	-0.047	0.686	13.6
II	8	Going down the stairs.	0.853	0.055	0.798	12.8
II	7	Going up the stairs.	0.822	0.093	0.797	12.7
I	5	Going down a slope.	0.766	0.183	0.825	17.0
I	4	Going up a slope.	0.763	0.175	0.807	17.5
V	24	Using a Japanese-style lavatory.	0.744	0.104	0.677	15.6
VI	27	Putting on socks or stockings in the standing posture.	0.736	0.034	0.578	10.9
III	20	Standing up from the squatting posture.	0.731	0.136	0.697	14.1
I	6	Crossing the doorstill.	0.612	0.287	0.713	21.1
III	18	Squatting down from the standing posture.	0.504	0.338	0.616	14.2
III	43	Maintaining the knee-standing posture.	-0.283	1.000	0.749	16.2
III	40	Walking on the knee.	-0.052	0.910	0.762	19.4
III	44	Keeping the standing posture.	0.132	0.742	0.711	18.5
III	16	Sitting cross-legged from the standing posture.	0.225	0.720	0.804	17.2
III	17	Sitting upright from the standing posture.	0.198	0.700	0.731	15.6
II	9	Getting on and off an automobile.	0.386	0.493	0.669	19.5
Correlation between factors						
		F1a: Movement activity group	1.000			
		F1b: Changing a standing posture activity	0.727	1.000		

%#: achievement rate of each activity. ADL domains corresponds with Table 1.

Table 2-2 Sub-groups of the dexterous manual activity and upper extremity activity group (F3 group) and achievement rate of each activity

Domain	No.	ADL activity	F3a	F3b	Communality	%#
VI	58	Pulling a zipper closed.	0.973	-0.161	0.742	11.5
VIII	50	Peeling a mandarin orange.	0.947	-0.125	0.738	25.7
IV	64	Drying the body with a towel after bathing.	0.835	-0.028	0.663	30.3
IX	72	Opening and closing a sliding door.	0.813	0.002	0.663	44.4
VI	60	Tucking the hem of the jacket into pants or a skirt.	0.771	-0.058	0.532	41.4
IV	61	Washing the extremities in the bath.	0.769	0.096	0.709	23.9
VII	55	Taking care of dentures. (Brushing the teeth.)	0.768	-0.026	0.560	38.4
IV	63	Rinsing the body with the shower.	0.761	0.068	0.660	32.6
IV	39	Washing the back in the bath.	0.720	0.116	0.654	19.2
IX	73	Undoing a package wrapped in cloth.	0.525	0.410	0.762	31.4
VII	56	Cutting the nails.	0.519	0.219	0.485	19.9
IX	69	Tying a string.	0.415	0.412	0.594	34.9
IV	65	Squeezing a wet towel.	-0.341	1.000	0.637	30.0
IX	71	Cutting paper with scissors.	-0.105	0.915	0.706	27.7
IV	38	Washing the hair in the bath.	0.317	0.571	0.693	23.5
IX	70	Writing characters.	0.368	0.537	0.717	21.5
VIII	53	Opening and closing the faucet.	0.286	0.494	0.535	24.5
IV	62	Scooping water in the bathtub.	0.442	0.447	0.686	28.6
VIII	51	Cutting fruits and vegetables with a knife. Peeling fruit and vegetables with a knife.	0.373	0.416	0.540	24.2
VI	59	Clasping buttons.	0.378	0.377	0.494	18.0
Correlation between factors						
		F3a: Upper extremity activity	1.000			
		F3b: Dexterous manual activity	0.738	1.000		

%#: achievement rate of each activity. ADL domains corresponds with Table 1.

lower extremities, and many of these activities corresponded to the activities representing movement in the report of Kim et al. The F1 group included the activities of changing posture in a standing position and dressing in a standing position, in addition to movement activities. Furthermore, the results in this study were similar to those in Kim et al.'s report in that the upper extremity activities and manual activities were interpreted

as different activity groups, and that the holding and changing posture activities were interpreted as one activity group. These results suggest that although the achievement levels differ between the dependent and independent elderly, their fundamental functional characteristics required in daily life may be similar, and that the activities in daily living are grouped to reflect these characteristics. Except for the F2 group, two sub-

Table 2-3 Sub-groups of the holding and changing the posture activity group (F4 group) and achievement rate of each activity

Domain	No.	ADL activity	F4a	F4b	Communality	%#
VI	34	Putting on a short-sleeved shirt with buttons.	1.000	-0.171	0.827	35.1
VI	35	Putting on a long-sleeved shirt with buttons.	1.000	-0.141	0.847	34.5
VI	32	Putting on shoes without strings.	0.937	-0.048	0.809	34.8
VI	31	Putting on wooden clogs.	0.918	0.002	0.845	31.6
VI	33	Putting on shoes.	0.850	0.073	0.825	34.7
VII	37	Wiping the body with a towel.	0.846	0.036	0.764	36.7
VI	28	Putting on pants or a skirt in the sitting posture.	0.782	0.098	0.740	23.7
VI	30	Putting on mules.	0.774	0.166	0.827	41.9
III	10	Shifting the body while lying on one's back.	0.671	0.291	0.840	43.0
VI	29	Putting on socks or stockings in the sitting posture.	0.665	0.176	0.657	22.6
III	11	Sitting up from the lying posture.	0.660	0.295	0.827	40.9
III	12	Moving the face of the body towards a different direction in the sitting posture.	0.620	0.343	0.834	42.6
V	25	Pulling up and down the underwear during excretion.	0.569	0.331	0.728	35.6
III	13	Getting off the bed.	0.535	0.453	0.869	40.1
I	3	Walking to an adjoining room.	-0.254	1.000	0.854	27.4
I	2	Walking in the room.	-0.122	1.000	0.854	29.3
III	15	Sitting on a chair from the standing posture.	0.278	0.674	0.824	35.2
III	19	Standing up from the sitting posture.	0.122	0.669	0.590	23.0
I	1	Crawling.	0.340	0.564	0.733	31.7
V	23	Using a Western-style lavatory.	0.425	0.524	0.802	37.2
III	14	Getting up on the bed.	0.474	0.522	0.883	39.9
Correlation between factors						
F4a: Holding and changing a sitting posture activity			1.000			
F4b: Holding a standing posture activity			0.781	1.000		

%#: achievement rate of each activity. ADL domains corresponds with Table 1.

Fig. 1 The relationships between achievement rates, activity groups and ADL domains in each activity
ADL domains: 1. Movement, 2. Going up and down stairs, 3. Changing and holding the posture, 4. Bathing, 5. Toileting, 6. Dressing, 7. Grooming, 8. Eating, 9. Manual activities
Activity group: F1a: Movement activity, F1b: Standing posture activity, F2: Manual activity, F3a: Upper extremity activity, F3b: Dexterous manual activity, F4a: Changing and holding a sitting posture activity, F4b: Holding a standing posture activity

groups were recognized in each activity group. The F1 group was classified into two activity groups of movement (F1a group) and holding and changing a standing posture (F1b group). As holding a standing posture is indispensable to

walking, these groups were closely related ($r=0.727$). Similar trends were found in the F3 and F4 groups.

In analyzing the characteristics of these activity groups from the viewpoint of the relationship between the ADL domain and the achievement rate of each activity (Figure 1), each activity group tended to be characterized by activities with similar achievement rates. The achievement rates of activities comprising the four activity groups obtained in this study tended to be high, in order, from the F2 group, F4 and F3 group, to the F1 group. The sub-groups in each activity group, furthermore, tended to be characterized by similarities of achievement rates and body parts used in achievement. In the relationships between activity groups, the strongest relationship was found between the F3 and F4 groups (Table 1), and their mean achievement rates were the closest (Figure 1). The weakest relationship was found between the F1 and F2 groups (Table 1), and their mean achievement rates were farthest apart (Figure 1). This suggests that the level of achievement rate, reflecting the difficulty of the activity, influenced the characteristics of the relationships among ADL activities. Furthermore, in bathing activities, the activities of entering or getting out the bathtub belonged to the F1 group, and activities using upper extremities, such as washing the body or extremities in the bath, belonged to the F3 group (Table 1). Similarly, some dressing activities in a standing posture belonged to the F1 group, and other dressing activities belonged to the F4 group. These findings suggest that activities in daily life can be classified into activity groups based on body parts used in achievement, and difficulty, differing from the ADL domains categorized by the object of each activity (Figure 1), and that the seven activity groups obtained in this study may be useful in ADL assessment

focusing on evaluating functional ability required in daily life, such as lower and upper extremity function, changing and holding of body posture function, and the manual function. These findings support Ando's report (4) that ADL activities can be categorized into several groups characterized by similarities of difficulty and the body parts used in achievement.

In making a care plan for the dependent elderly to determine situations in daily living where personal or impersonal care is needed, assessment activities must be selected from all ADL domains. On the other hand, in assessing physical function of the elderly using ADL, it is important to select assessment activities considering the physical functional characteristics required to achieve each activity (1). The activity groups obtained in this study reflected characteristics of body parts used in achievement, and difficulty, and these groupings are considered to be useful in ADL assessment focusing on the evaluation of the functional characteristics of the dependent elderly.

The present results did not compare characteristics between diseases considering the sample size, because half or more of the female elderly in the old-old group had multiple diseases. The achievement of activity was closely related to contraction of disease, and the difficulty of each activity was also considered to be influenced. Although the activity groups obtained in this study were considered to support the result of the previous study, further examinations considering characteristics of disease

will be needed. In addition, this study analyzed only the old-old female group because of the limitation of the sample size in each sex and age group. Gender differences and changes with aging in the structure characteristics of ADL activities will also need to be examined.

In conclusion, the activities of daily living in institutionalized dependent elderly in the old-old female group were composed of four activity groups of lower extremity activities, manual activities, changing and holding posture activities, and upper extremity and dexterous manual activities. Except for the manual activity group, these activity groups were classified into two sub-groups. These activity groupings were characterized by similarities of the body parts used in achievement and the difficulty of activity. The activity groupings obtained in this study are considered to be useful in ADL assessment focusing on evaluating the functional characteristics of the dependent elderly.

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